

MEDICINE today

a professional medical journal

VOL. 37

NO. 1

January 2025

CONTENTS

INSTRUCTIONS TO AUTHORS

ORIGINAL ARTICLES

- Clinical and Demographic Profile of Chronic Pancreatitis: A Retrospective Study in Bangladesh** 01
ANM Saifullah*¹, Madhusudan Saha², Bimal Chandra Shil³, Royes Uddin⁴, Arifa Akhter⁵, Md. Shafiqul Islam⁶
- Maternal and Neonatal Outcomes of Dengue Fever in Pregnancy: A Cross-Sectional Study** 05
Bilkis Ferdous*¹, Md. Mostafizur Rahman², Tanzila Halim³, Hasina Khatun⁴, Abu Mohammad⁵
- Influence of Nutritional Support Methods on Postoperative Well-being in Pancreaticoduodenectomy Patients** 09
Md. Mozammel Haque*¹, Bidhan Chandra Das², Abunur Md Masud Rana³, S.M. Ferdous Ahmed⁴, Md. Abdul Quiyum⁵
- Safety of Topical Mometasone Furoate 0.1% Cream vs Topical Tacrolimus 0.03% Ointment in the Treatment of Atopic Dermatitis** 14
Md Alauddin Khan¹, Mohammad Abu Hena Chowdhury², Lubna Khondker³, Dilshad Afroze⁴
- Efficacy of Serum Cystatin C as a Diagnostic Marker of Early Renal Dysfunction in Hypertensive Individuals** 19
Saima Shakila*¹, MD. Monaim Farhad², Farhana Hasan³, Shaila Sharmin⁴, MD. Monzurul Alam Bhuiyan⁵, Tuhin Sultana⁶, Iltutmish Akanda⁷
- Efficacy of Intra-cameral Mydriatic and Anesthetics- in Small Incision Cataract Surgery (SICS)** 23
Md. Mahmud-ul-Huda*¹, Sajed Abdul Khaleque², Md. Zinnurain³, Md. Musharraf Hossain⁴, Rowjatul Jannat Munjifa⁵
- Assessment of Physical Deconditioning due to COVID-19 Lock Down: A Comparison between COVID-19 Affected and Non-affected Person** 27
Golam Nobil*¹, Md. Obaidul Alam², ABM Mehedi³, Abul Kalam Azad⁴, Immamur Rashid⁵, M. A. Shakoor⁶, Nadia Rahman⁷
- Outcome of Gartland Type III Paediatric Supracondylar Humerus Fracture Fixation with the Kapandji Technique in the Prone Position** 33
Partho Protim Chakroborty*¹, Biplob Mozumder², Syed Ariful Islam³, Mohammad Aman Ullah Kabir⁴, Tripty Chakroborty⁵, Chandan Kumar Das⁶
- Multimodal Treatment of Unilateral Temporomandibular Disorder (TMD)- Study of 120 Cases** 37
Mohammad Iqbal Kabir*¹, Md. Atiqul Islam Rabby², Samira Taufique Reshma³, Md. Abdur Rab⁴, Ismat Ara Haider⁵, Golam Mohiuddin Chowdhury⁶
- A Decade of Antibiotic Resistance in E. Coli in Urinary Tract Infections : A Study from a Tertiary Care Hospital in Bangladesh** 44
Md. Mahabubul Islam Majumder*¹, Ashrafur Rahaman Mahadi², Tareq Ahmed³, Nazmus Sakib⁴, Mostaque Ahmed⁵, Mohammad Nazim Uddin⁶, Hossain Mohammad Shihab⁷
- Challenges and Remedies in the age of antimicrobial Resistance Landscape: Ventilator-Associated Pneumonia** 52
Md. Farhan Azad Badhon*¹, Nadia Natasha Ahmed Chowdhury², Farjan Azad³, Abhijit Mondol⁴, Gaitri Kashyapi⁵, Abul Kalam Azad⁶
- Generalized Anxiety in Uninvestigated Dyspepsia Patients: A Single Centre Cross-Sectional Study** 57
Imteaz Mahbub*¹, Md. Enamul Karim², Md. Altaf Hossain³, Md. Moshfiqur Rahman Chowdhury⁴, Al Mahmood Appolo⁵, Sayeda Rahim⁶
- Socio-demographic and Clinical profile of Children with Typhoid Fever in a Tertiary Care Hospital** 61
Syeda Farzana Rahat¹, Kartick Chanda Shaha*², Humayra Sultana³, MD. Shafiqur Rahman⁴, Sheikh Hasibur Rahman⁵
- Bedside Prediction of Neonatal Pulmonary Maturity by Single Step Gastric Aspirate Shake Test** 64
Mohammad Khairul Alam*¹, Nadira Sultana², Mohammad Zahirul Islam³, Faruk Ahmed⁴, Md. Abul Hashem⁵
- Surgical Scar Endometriosis: A Painful Scar** 69
Syeda Ummay Kulsum*¹, Fowzia Yasmin², Mehriban Amatullah³, Umme Kulsum⁴, Fatima Wahid⁵
- Outcome of Continuous versus Interrupted Sutures for Circumcision** 73
M M Masud Pervez*¹, Tamanna Narmeen², Amrita Lal Halder³, Mahjib Shahnaz⁴, Saniath Ahmad Salehin⁵

MEDICINE today

a professional medical journal

VOL. 37

NO. 1

January 2025

CONTENTS*Continuations from 1st page***ORIGINAL ARTICLES**

- Prevalence and Causes of Low Vision in Urban vs. Rural Populations** 78
Md. Miftahul Hossain Chowdhury^{*1}, Md. Golam Faruk Hossain², Shamima Siddiqui³
- Evaluation of the Outcome of Primary Repair within 24 Hours of Open Tendo Achilles Injury** 83
Mohammed Abdul Kadir^{*1}, Liton Kumar Roy², Mahabub Alam³, Apel Chandra Saha⁴, Md. Khorshedul Alam⁵, Abdullah Al Rafi⁶
- Supracondylar Humerus Fracture in Children: A Retrospective Study** 88
Shorif Uz Zaman^{*1}, A.F.M. Julfikar², Md. Nazmul Islam Nissam³
- Risk Elements Linked to Oral Candidiasis** 93
Tanzila Rawnuck^{*1}, Md Selim Reza², Nusrat Jahan³, A.B.M. Iftekhhar Hossain⁴, Bushra Fatema⁵, Mohammad Fatteh-Ul- Islam⁶
- The Pattern of Clinical Characteristics of Tubercular Meningitis (TBM) Patients in Pediatric Unit of Magura Medical College Hospital** 99
Mohammad Abdul Hye^{*1}, Md. Shamsur Rahman², Md. Iqbal Hossain³, Shuperna Ahmed⁴
- Community Engagement and Readiness for E-waste Initiatives: Attitudes, Barriers and Opportunities** 102
Irin Hossain^{*1}, Md. Shafiur Rahman², Md. Golam Abbas³, Shahria Sattar⁴, Afsana Nazneen⁵
- Microscopic Study on the Diameter of the Parietal Cells of Post Mortem Human Stomach** 108
Pran Krishna Basak¹, Suchitra Talukdar², Md. Ashraful Kabir³, Biplab Kumar Barman^{*4}, Abdullah Al Foysal⁵, Halima Akther Suchi⁶, Mahmuda Sultana⁷, Anup Kumar Biswas⁸, Joyashish Roy⁹, Joyanti Rani Debnath¹⁰, Mahmuda Jannat¹¹
- Utilization Pattern of Analgesics in Orthopedic in-Patient Department at Tertiary Level Teaching Hospital in Dhaka** 111
Shima Akter Khatun^{*1}, Sumaiya Ahmed², Mosaddek Hossain Mondal³, Md. Rashel Bin Hossain⁴, Kartick Chanda Shaha⁵, Shusmita Saha⁶
- Association of Renal Functional Status in Different Stages of Diabetic Retinopathy** 114
Farah Diba Chowdhury^{*1}, Mirza Omar Beg², Nusrath Jahan Chowdhury³, Barsha Mojumder Papri⁴, Shukdeb Paul⁵
- Evaluation of the Outcome of Ilizarov External Fixator in Tibial Non-union** 119
K M Badar Uddin^{*1}, MD. Rukanuddawla Khan², Swarupananda Chakraborty³, Asho Tosh Nath⁴, Sheikh Kawsar Mahmood⁵, Khandoker Muhammad Mazher⁶
- Functional Outcome Measures in Acute Low Back Pain Patients in Follow up** 123
Md. Masud Alam^{*1}, Md. Mostafijur Rahman², Kh. Mohammad Ali³, Md. Rakibul Hasan⁴, Taposh Kumar Ghosh⁵, Md. Aminul Alam⁶, Md. Atikul Aziz⁷
- Dietary Adherence and Glycemic Status among Type 2 Diabetes Patients in Rural Areas** 127
Md. Ali Ajim¹, Mst. Lutfun Nahar Juty², Faisal Ahmed³, Jannat Ara⁴, Wahida Yasmeen⁵, Mohammad Nurunnabi^{*6}
- REVIEW ARTICLES**
- Improving Antibiotic Prescribing in Bangladesh Comparing with the United Kingdom: A Systematic Review** 133
Abu Hanif^{*1}, Naznin Parvin², Lokiat Ullah³
- Infertility Due to Obesity in Women: Endocrine Pathways** 144
Murshida Afruz Lubna^{*1}, Umme Sayeeda Bilkish²
- Adjuvant Zinc Therapy in Young Infants with Sepsis: A Systematic Review** 149
Raisa Enayet Badhan^{*1}, Md. Jahangir Alam²
- CASE REPORT**
- A Case Report of a 10-Month-Old Child Diagnosed with Tricuspid Valve Atresia** 154
Golam Mahfuz Rabbani^{*1}

MEDICINE today

A Professional Medical Journal

Medicine Today is a Professional Medical Journal Recognised by Bangladesh Medical & Dental Council (BM&DC). It is a peer-reviewed journal published two times a year in January and July by print and electronic forms.

EDITORIAL BOARD

Chairman

Prof. Dr. N. A. Kamrul Ahsan, FACS, MS.

Editor

Prof. Dr. Md. Ruhul Amin, M.Phil.

Associate Editors

Prof. Dr. Md. Shahinul Alam, FCPS. MD.

Prof. Dr. Sajed Abdul Khaleque, FCPS.

Prof. Dr. Nazmul Haque Robi, DO, MCPS.

Managing Editor:

Dr. Lokiat Ullah, MBBS, PGDPM,
PGDMM, PGDCM, MBA.

Assistant Editor:

Nusrat Sharmin, M. Pharm, MBA.

Members

Prof. Dr. Motiar Rahman

Prof. Dr. Altaf Uddin Ahmed

Dr. AKM Fazlul Haque

Dr. Shahab Uddin Ahmed Chowdhury

Dr. Mohd. Mizanur Rahman

Dr. Md. Anwarul Azim

Dr. M.A. Hye

Dr. Modabbir Hossain

Dr. Mahmud Hossain

Dr. Md. Solaiman

Dr. Ehsanul Kabir

BM&DC RECOGNIZED		e-ISSN 2408-8724 (Online) ISSN 1810-1828 (Print)
MEDICINE today		
a professional medical journal		
VOL. 37	NO. 1	January 2025
CONTENTS		
INSTRUCTIONS TO AUTHORS		
ORIGINAL ARTICLES		
Clinical and Demographic Profile of Chronic Pancreatitis: A Retrospective Study in Bangladesh	81	
ANM Staffs' Health, Maternal and Neonatal Outcomes of Preterm Birth: A Cross-Sectional Study	85	
Effect of Nutritional Support Methods on Postoperative Wound-healing in Pancreaticoduodenectomy Patients	89	
Safety of Topical Minoxidil Versus 5-Fluorouracil in the Treatment of Alopecia Areata	14	
Effect of Serum Creatinine C as a Diagnostic Marker of Early Renal Dysfunction in Hypertensive Individuals	19	
Effect of Intravenous Metoprolol and Lisinopril in Small Intestine Cancer Surgery (MIS)	23	
Assessment of Physical Readiness for the COVID-19 Lock Down: A Comparison between COVID-19 Affected and Non-affected Persons	27	
Outcome of Graftless Type III Pediatric Supracondylar Humerus Fracture Fixation with the Kapandji Technique in the Proximal Position	33	
Multistage Treatment of Unilateral Transmandibular Disorder (TMD): Study of 12 Cases	37	
A Review of Antibiotic Resistance in E. Coli in Urinary Tract Infection: A Study from a Tertiary Care Hospital in Bangladesh	44	
Challenges and Remedies in the age of antimicrobial Resistance Landscape: Ventilator-Associated Pneumonia	52	
Genitourinary Infection in Unilateral Hypospadias Patients: A Single Center Cross-Sectional Study	57	
Socio-demographic and Clinical profile of Children with Typhoid Fever in a Tertiary Care Hospital	61	
Recovery Prediction of Neonatal Pulmonary Maturity by Single Step Gastric Aspiration Shake Test	64	
Effect of Continuous versus Interrupted Sutures for Circumcision	73	
Published two times a year in January and July		
www.banglapedia.informatica.org/MEDTODAY Entered in SCOPUS, SCOPUS, ADL Indexed in SCOPUS, SCOPUS, ADL		

BM&DC RECOGNIZED		e-ISSN 2408-8724 (Online) ISSN 1810-1828 (Print)
MEDICINE today		
a professional medical journal		
VOL. 37	NO. 1	January 2025
CONTENTS		
Continuations from 1st page		
ORIGINAL ARTICLES		
Prevalence and Causes of Low Vision in Urban vs. Rural Populations	78	
Evaluation of the Outcome of Primary Repair within 24 Hours of Open Treadle Achilles Injury	83	
Supracondylar Humerus Fracture in Children: A Retrospective Study	88	
Risk Elements Linked to Oral Candidiasis	93	
The Pattern of Clinical Characteristics of Tubercular Meningitis (TBM) Patients in Pediatric Unit of Mymensingh Medical College Hospital	99	
Community Engagement and Readiness for E-waste Initiatives: Attitudes, Barriers and Opportunities	102	
Microscopic Study on the Diameter of the Parietal Cells of Post Mortem Human Stomach	108	
Association of Renal Functional Status in Different Stages of Diabetic Retinopathy	114	
Evaluation of the Outcome of External Fixator in Tibial Non-union	119	
Functional Outcome Measures in Acute Low Back Pain Patients in Follow up	123	
Dietary Adherence and Glycemic Status among Type 2 Diabetes Patients in Rural Areas	127	
REVIEW ARTICLES		
Improving Antibiotic Prescribing in Bangladesh Comparing with the United Kingdom: A Systematic Review	133	
Infertility Due to Obesity in Women: Endocrine Pathways	144	
Adjunctive Zoon Therapy in Young Infants with Spastic A Systematic Review	149	
CASE REPORT		
A Case Report of a 16-Month-Old Child Diagnosed with Tricuspid Valve Atresia	154	
Published two times a year in January and July		
www.banglapedia.informatica.org/MEDTODAY Entered in SCOPUS, SCOPUS, ADL Indexed in SCOPUS, SCOPUS, ADL		

Volume 37, January 2025

Copyright: © Prof. N. A. Kamrul Ahsan

Production Editing: Medical Services Department, Biopharma Ltd.

 medicinetoday@biopharmabd.com  www.biopharmabd.com



Contents in this journal are licensed under the Creative Commons Attribution-Non Commercial 4.0 International License (CC BY-NC 4.0).

Sponsored by:

BIOPHARMA
FOUNDATION
Committed to Serving Mankind

Corporate Office: House No.-1, Road No- 1, Dhaka Housing, Adabar, Dhaka-1207, Bangladesh.

The Journal Medicine Today agrees to accept manuscript prepared in accordance with the 'Uniform Requirements Submitted to the Biomedical Journals' published in the New England Journal of Medicine 1991; 324: 424-8.

Aims and scope:

The Medicine Today is a professional Medical Journal recognized by BM&DC, published two times a year in January & July. It is devoted to continuing education in Medical Science. It accepts original research/ articles, review articles, special articles, case reports, recent advances, new techniques, books review on clinical / medical education, adverse drug reaction, an editorial on purely scientific topic or a letter to the editor. Complimentary copies of the journal are sent to libraries of all medical and other relevant academic institutions in the country and selected institutions abroad.

Conditions for submission of manuscript:

- All manuscripts are subject to peer review.
- Manuscripts are received with the understanding that they are not under simultaneous consideration by any other journal.
- **Copyright:**

Copyright on any research article is transferred in full to Medicine Today upon publication in the journal. The copyright transfer includes the right to reproduce and distribute the article in any form of reproduction (printing, electronic media or any other form).



Articles in the Medicine Today are Open Access articles published under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/) (CC BY-NC 4.0).

This License permits to use, distribution and reproduction in any medium, provide the original work is cited and not use for commercial purposes.

Ethical aspects:

- Ethical aspect of the study will be very carefully considered at the time of assessment of the manuscript.
- Any manuscript that includes table, illustration or photograph that have been published earlier should accompany a letter of permission for republication from the author(s) of the publication and editor/publisher of the Journal where it was published earlier.

Preparation of manuscript:

Criteria:

Information provided in the manuscript are important and likely to be of interest to an international readership.

Preparation:

- a) Manuscript should be written in English and typed on one side of A4 (290 x 210 cm) size white paper.
- b) Double spacing should be used throughout.
- c) Margin should be 5 cm for the header and 2.5 cm for the remainder.
- d) Each of the following section should begin on separate page:

- Title page
- Abstract
- Text (Introduction, Materials and Methods, Results (with tables, figures and legends where required), Discussion, Conclusion).
- Conflict of Interest
- Acknowledgement
- References

Title Page

The title page should contain:

- Title of the article (concise, informative and self explanatory)
- Name of each author with highest academic degree.
- Name of the department and institute where the work was carried out.
- Name and address of the author to whom correspondence regarding manuscript to be made. It should include e-mail address, mobile number.

Short Title:

Must be provided. These will be printed at the beginning of the paper.

Abstract

The abstract of the manuscript:

- Should be informative.
- Should be limited to less than 250 words.
- Should be suitable for use by abstracting journals and structured as-introduction with objectives, materials and methods, result, discussion with conclusion including key words number of figures, tables, reference & correspondence.
- Should emphasize mainly on new and important aspects of the study.

INSTRUCTIONS TO AUTHORS

Text

Introduction:

- This should include the purpose of the article.
- The rationale for the study or observation should be summarized. Only strictly pertinent reference should be cited.
- The subject should not be extensively reviewed. Data or conclusion from the work being reported should not be presented.

Materials & Methods:

This section of the study should be very clear and describe:

- The selection criteria of the study, population including controls (if any).
- Study design and sampling method and apparatus used in the research.
- Previously published methods (if applicable) with appropriate citations.
- The procedure of the study in such a detail so that other workers can reproduce the results.

Consent from respondents / patients should be taken in the form before interview / study.

All drugs & chemicals used should be identified precisely, including generic name, dose, route of administration. For all quantitative measurement SI unit should be used.

Results:

The findings of the research should be described here and it should be:

- Presented in logical sequence in the text, tables and illustrations.
- Described without comment.
- Supplemented by concise textual description of the data presented in tables and figures where it is necessary
- Standard procedure to be maintained for statistical analysis. It should be done by a recognized statistician or subject expert related to statistics.

Tables:

During preparation of tables following principles should be followed:

- Tables should be simple, self explanatory and supplement, not duplicate the text.
- Each table should have a title and typed in double space in separate sheet.

- They should be numbered consecutively with roman numerical in order of text. Page number should be in the upper right corner.

- If abbreviations are to be used, they should be explained in footnotes.

Figures and photographs:

The figures and photographs:

- Should be used only where data can not be expressed in any other form
- Should be un-mounted glossy print in sharp focus, 12.7 x 17.3 cm in size.
- Should bear number, title of manuscript, name of corresponding author and arrow indicating the top on a sticky, label and affixed on the back of each illustration.
- Should be mentioned source of Illustrations and Figures.

Legend:

The legend:

- Must be typed in a separate sheet of paper
- Photomicrographs should indicate the magnification, internal scale and the method of staining.

Discussion:

The discussion section should reflect:

- The authors' comment on the results supported with contemporary references and to relate them to those of other authors.
- The relevance to experimental research or clinical practice.
- Well founded arguments
- Brief acknowledgement at end.

Conclusion:

Clearly explain the main focus of the work highlighting its importance and relevance including any practical application.

Conflict of Interest: Should include a statement.

Acknowledgement:

Individuals, organizations or bodies may be acknowledged in the article and may include:

- Name (or a list) of funding bodies
- Name of the organization(s) and individual(s) with their consent.

Abbreviations and Symbols:

- Use only standard abbreviations.
- Avoid abbreviations in the title of the article.

References:

This section of the manuscript:

- Should be numbered consecutively in the order in which they are mentioned in the text.
- Should be identified in the text by superscript in numerical.
- Should be in Vancouver style.

National Library of Medicine and used in Index Medicus.

The authors are responsible for the correctness of references. References are numbered consecutively in the order in which they appear in the text. Citations should be in superscript without bracket and should appear in front of the period or comma at the end of the sentence/clause. All references should be cited.

Unpublished data, personal communications, abstracts at meetings and manuscripts submitted for publication are not acceptable as references. References should be listed in numerical order in the Reference section. Journal titles should be abbreviated according to the list of Journals Indexed in Index Medicus or MEDLINE. Please note that no periods are used after the authors initials. A period is used at the end of each reference. The type and punctuation of references is consistent with the Uniform Requirements for Manuscripts Submitted to Biomedical Journals of the International Committee of Medical Journal Editors (<http://www.ICMJE.org/>). Some examples follow.

Journal article up to six authors (list all authors)
Smithline HA, Mader TJ, Ali FM, Cocchi MN. Determining pretest probability of DVT: clinical intuition vs. validated scoring systems. *N Engl J Med*. 2003 Apr 4;21(2):161-2.

Journal article more than six authors (list first six and add et al.): Gao SR, McGarry M, Ferrier TL, Pallante B, Gasparrini B, Fletcher JR, et al. Effect of cell confluence on production of cloned mice using an inbred embryonic stem cell line. *Biol Reprod*. 2003;68(2):595-603.

Book:

Carlson BM. Human embryology and developmental biology. 3rd ed. St. Louis: Mosby;2004.

Chapter in a book:

Ixter PS, Farnsworth TP. Social health and class inequalities. In: Carter C, Peel JR, editors. Equalities and inequalities in health. 2nd ed. London: Academic Press;1976:165-78.

Conference proceedings:

Harnden P, Joffe JK, Jones WG, editors. Germ cell tumours V. Proceedings of the 5th Germ Cell Tumour Conference; 2001 Sep 13-15; Leeds, UK. New York: Springer; 2002.

Scientific or technical report:

Akutsu T. Total heart replacement device. Bethesda MD: National Institutes of Health, National Heart and Lung Institute; 1974 Apr. Report No.: AFRLSRBLTRO 20123.

Dissertation:

Borkowski MM. Infant sleep and feeding: a telephone survey of Hispanic Americans [thesis/dissertation]. Michigan: Central Michigan University; 2002.

Websites:

WHO, 2010. Avian influenza – situation in Vietnam- update 8.

Available: <http://www.who.int/csr/don/20100304a/en/index.html>.

All References should include the possible DOI and PMid numbers.

Manuscript submission:

Manuscript should include hard and soft copy. No manuscript will be considered without hard and soft copy. It should be submitted to the Editor in Chief and must be accompanied by a covering letter and following inclusions:

- a) A statement regarding the type of article being submitted.
- b) A statement that the work has not been published or submitted for publication elsewhere.
- c) A statement of financial or other relationships that might lead to a conflict of interests.
- d) A statement that the manuscript has been read approved and signed by all authors.
- e) If the article is a whole or part of the dissertation or thesis submitted for diploma/degree, it should be mentioned in detail and in this case the name of the investigator and guide must be specifically mentioned. Submissions must be in triplicates with three sets of illustrations. Text must be additionally submitted in a compact disc (CD).

Editing and peer review:

All submitted manuscripts are subject to scrutiny by the Editor in chief or any member of the Editorial Board. Manuscripts containing materials without sufficient

INSTRUCTIONS TO AUTHORS

scientific value and of a priority issue, or not fulfilling the requirement for publication may be rejected or it may be sent back to the author(s) for resubmission with necessary modifications to suit one of the submission categories. Manuscripts fulfilling the requirements and found suitable for consideration are sent for peer review. Manuscripts found suitable for publication by the reviewer, may need revision/ modifications before being finally accepted. Editorial Board finally decides upon the publishability of the reviewed and revised/modified submission. Proof of accepted manuscript may be sent to the authors, and should be corrected and returned to the editorial office within one week. No addition to the manuscript at this stage will be accepted. All accepted manuscripts are edited according to the Journal's style.

Subscription information:

Journal of Medicine Today ISSN 1810-1828(print) & e-ISSN 2408-8714(online); published by the Dr. Lokiat Ullah, Managing Editor, BIOPHARMA LTD. two times a year in January and July.

Address of correspondence:

Manuscripts and other communication for the editors should be addressed to Medicine Today, **Medical Services Department.**

Biopharma Limited. Corporate Office: House No-01, Road No.-01, Dhaka Housing, Adabor, Dhaka-1207, Bangladesh.
E-mail: medicinetoday@biopharmabd.com
Phone: +8801711465704, +8801713188154

Clinical and Demographic Profile of Chronic Pancreatitis: A Retrospective Study in Bangladesh

ANM Saifullah*¹, Madhusudan Saha², Bimal Chandra Shil³, Royes Uddin⁴, Arifa Akhter⁵,
Md. Shafiqul Islam⁶

Abstract

Introduction: Chronic pancreatitis is characterized by irreversible damage to the pancreas that leads to pain and/or exocrine and endocrine insufficiency. In this study, we investigated the demographic profile, clinical feature and therapeutic modalities of chronic pancreatitis in Bangladesh. **Materials and Methods:** This is a retrospective hospital-based study. All patients admitted with chronic pancreatitis in Gastroenterology department of two tertiary care hospital from Jan. 2019 to Dec.2022 were included in this study. **Results:** A total of (n=106) patients were enrolled in this study with a median age of 17.67 ± 15.47 years. Abdominal pain was a presenting symptom in most of the cases (89.6%). Forty-two patients (39.6 %) had diabetes mellitus. Ductal dilatation (48.11 %) and pancreatic calcification (51.89 %) were the most common ultrasonological findings. All the patients were receiving medical treatment. Two patients undergone pancreato-jejunostomy & nine patients (8.5 %) received endo therapy. Out of complications, seven patients (6.6 %) had evidence of pseudocyst, six patients (5.66%) had biliary obstruction & four patients (3.77%) had ascites. **Conclusion:** In this study, idiopathic chronic pancreatitis (CP) was observed as the most common & should be treated by multidisciplinary team.

Key words: Chronic pancreatitis, Abdominal pain, Pancreatic calcification.

Number of Tables: 04, Number of References :14; Number of Correspondences: 06.

*1. Corresponding Author

Dr. ANM Saifullah

Associate Professor
Department of Gastroenterology
Sheikh Sayera Khatun Medical College
Gopalganj, Bangladesh.
Email: saifullahanm@gmail.com
Mobile: +8801915055273

2. Professor Madhusudan Saha

Professor & Head
Department of Gastroenterology
Northeast Medical College
Sylhet, Bangladesh.

3. Professor Bimal Chandra Shil

Professor & Head (Ex)
Department of Gastroenterology
Sir Salimullah Medical College Mitford Hospital
Dhaka, Bangladesh.

4. Dr. Royes Uddin

Assistant Professor
Department of Gastroenterology
Sir Salimullah Medical College Mitford Hospital
Dhaka, Bangladesh.

5. Dr. Arifa Akhter

Associate Professor
Department of Gynecology & Obstetrics
Bashundhara Ad-Din Medical College
Dhaka, Bangladesh.

6. Dr. Md. Shafiqul Islam

MD Resident (Phase-B)
Department of Gastroenterology
Sir Salimullah Medical College Mitford Hospital
Dhaka, Bangladesh.

Introduction:

Chronic pancreatitis (CP) is a chronic inflammatory disease of the pancreas characterized by irreversible morphological changes. Typically, CP presents with abdominal pain and/or exocrine & endocrine insufficiency¹. CP is widely prevalent in Asia with a reported prevalence of 125/100,000 population from a study in India². Chronic alcohol abuse is the most common cause in the west³. In a large proportion of patients with chronic pancreatitis, no etiology can be identified, and they are labeled as having idiopathic chronic pancreatitis. An idiopathic, nonalcoholic form of chronic calcific pancreatitis is the most common in Bangladesh. Tropical pancreatitis (TP) refers to a severe type of idiopathic chronic pancreatitis that develops in children in tropical regions of Africa and southern Asia. Phenotypically TP is subdivided into fibro calculous pancreatic diabetes (FCPD) and tropical calcific pancreatitis without diabetes mellitus (TCP). One study found that, SPINK1 mutations are associated with FCPD in Bangladesh⁴. The presenting symptom of most patients with chronic pancreatitis is abdominal pain, usually epigastric, dull and constant in nature. It is almost always localized in the upper half of the abdomen, from which it can radiate directly through to the back. Initially the duration of pain is quite variable, ranging from several hours to several days, but as the disease

progresses the attacks become more frequent and pain-free intervals decrease¹. In some patients, chronic pancreatitis can be entirely silent, patients may present with the sequelae of exocrine or endocrine insufficiency¹. Early diagnosis have some benefits, like- alleviating the pain and slowing the progression of disease by using various treatment alternatives e.g. alcohol abstinence, smoking cessation, analgesics, neuropathic drugs, pancreatic enzyme and antioxidants⁵. Many serious complications such as jaundice, duodenal obstruction, pseudocyst, diabetes, and cancer of the pancreas can be managed efficiently if the disease identified early³.

Materials and Methods:

This is a retrospective hospital-based study. All patients with characteristic clinical features, laboratory parameters and radiological findings suggestive of chronic pancreatitis admitted in Gastroenterology Department of Sir Salimullah Medical College Mitford Hospital, Dhaka & North East Medical College, Sylhet, Bangladesh from January 2019 to December 2022 were studied. The diagnosis of CP was made on the basis of clinical, biochemical and imaging studies⁶. A thorough diagnostic evaluation was done for the patients with chronic abdominal pain for reaching the diagnosis. Diagnosis was established if there was evidence of pancreatic calcification on abdominal x-ray &/ ultrasonography &/ abdominal CT &/ characteristic ductal changes on Magnetic resonance cholangiopancreatography (MRCP). Glucose tolerance test & fecal fat studies were performed where indicated. Endoscopic retrograde cholangiopancreatography (ERCP) was performed in patients who were needed to treat with pancreatic endotherapy. Exclusion criteria: Children below the age 10 years or less, diagnosed as acute pancreatitis, gall stone disease, pancreatic carcinoma, cardiac disease or other co-morbid condition were excluded from this study. Informed written consent from patients were obtained as per institutional policy and this study was approved by the institutional review board. Data were recorded in a predesigned form & obtained by retrospective review of medical records & analyzed by SPSS-22. P value <0.05 was accepted as significant. The summarized data were interpreted accordingly & was presented in the form of tables. Categorical data were tested with chi-square test & continuous data were tested with unpaired t-test.

Result:

A total of 106 patients were enrolled in this study. Most of the patients were young, with a mean age of 17.67±15.47 years. Of the 106 cases 61(57.5%) were male. Among them 74(69.81%) hailing from rural area & most were belonging to lower middle socioeconomic condition. Detail demographic & clinical profile of study population is shown in Table-I. Abdominal pain 95(89.6%) was the most common presentation with which patients were admitted in the hospital. Though severity of pain was differed. Vomiting was seen (11.3%) cases. Abdominal tenderness was present 29(27.3%) & recurrent attacks of pain was seen 74(69.8%) patients. At the time of presentation 42(39.6%) patients had diabetes mellitus. Plain x-ray of abdomen was done in all

patients & calcification was found only in 18(16.9%) patients. Ultrasound data was available in all patients. Most common findings were pancreatic parenchymal calcification 55(51.8%), dilated main pancreatic duct 51(48.1%) & inhomogeneous parenchyma 39(36.79%). CT scan of abdomen was done only 13(12%) patients & findings were dilated pancreatic duct, calcification, atrophy & pancreatic pseudocyst. MRCP was done in 6 cases & in 5 cases MPD was dilated. EUS was performed in only 05 cases. All patients were receiving medical therapy, like-pancreatic enzyme supplements and opioids for pain. Two of them had undergone surgery (pancreatojejunostomy) & nine of them received endotherapy. Complications of chronic pancreatitis. Seven patients (6.6 %) had evidence of pseudocyst. Six (5.6%) of the patients had biliary obstruction & four patients had ascites. None of the patient had pancreatic neoplasm & Gastrointestinal bleeding.

Table I: Demographic characteristics of the patients (n=106)

Characteristics	Frequency	Percent
Age in years		
≤15	07	6.6%
16-30	46	43.4%
31-40	31	29.2%
41-50	11	10.4%
51-60	06	5.7%
>60	05	4.7%
Mean±SD	17.67 ±15.47	
Sex		
Female	45	42.45%
Male	61	57.55%
p value	0.02	
Residence		
Rural	74	69.81%
Urban	32	30.19%
p value	0.12	
Occupation		
Service	12	11.32%

Business	22	20.75%
Student	10	9.43%
Farmer	24	22.64%
Housewife	27	25.47%
Day labor	03	2.83%
Unemployed or dependent	08	7.55%
Socioeconomical status		
Poor	17	16.04%
Lower middle class	53	50%
Higher middle class	36	33.96%
Rich	00	
BMI		
Normal	51	48.11%
Under nourished	35	33.02%
Obese	18	16.98%
Morbidity obes	02	1.89%

Table II: Clinical presentation of the patients (n=106)

Clinical presentation	Frequency	Percent
Pain	95	89.62%
Vomiting	12	11.32%
Fever	05	4.72%
Tenderness	29	27.36%
Feature of malabsorption	02	1.89%
History of previous attack	74	69.81%
Weight loss	35	33.02%
DM	42	39.62%
HTN	14	13.21%
Elevated pancreatic enzyme	31	29.25%

Table III: USG of the patient (n= 106)

	Frequency	Percent
Inhomogeneous	39	36.79%
Atrophy	09	8.49%
Pancreatic calcification	55	51.89%
MPD dilation	51	48.11%

Table IV: CT scan of the patients(n-15)

	Frequency	Percent
Atrophy	02	
Dilatation	05	
Stone/calcification	06	

Discussion:

This was an observational retrospective study done in two tertiary care hospital of Bangladesh. This study was done to find out the clinical presentation, demographic profile, management & complication of chronic pancreatitis. All consecutive patients of chronic pancreatitis admitted in hospital were included in this study. The median age of the study subjects was 17.67 ± 15.47 with men comprising around 57.55% of the cases. It is noted that disease pattern was seen in a much younger population in our study. Similar observation had also been reported by Shama et al.² Genetic tests like cationic trypsinogen, CFTR, and SPINK1 mutation was not performed due to lack of availability and resource constraint. The role of alcohol is the cornerstone of the pathogenesis of chronic pancreatitis in western countries but in Bangladesh alcohol consumption is quite uncommon due to their religious and cultural habit. less than 1% had history of taking alcohol in this study. A multicenter study from Italy reported excessive alcohol consumption as the principal factor in 34% of CP⁷. About 26% of subjects were smoker and 28% subjects are betel nut chewer. Almost all the smokers were male. Smoking is now recognized independent risk factor for chronic pancreatitis as compared with a Hungarian article, 63% subjects were smoker⁸. The frequency of smoking is increasing in Southeast Asia.

Most of the subjects (90%) had upper abdominal pain of varying intensity. In one study this was 68% & other studies, this was 80%^{8,9}. About 33% had significant weight loss. While another study showed 35% of cases⁸. Severe pain and vomiting decreased food consumption contribute to weight loss. Around 69% patient had recurrent attack which has a significant impact on the quality of life^{10,11}. Diabetes was present in around 39% of the subject. In another study diabetes was present in around 68% of the patient². Nearly half of these subjects, where control by diet and oral anti diabetic agent while half required insulin. None of the patient had any diabetic complications. Diagnosing chronic pancreatitis can be challenging especially in early stages. Sometimes no radiological or laboratory abnormalities can be found⁸. Plain x-ray of abdomen and transabdominal ultrasound was the key investigations of the of diagnosis because of their low cost and wide availability but the sensitivity of the transabdominal ultrasound is between 60-81% while specificity is between 72 -90%^{12,13}. CT scan and MRCP was done while diagnosis was inconclusive. The sensitivity & specificity of CT scan are 75% to 90% respectively. Due to significant morbidity and mortality

ERCP is no longer employed as a diagnostic tool. MRCP is noninvasive test which does not use ionizing radiation and provides excellent image of the pancreatic duct⁸. We done EUS in 5% cases as this have available in one of our centers. In one study EUS was used in only 7.4% of all patient⁸. This may be inadequate facilities in the country. EUS is a very sensitive diagnostic tool, allowing for the evaluation of the pancreatic parenchyma and duct system with sensitivity and specificity of 80–100%¹⁴. Treatment of chronic Pancreatitis is very complex. Pain is a major clinical problem. All patient receives analgesics (mostly opioid) episodically. Patient who was smoker, they were advised to stop smoking. In our study, endoscopic intervention was performed in 8.49% in another study 52% of the patient received endotherapy⁸. This is due to our resource constraint and lack of expertise.

Conclusion:

Prevalence of chronic pancreatitis is high in the Asia pacific region. Early diagnosis of chronic pancreatitis is challenging in resource poor country. For awareness and recognition of the disease, there is a need for a larger population-based studies to understand the true magnitude and burden of this disease in Bangladesh.

Conflict of Interest: None.

Acknowledgement:

I would like to give thanks **Prof. Madhusudan Saha** Professor & Head Department of Gastroenterology, Northeast Medical College, Sylhet, **Professor Dr. Bimal Chandra Shil** Professor & Head (Ex) Department of Gastroenterology, Sir Salimullah Medical College Mitford Hospital, Dhaka, under whose supervision this paper was prepared. I would also like to thank all my patients, colleagues and my family members without whose support the completion of this paper would not have been possible.

References:

- Duggan, S. N., Chonchubhair, H. M. N., Lawal, O., et al. Chronic pancreatitis: A diagnostic dilemma. 2016; 22(7): 2304-2313.
<https://doi.org/10.3748/wjg.v22.i7.2304>
- Sharma, R., Pradhan, B., Karki, P., & Subedi, M. Clinical and Epidemiologic Profile of Chronic Pancreatitis, A Retrospective Study in Eastern Nepal. Journal of Advances in Internal Medicine. 2018; 7(2):30–33.
<https://doi.org/10.3126/jaim.v7i2.23487>
- De Silva, M., Selliah, S. and Thabrew, I. 'Descriptive study of chronic calcific pancreatitis in Sri Lanka', Ceylon Medical Journal. 2005; 50(1): 5-10. Available at: <https://doi.org/10.4038/cmj.v50i1.1581>.
- Rossi, L., Pfützner, R.H., Parvin, S., Ali, L., Sattar, S., Kahn, A.K.H., et al. SPINK1/PSTI Mutations Are Associated with Tropical Pancreatitis in Bangladesh: A Preliminary Report. Pancreatolgy. 2001;1(3), 242-245.
<https://doi.org/10.1159/000055818>
- Atsawarungrangkit, A., Pongprasobchai, S., & Pausawasdi, N. Original Article Prevalence and Predictors of Chronic Pancreatitis in Patients with Chronic Abdominal Pain with Negative Endoscopy and Cross-Sectional Imaging. 2018: 521-527.
- Etemad B, Whitcomb DC. Chronic pancreatitis: diagnosis, classification, and new genetic developments. Gastroenterology. 2001; 120:682-707.
<https://doi.org/10.1053/gast.2001.22586>
- Frulloni L, Gabbriellini A, Pezzilli R, Zerbi A, Cavestro GM, Marotta F, et al. PanCroInfAISP Study Group. Chronic pancreatitis: report from a multicenter Italian survey (PanCroInfAISP) on 893 patients. Dig Liver Dis. 2009 Apr 41(4):311-7.
<https://doi.org/10.1016/j.dld.2008.07.316>
PMID: 19097829.
- Szűcs A, Marjai T, Szentesi A, Farkas N, Pa'rniczky A, Nagy G, et al. Chronic pancreatitis: Multicentre prospective data collection and analysis by the Hungarian Pancreatic Study Group. PLoS ONE 2017; 12(2): e0171420.
<https://doi.org/10.1371/journal.pone.0171420>
- Ammann RW. The natural history of alcoholic chronic pancreatitis. Intern Med. 2001; 40(5):368-75.
<https://doi.org/10.2169/internalmedicine.40.368>
- Mullady DK, Yadav D, Amann ST, et al. NAPS2 Consortium. Type of pain, pain-associated complications, quality of life, disability, and resource utilization in chronic pancreatitis. A prospective cohort study. Gut. 2011; 60:77-84.
<https://doi.org/10.1136/gut.2010.213835>
- Amann ST, Yadav D, Barmada MM, et al. Physical and mental quality of life in chronic pancreatitis: A case-control study from the North American Pancreatitis Study 2 cohort. Pancreas. 2013; 42:293-300.
<https://doi.org/10.1097/MPA.0b013e31826532e7>
- Buscail L, Escourrou J, Moreau J, Delvaux M, Louvel D, Lapeyre F, et al. Endoscopic ultrasonography in chronic pancreatitis: a comparative prospective study with conventional ultrasonography, computed tomography, and ERCP. Pancreas. 1995; 10(3):251-7.
<https://doi.org/10.1097/00006676-199504000-00006>
- Glasbrenner B, Kahl S, Malfertheiner P. Modern diagnostics of chronic pancreatitis. Eur J Gastroenterol Hepatol. 2002; 14(9):935-41.
<https://doi.org/10.1097/00042737-200209000-00003>
- Hoffmeister A, Mayerle J, Beglinger C, Buchler MW, Bufler P, Dathe K, et al. [S3-Consensus guidelines on definition, etiology, diagnosis and medical, endoscopic and surgical management of chronic pancreatitis German Society of Digestive and Metabolic Diseases (DGVS)]. Z Gastroenterol. 2012; 50 (11):1176-224. Epub 2012/11/15.
<https://doi.org/10.1055/s-0032-1325479> PMID: 23150111

Maternal and Neonatal Outcomes of Dengue Fever in Pregnancy: A Cross-Sectional Study

Bilkis Ferdous^{*1}, Md. Mostafizur Rahman², Tanzila Halim³, Hasina Khatun⁴,
Abu Mohammad⁵

Abstract

Introduction: Dengue fever is a significant public health concern, particularly in tropical and subtropical regions, and poses risks to pregnant women and their infants. This study aims to evaluate dengue fever's maternal and neonatal outcomes during pregnancy. **Materials and Methods:** A cross-sectional study was conducted over one year, from January 2023 to June 2024, at Bangabandhu Sheikh Mujib Medical University (BSMMU) and Ibn Sina Diagnostic & Consultation Center, Malibagh total of 200 pregnant women diagnosed with dengue fever were included in the study. The sample size calculation was based on an expected prevalence of adverse maternal outcomes of 20% in dengue-infected pregnancies, with a confidence level of 95% and a margin of error of 5%. Data regarding maternal demographics, clinical characteristics, and neonatal outcomes were collected and analyzed. **Results:** Among the 200 pregnant women, the mean age was 27.3 ± 6.1 years, with a majority (65%) in their third trimester. Thrombocytopenia was observed in 120 (60%) women, with severe cases (platelet count $<50,000/\mu\text{L}$) in 30 (15%). Maternal complications included postpartum hemorrhage in 25 (12.5%), acute kidney injury in 15 (7.5%), and acute respiratory distress syndrome in 10 (5%). The overall maternal mortality rate was 5% (10 women). Neonatal outcomes revealed 10 (5%) stillbirths, 5 (2.5%) neonatal deaths, and 22 (12%) low birth weight infants and 18(8%) prematurity. **Conclusions:** Dengue infection during pregnancy is associated with maternal and neonatal morbidity and mortality. Enhanced awareness, early diagnosis, and management strategies are crucial to mitigate the risks of dengue in pregnant women.

Keywords: Dengue, Pregnancy, Maternal Outcomes, Neonatal Outcomes, Cross-Sectional Study.

Number of Tables:03; Number of References:11; Number of Correspondences; 05.

*1. Corresponding Author:

Dr. Bilkis Ferdous

Assistant Professor
Department of Obst & Gynaecology
Bangabandhu Sheikh Mujib Medical University
Dhaka, Bangladesh.
Contact: 01711114697
Email: drbilkis1975@gmail.com

2. Prof. Dr. Md. Mostafizur Rahman

Professor & Head of the Department of Pediatrics
Sir Salimullah Medical College
Dhaka, Bangladesh.

3. Dr. Tanzila Halim

Assistant Professor
Department of Obst & Gynaecology
Bangabandhu Sheikh Mujib Medical University
Dhaka, Bangladesh.

4. Dr. Hasina Khatun

Assistant Professor
Department of Obst & Gynaecology
Bangabandhu Sheikh Mujib Medical University
Dhaka, Bangladesh.

5. Dr. Abu Mohammad

Assistant Professor
Department of Medicine
Dhaka Medical College Hospital
Dhaka, Bangladesh.

Introduction:

Dengue fever, caused by the dengue virus (DENV) and transmitted primarily by Aedes mosquitoes, has emerged as a significant public health concern in tropical and subtropical regions worldwide. The World Health Organization (WHO) estimates that approximately 390 million dengue infections occur annually, with a substantial proportion of these cases affecting pregnant women¹. The implications of dengue infection during pregnancy are particularly alarming, as it poses risks not only to maternal health but also to fetal and neonatal outcomes. Understanding these risks is crucial for developing effective management strategies and improving health outcomes for both mothers and their infants. Pregnancy induces various physiological changes that can alter the immune response, potentially exacerbating the severity of infections, including dengue. Studies have shown that pregnant women are at a higher risk of developing severe forms of dengue, such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS)². The increased susceptibility to severe disease can

lead to significant maternal morbidity and mortality. For instance, a systematic review highlighted that pregnant women with dengue are more likely to experience complications such as postpartum hemorrhage, acute respiratory distress syndrome, and acute kidney injury compared to non-pregnant women³. These findings underscore the need for heightened awareness and monitoring of pregnant women diagnosed with dengue. The impact of dengue on neonatal outcomes is equally concerning. Research indicates that maternal dengue infection can lead to adverse effects on fetal development, resulting in complications such as low birth weight, preterm birth, and stillbirth⁴. A study conducted in Brazil found that infants born to mothers with dengue had a significantly higher risk of low birth weight and neonatal mortality compared to those born to uninfected mothers⁵. The mechanisms underlying these adverse outcomes may include placental insufficiency and fetal exposure to the virus, which can disrupt normal growth and development. Moreover, the psychological and social implications of dengue infection during pregnancy cannot be overlooked. The stress and anxiety associated with the potential health risks to both mother and child can have lasting effects on maternal mental health. A study emphasized the importance of providing psychological support to pregnant women diagnosed with dengue, as the fear of complications can exacerbate stress levels and negatively impact maternal well-being⁶. Despite the growing body of research on dengue infection during pregnancy, there remains a notable gap in understanding the full range of maternal and neonatal outcomes. While many studies focus on individual complications, comprehensive data detailing the overall impact of dengue on pregnancy outcomes is still limited. This gap is particularly evident in frequency-related data, which hinders the development of effective clinical guidelines and public health strategies to address the specific needs of pregnant women affected by dengue. Given the increasing incidence of dengue in endemic regions and the potential for outbreaks in non-endemic areas driven by climate change and urbanization, it is crucial to prioritize further research. In light of these considerations, our study aims to investigate the maternal and neonatal outcomes of dengue infection during pregnancy in a cohort of affected women. By analyzing the frequency and severity of complications, we hope to contribute valuable insights to the existing literature and highlight the urgent need for targeted interventions to improve health outcomes for mothers and their infants. This research is particularly timely, as the global burden of dengue continues to rise, necessitating a comprehensive understanding of its implications for vulnerable populations, including pregnant women.

Materials and Methods:

This cross-sectional study was conducted at Bangabandhu Sheikh Mujib Medical University (BSMMU) and Ibn Sina Diagnostic & Consultation Center, Malibagh, from January 2023 to June 2024. The study included pregnant women diagnosed with dengue fever, confirmed through NS1 antigen

or IgM antibody tests. A total of 200 participants were included in the study.

Inclusion and Exclusion Criteria

Inclusion Criteria:

1. Pregnant women aged 18 years and older.
2. Confirmed diagnosis of dengue fever based on NS1 antigen or IgM antibody tests.
3. Women presenting with dengue symptoms during any trimester of pregnancy.
4. Consent was obtained willingly from all participants, reflecting their informed and deliberate choice.

Exclusion Criteria:

1. Pregnant women with a history of chronic illnesses (e.g., diabetes, hypertension) that could confound the results.
2. Women diagnosed with other viral infections (e.g., Zika virus, chikungunya) during the study period.
3. Pregnant women who were not willing to participate or provide informed consent.

Data Collection Methods

Data were collected using a structured questionnaire designed to capture relevant information regarding maternal demographics, clinical presentations, laboratory findings, and neonatal outcomes. The questionnaire was developed based on existing literature and expert consultations to ensure comprehensiveness and relevance.

1. Maternal Demographics: Age, parity, gestational age at diagnosis, and socioeconomic status.
2. Clinical Presentations: Symptoms experienced (e.g., fever, rash, joint pain), duration of symptoms prior to diagnosis, and any complications during hospitalization.
3. Laboratory Findings: Results of NS1 antigen and IgM antibody tests, complete blood count (CBC) results, and liver function tests.
4. Neonatal Outcomes: Birth weight, gestational age at delivery, Apgar scores, and any neonatal complications (e.g., stillbirth, neonatal death).

Data collection were performed by authors. Each participant was approached during their hospital visit, and informed consent was obtained prior to data collection. The questionnaire was administered through face-to-face interviews, ensuring clarity and accuracy in responses.

Data Analysis

Data were analyzed using statistical software (e.g., SPSS version 25.0). Descriptive statistics were calculated for maternal demographics and clinical characteristics, including means, standard deviations, and frequencies.

Ethical Considerations

Ethical clearance for the study was obtained from concerned authority prior to the commencement of data collection. All participants were informed about the purpose of the study, the voluntary nature of their participation, and their right to withdraw at any time without any consequences. Confidentiality was maintained throughout the study, with all

data anonymized and securely stored. Informed consent was obtained from each participant before enrollment in the study, ensuring adherence to ethical standards in research involving human subjects.

Results:

A total of 200 pregnant women diagnosed with dengue fever were enrolled in the study. The age distribution of the 200 pregnant women diagnosed with dengue fever in this study reveals a predominant concentration within the 25–29 age range, which constitutes 41% of the sample, equating to 82 individuals. Following this, the 30–34 age range comprises 29% of the participants, totaling 58 women. The 18–24 age group accounts for 18.5% of the sample, representing 37 individuals. Additionally, 10% of the participants (20 women) fall within the 35–39 age range, while a small minority, comprising 1.5% (3 participants), are aged 40 years or older. This distribution indicates that the majority of the participants are situated within the 25–34 age range, with a notable decline in the number of individuals in both the youngest and oldest age categories. The mean age of participants was 27.3 ± 6.1 years.

Table I: Age Distribution of Pregnant Women Diagnosed with Dengue Fever

Age Range (Years)	Frequency (n=200)	Percentage (%)
18 - 24	37	18.5%
25 - 29	82	41.00%
30 - 34	58	29.00%
35 - 39	20	10%
≥ 40	3	1.50%
Total	200	100.0

Table II presents a comprehensive analysis of thrombocytopenia among a cohort of 200 pregnant women diagnosed with dengue fever. The data indicate that a significant proportion of the participants, specifically 120 women (60.00%), exhibited thrombocytopenia, which is characterized by a reduced platelet count.

The table further categorizes the severity of thrombocytopenia into three distinct classifications based on platelet count thresholds. Among those with thrombocytopenia, 60 women (30.00%) were identified as having mild thrombocytopenia, defined by a platelet count ranging from 100,000 to 150,000/ μ L. Additionally, 30 women (15.00%) were classified as having moderate thrombocytopenia, with platelet counts between 50,000 and 100,000/ μ L. Notably, another group of 30 women (15.00%) presented with severe thrombocytopenia, characterized by a platelet count of less than 50,000/ μ L.

Conversely, the remaining 80 women (40.00%) in the study did not exhibit any signs of thrombocytopenia, indicating a normal platelet count. This distribution underscores the prevalence and varying degrees of thrombocytopenia in this population, highlighting the potential clinical implications for maternal and fetal health in the context of dengue infection during pregnancy.

Table II: Thrombocytopenia in Pregnant Women Diagnosed with Dengue Fever

Thrombocytopenia Status	Frequency (n=200)	Percentage (%)
Total with Thrombocytopenia	120	60.00%
- Mild Thrombocytopenia (100,000 - 150,000/ μ L)	60	30.00%
- Moderate Thrombocytopenia (50,000 - 100,000/ μ L)	30	15.00%
- Severe Thrombocytopenia (<50,000/ μ L)	30	15.00%
Total without Thrombocytopenia	80	40.00%

Table III provides a detailed overview of the maternal and neonatal outcomes associated with dengue infection during pregnancy, based on a cohort of 200 pregnant women diagnosed with the disease. The outcomes are categorized into maternal and neonatal groups, with corresponding frequencies and percentages reported for each outcome.

Maternal Outcomes: The table indicates that postpartum hemorrhage was the most prevalent maternal complication, affecting 25 women, which corresponds to 12.50% of the study population. Acute kidney injury was reported in 15 women (7.50%), while acute respiratory distress syndrome was observed in 10 women (5.00%). Additionally, maternal mortality was recorded in 10 cases, representing 5.00% of the participants. These findings highlight the significant risks associated with dengue infection during pregnancy, emphasizing the potential for severe maternal morbidity and mortality.

Neonatal Outcomes: In terms of neonatal outcomes, the data reveal that stillbirths occurred in 10 cases, accounting for 5.00% of the total births. Neonatal deaths were reported in 5 infants, which corresponds to 2.50% of the cohort. Furthermore, a notable proportion of infants, specifically 22 (12%) were classified low birth weight and infants 18(8%) prematurity, indicating a concerning trend in neonatal health outcomes linked to maternal dengue infection. Overall, the data presented in Table 3 underscore the serious implications of dengue fever on both maternal and neonatal health, highlighting the need for vigilant monitoring and management of pregnant women affected by this viral infection. The outcomes reflect the multifaceted challenges posed by dengue in pregnancy, necessitating further research and targeted interventions to improve health outcomes for both mothers and their infants.

Table III: Maternal and Neonatal Outcomes of Dengue Infection in Pregnancy

Outcome	Frequency (n=200)	Percentage (%)
Maternal Outcomes		
Postpartum Hemorrhage	25	12.50%
Acute Kidney Injury	15	7.50%
Acute Respiratory Distress Syndrome	10	5.00%
Maternal Mortality	10	5.00%
Neonatal Outcomes		
Stillbirths	10	5.00%
Neonatal Deaths	5	2.50%
Low Birth Weight Infants	22	12.00%
Prematurity	18	8.00%

Discussion:

Dengue fever, a mosquito-borne viral infection, poses significant health risks, particularly for pregnant women and their neonates. This discussion synthesizes findings from our study on maternal and neonatal outcomes of dengue infection during pregnancy,

contextualizing them within the broader literature to highlight the severity and impact of this disease.

Maternal Outcomes in Context

Our study found that postpartum hemorrhage occurred in 12.50% of pregnant women with dengue, which aligns with findings from a study conducted in Burkina Faso, where dengue during pregnancy was associated with increased maternal mortality and severe complications requiring intensive monitoring⁷. This suggests that the physiological changes during pregnancy may exacerbate the effects of dengue, leading to heightened risks of severe outcomes such as acute kidney injury and respiratory distress syndrome, which were observed in 7.50% and 5.00% of our cohort, respectively. Moreover, the maternal mortality rate of 5.00% in our study is consistent with the literature indicating that pregnant women are at a higher risk of severe dengue compared to their non-pregnant counterparts⁸. This reinforces the need for healthcare providers to be vigilant in monitoring pregnant patients with dengue, as the potential for severe outcomes is significantly elevated.

Neonatal Outcomes and Comparisons

In terms of neonatal outcomes, our findings indicate that 5.00% of pregnancies resulted in stillbirths and 2.50% in neonatal deaths. These rates are concerning and echo the results from a narrative review that highlighted the risks of fetal and neonatal death associated with dengue infection⁹. The prevalence of low-birth-weight infants (12.00%) and prematurity (8%) in our study further emphasizes the adverse effects of dengue on neonatal health, corroborating findings from other studies that report similar trends in low birth weight and preterm deliveries among dengue-infected mothers¹⁰.

Implications for Future Research and Practice

The implications of our findings are profound, suggesting that dengue infection during pregnancy not only poses immediate health risks to mothers but also has lasting effects on neonatal health. The need for targeted interventions and enhanced surveillance during dengue outbreaks is critical. As highlighted in the updated systemic review on dengue, understanding the epidemiology and clinical manifestations of the disease is essential for developing effective management strategies¹¹.

Furthermore, our study underscores the importance of public health initiatives aimed at reducing dengue transmission, particularly in endemic regions. The integration of maternal health services with vector control strategies could significantly mitigate the risks associated with dengue during pregnancy.

Conclusion:

In conclusion, this study highlights that maternal and neonatal outcome associated with dengue fever during pregnancy. Maternal complications, including thrombocytopenia, postpartum hemorrhage and acute kidney injury, were prevalent, with a maternal mortality rate of 5%. Neonatal outcomes also revealed concerning rates of stillbirth, low birth weight, and prematurity. These findings underscore the need for enhanced monitoring and management of dengue fever in pregnant women to improve maternal and neonatal outcomes.

Conflict of Interest: None.

Acknowledgement:

We are grateful to all teachers and staffs of the Bangabandhu Sheikh Mujib Medical University (BSMMU) and Ibn Sina Diagnostic & Consultation Center, Malibagh.

References:

1. Cogan JE. Dengue and severe dengue. World Health Organization. 2020.
2. Mulik V, Dad N, Buhmaid S. Dengue in pregnancy. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2021 Jun 1;261:205-10. <https://doi.org/10.1016/j.ejogrb.2021.04.035> PMID:33971383
3. Wijesinghe V, Senadeera D, Piyadigama I, Nanayakkara S. Dengue and SARS-COV-2 co-infection in pregnancy: decision making dilemma. F1000Research. 2022 Jul 6;11:747. <https://doi.org/10.12688/f1000research.111212.1>
4. Paixão ES, Maria da Conceição NC, Teixeira MG, Harron K, De Almeida MF, Barreto ML, Rodrigues LC. Symptomatic dengue infection during pregnancy and the risk of stillbirth in Brazil, 2006-12: a matched case-control study. The Lancet infectious diseases. 2017 Sep 1;17(9):957-64. [https://doi.org/10.1016/S1473-3099\(17\)30366-3](https://doi.org/10.1016/S1473-3099(17)30366-3) PMID:28845800
5. Paixão ES, Campbell OM, Teixeira MG, Costa MC, Harron K, Barreto ML, et al. Dengue during pregnancy and live birth outcomes: a cohort of linked data from Brazil. BMJ open. 2019 Jul 1;9(7):e023529. <https://doi.org/10.1136/bmjopen-2018-023529> PMID:31345962 PMCID:PMC6661644
6. Amulya M. The Role of Zinc and Folic Acid Supplementation as an Aid to Hematological Recovery in Dengue Fever (Doctoral dissertation, Rajiv Gandhi University of Health Sciences (India)).
7. Sondo KA, Ouattara A, Diendéré EA, Diallo I, Zoungana J, Zémané G, et al. Dengue infection during pregnancy in Burkina Faso: a cross-sectional study. BMC Infectious Diseases. 2019 Dec;19:1-5. <https://doi.org/10.1186/s12879-019-4587-x> PMID:31771564 PMCID:PMC6880640
8. Machado CR, Machado ES, Rohloff RD, Azevedo M, Campos DP, De Oliveira RB, et al. Is pregnancy associated with severe dengue? A review of data from the Rio de Janeiro surveillance information system. PLoS neglected tropical diseases. 2013 May 9;7(5):e2217. <https://doi.org/10.1371/journal.pntd.0002217> PMID:23675548 PMCID:PMC3649957
9. Wijesinghe V, Senadeera D, Piyadigama I, Nanayakkara S. Dengue and SARS-COV-2 co-infection in pregnancy: decision making dilemma. F1000Research. 2022 Jul 6;11:747. <https://doi.org/10.12688/f1000research.111212.1>
10. Nascimento LB, Siqueira CM, Coelho GE, Siqueira JB. Symptomatic dengue infection during pregnancy and livebirth outcomes in Brazil, 2007-13: a retrospective observational cohort study. The Lancet Infectious Diseases. 2017 Sep 1;17(9):949-56. [https://doi.org/10.1016/S1473-3099\(17\)30169-X](https://doi.org/10.1016/S1473-3099(17)30169-X) PMID:28528802
11. Khan MB, Yang ZS, Lin CY, Hsu MC, Urbina AN, Assavalapsakul W, et al. Dengue overview: An updated systemic review. Journal of infection and public health. 2023 Aug 3. <https://doi.org/10.1016/j.jiph.2023.08.001> PMID:37595484

Influence of Nutritional Support Methods on Postoperative Well-being in Pancreaticoduodenectomy Patients

Md. Mozammel Haque^{*1}, Bidhan Chandra Das², Abunur Md Masud Rana³,
S.M. Ferdous Ahmed⁴, Md. Abdul Quiyum⁵

Abstract

Introduction: Early enteral feeding has gained attention as a potential method to enhance postoperative recovery in patients undergoing pancreaticoduodenectomy. Traditionally, postoperative feeding was delayed to stabilize intestinal anastomoses, but recent evidence suggests that early enteral feeding may offer significant advantages. By examining the effects of early versus delayed enteral feeding, we aim to understand its impact on postoperative outcomes and guide best practices in perioperative care. **Materials and Methods:** This prospective case-control study took place in the Department of Surgery of Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka. This study was conducted from 1st January to 31st December 2016. A total of 30 patients were selected as study subjects by purposive sampling technique. Patients were divided into two groups; case (Group I, n=15) and control (Group II, n=15). Statistical analysis of the results was obtained by using Statistical Packages for Social Sciences (SPSS-21.0). Statistical significance was set at $p < 0.05$ and the confidence interval was set at 95% level. **Result:** The study compared early and delayed enteral feeding in pancreaticoduodenectomy patients. Demographic and preoperative nutritional statuses were similar between groups. Significant differences were observed in intraoperative metrics, with the case group showing less blood loss (540.00 ± 91.03 ml vs. 613.33 ± 83.38 ml, $p=0.029$) and shorter operation times (4.40 ± 1.12 hrs vs. 5.30 ± 0.65 hrs, $p=0.012$). Postoperatively, hemoglobin levels and lymphocyte counts increased more in the case group, indicating better recovery. Differences in surgical techniques also varied significantly between groups. **Conclusion:** This study evaluated the effects of early versus delayed enteral feeding on postoperative outcomes in pancreaticoduodenectomy patients. The results show that early enteral feeding enhanced lymphocyte counts, indicating better immune function.

Keywords: Nutritional Support, Pancreaticoduodenectomy, Hemoglobin, Lymphocyte.

Number of Tables: 04; Number of Figures: 04; Number of References: 12; Number of Correspondences: 03.

*1. Corresponding Author:

Dr. Md. Mozammel Haque

Assistant Professor

Department of Surgery

Dhaka Medical College

Dhaka, Bangladesh.

Email: drmhque77@gmail.com

Contact: 01712166843

2. Prof. Dr. Bidhan Chandra Das

Professor

Department of Hepatobiliary Surgery

Bangabandhu Sheikh Mujib Medical University

Dhaka, Bangladesh.

3. Dr. Abunur Md Masud Rana

Associate Professor

Department of Surgery

Dhaka Community Medical College

Dhaka, Bangladesh.

4. Dr. S.M. Ferdous Ahmed

Assistant Professor

Department of Casualty

Sir Salimullah Medical College

Dhaka, Bangladesh.

5. Dr. Md. Abdul Quiyum

Resident Surgeon

300 Bedded Hospital

Narayanganj, Bangladesh.

Introduction:

Pre-existing malnutrition is a significant challenge in patients requiring a pancreaticoduodenectomy¹. Complete nutritional correction is often unattainable before surgery due to disease progression and its effects. These patients face increased operative stress, as the procedure involves extensive dissection, surgical resections that affect digestion, multiple anastomoses, and prolonged operation times, all of which exacerbate nutritional deficiencies and contribute to high postoperative morbidity². Malnutrition compromises immune function, increases infection rates, impairs cardiovascular reflexes, and delays wound healing and recovery³. This can further deteriorate during the postoperative phase due to fasting and subsequent treatments, making nutritional support critical for reducing complications. Clinical practice in postoperative feeding after pancreaticoduodenectomy is inconsistent, with various approaches including intravenous fluids, parenteral nutrition, and enteral feeding through different routes. Perioperative nutritional supplements, including early enteral feeding

(EOF), have been shown to improve outcomes, reduce postoperative complications, and enhance immune function, lowering sepsis risk and hospital stays⁴. Compared to total parenteral nutrition (TPN), EOF has been associated with fewer incidences of pancreatic fistulas, hemorrhages, and infectious complications⁵. Enteral feeding is more physiological, cost-effective, and beneficial as it stimulates enterocyte growth, improves mucosal barriers, and reduces bacterial translocation, promoting natural nutrition without the drawbacks of prolonged TPN⁶. The European Society for Parenteral and Enteral Nutrition advocates for early enteral feeding in patients undergoing major gastrointestinal surgeries like pancreaticoduodenectomy, though complications such as diarrhea and feeding intolerance are possible⁷. Nutritional support is a cornerstone of postoperative care, particularly in the context of pancreaticoduodenectomy. Adequate nutrition is crucial for promoting wound healing, reducing the risk of infections, and supporting overall recovery. Traditional methods of nutritional support have included enteral feeding, but recent advancements have introduced more sophisticated approaches, such as individualized enteral nutrition and tailored parenteral nutrition⁸. Pancreaticoduodenectomy is a common procedure at Bangabandhu Sheikh Mujib Medical University (BSMMU), where early postoperative parenteral nutrition is standard, with enteral feeding typically initiated on the 6th or 7th postoperative day. This study aims to evaluate the influence of nutritional support methods on postoperative well-being in pancreaticoduodenectomy patients.

Materials and Methods:

This prospective case-control study took place in the Department of Surgery of Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, from 1st January to 31st December 2016. Patients operated by pancreaticoduodenectomy at Bangabandhu Sheikh Mujib Medical University (BSMMU), were considered as the study population. A total of 30 patients were selected as study subjects by purposive sampling technique. Patients were divided into two groups; case (Group I, n=15) and control (Group II, n=15). In case groups, enteral feeding was started 48 hrs after operation, in the first 24 hrs. drinking water, ORS, green coconut water, 20-30 ml per hrs. through NJ (naso-jejunal) tube, then gradually increased up to 5th POD, and include clear soups, formulated balanced diet assure powder, dal water, with parenteral 25% glucose saline 500ml daily amino acids and fatty solution 500ml every alternate day, vit B complex, vit C daily .9% N/S 1000 ml, potassium 40 mg daily. After calculation of daily calorie and fluid requirements. Fluid was given 30-40ml/kg/day and calorie also 30-40kcal/kg/day. This schedule continued up to the 5th POD then the n-j tube and allowed oral feeding by soft rice with fish vegetables and fruits. Also, continue parenteral amino acid and fatty sol. In the control group, TPN was continued up to the 6th or 7th POD. All necessary data were collected in a predesigned data collection sheet. Then the data was entered into the computer and statistical analysis of the

results was obtained by using Statistical Packages for Social Sciences (SPSS-21.0) (SPSS Inc, Chicago, IL, USA). Different statistical methods were adopted for data analysis. The results were presented in tables and figures as necessary and compared by t-test, chi-square test, and Fisher's Exact test. The statistical terms included in this study are mean, standard deviation, and percentage. Statistical significance was set at $p < 0.05$ and the confidence interval was set at 95% level. Informed written consent was taken from the participants. Ethical clearance was taken from the ethics committee of BSMMU. Inclusion Criteria were Patients having Pancreaticoduodenectomy operation, Patients willing to enroll in the study and Patients aged 18 or more than 18 years. Exclusion criteria were Patients having severe co-morbidities, Patients aged less than 18 years and The patient not willing to enroll in the study.

Results:

Table I: Demographic difference between two groups (N=30):

Parameter	Group		p-value
	Case (n=15)	Control (=15)	
Age (years)			
<35	2 (13.3) [#]	3 (20.0)	0.581 ^a
35-45	3 (20.0)	4 (26.7)	
45-55	7 (46.7)	6 (40.0)	
>55	3 (20.0)	2 (13.3)	
Mean ± SD	49.13± 11.65	46.87 ± 10.56	
Sex			
Male	6 (40.0)	9 (60.0)	0.273 ^b
Female	9 (60.0)	6 (40.0)	
Diagnosis			
Pancreatic head malignancy	1 (6.7)	2 (13.3)	0.824 ^b
Ampullary carcinoma	10 (66.7)	9 (60.0)	
Lower bile duct carcinoma	4 (26.7)	4 (26.7)	
Co-morbidities			
DM	5 (33.3)	4 (26.7)	0.999 ^c
HTN	6 (40.0)	5 (33.3)	0.705 ^b
Bronchial asthma	2 (13.3)	2 (13.3)	0.999 ^c

^at test was done to measure the level of significance.

^bChi square test was done to measure the level of significance.

^cFisher's Exact test was done to measure the level of significance.

#Figure within parentheses indicates in percentage.

Table I shows the Demographic difference between the two groups. The maximum patient age in both groups is between 35—and 55 years. (66.7%). The mean age of patients in case groups was 49.13 $\pm$ 11.65 and control groups were 46.87 $\pm$ 10.56. Maximum patients in both groups diagnosis were ampullary carcinoma. Common Comorbidities DM and HTN in both groups. There were no statistically significant differences in both groups according to the distribution of age, sex, diagnosis, and comorbidities.

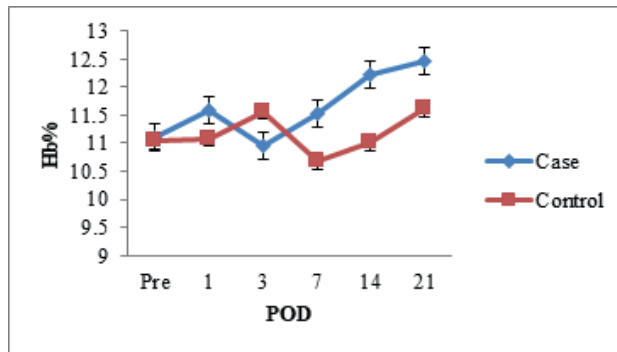


Figure 1: Postoperative Hb level between two groups

Figure 1 shows the comparison of postoperative Hb levels between the two groups. Serum Hb levels were almost similar in both groups in the first 3 PODs but the Hb level increased significantly in the case group than the control group from 7 POD onward of the follow-up period.

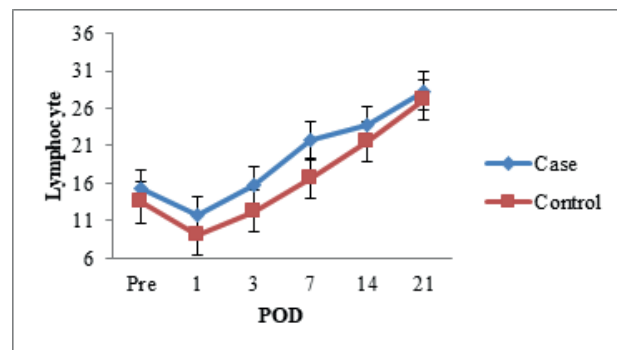


Figure 4: Postoperative lymphocyte level between two groups

Figure 4 shows the postoperative lymphocyte count of the two groups. Lymphocyte count decreased in the initial post-operative period up to the 3rd pod in both groups, but the lymphocyte count increased in the case group significantly more than the control group from the 3rd POD onward.

Table II: Differences in nutritional status of patients before surgery between two groups (N=30)

Parameter	Group		p-value*
	Case (n=15)	Control (n=15)	
BMI (kg/m ²)			
Underweight	1 (6.7)	0 (.0)	-
Normal	12 (80.0)	14 (93.3)	
Overweight	2 (13.3)	1 (6.7)	
Mean ± SD	22.44 ± 2.66	22.15 ± 2.00	0.736
Serum Albumin	31.47 ± 4.34	32.13 ± 4.87	0.695
Total protein	66.00 ± .69	65.7 ± 1.18	0.804

*A t-test was done to measure the level of significance.

#Figure within parentheses indicates in percentage.

Table II shows Differences in the nutritional status of the patient before surgery between the two groups. The mean BMI in the case group was 22.44 $\pm$ 2.66(kg/m²) and control group 22.15 $\pm$ 2.00(kg/m²) Most of the patients in the case group(80%), and control group (93.3%) were in normal BMI

(18--25) kg/m². The mean serum albumin level was 31.47 $\pm$ 4.34(mg/l) in the case group and 32.13 $\pm$ 4.87(mg/l) in control group. The Differences in the nutritional status of patients before surgery between the two groups were not statistically significant.

Table III: Differences in intraoperative findings & measures taken between two groups (N=30)

Parameter	Group		p-value
	Case (n=15)	Control (n=15)	
CV line placement	15 (100.0)	15 (100.0)	-
Epidural analgesia	10 (66.7)	8 (53.3)	0.456**
Blood loss	540.00 $\pm$ 91.03	613.33 $\pm$ 83.38	0.029*
Operation time (hours)	4.40 $\pm$ 1.12	5.30 $\pm$ 0.65	0.012*
Blood transfusion (units)	2.60 $\pm$ 0.63	2.73 $\pm$ 0.70	0.590*

*A t-test was done to measure the level of significance.

**A Chi-square test was done to measure the level of significance.

Data was expressed as Mean $\pm$ SD.

Table III shows Differences in intra-operative findings & measures taken between the two groups. In all patients in both groups, CV lines were placed, and epidural analgesia was given (66.7%) patients in the case group, and (53.3%) patients in the control group. Differences in CV line placement, Epidural analgesia, and per-operative blood transfusion between the two groups were not statistically significant. But mean blood loss (ml) in case group 540.00 $\pm$ 91.03, wherein control group 613.33 $\pm$ 83.38, (p-value .029), and operation time(hrs.) in case group 4.40 $\pm$ 1.12 wherein control group 5.30 $\pm$ 0.65, (p-value .012), the difference between two groups were statistically significant.

Table IV: Differences in operational technique between two groups (N=30)

Parameter	Group		p- value
	Case (n=15)	Control (n=15)	
Pancreatico jejunal anastomosis			
Duct to mucosal	13 (86.7) [#]	3 (20.0)	0.001*
End to end	2 (13.3)	12 (80.0)	
Stent placement			
Yes	15 (100.0)	15 (100.0)	-
No	0 (.0)	0 (.0)	
Biliary-enteric anastomosis stent placement			
Yes	10 (66.7)	15 (100.0)	0.042**
No	5 (33.3)	0 (.0)	
Gastrojejunostomy			
Stapler	5 (33.3)	4 (26.7)	0.999**
Hand sewing	10 (66.7)	11 (73.3)	

*A Chi-square test was done to measure the level of significance.

**Fisher's exact test was done to measure the level of significance.

#Figure within parentheses indicates in percentage.

Table IV shows the Differences in operational technique between the two groups. The difference between the Pancreatico-jejunal anastomotic technique (p-value .001) and the number of biliary-enteric stent placements (p-value .042)

was statistically significant. Several Pancreatico jejunal stent placement and gastro-jejunostomy techniques found no statistical difference between the two groups.

Discussion:

The single-centered case-control study has been taken to evaluate the effect of early and delayed starting of enteral feeding after pancreaticoduodenectomy. Patients of early enteral feeding are included in the case group and patients of delayed enteral feeding are in the control group. In the past patients who underwent major gastro-intestinal surgeries having an intestinal anastomosis were not fed orally early, primarily to stabilize the intestinal anastomosis to avoid possible mechanical pressure induced by food passage. However, it remains unclear whether delayed postoperative oral feeding would enhance recovery after surgery, especially since a period of starvation following GIT surgery showed no benefit to patients⁹. This study evaluated the differences in nutritional status, postoperative hemoglobin, and lymphocyte count intraoperative findings, and operational techniques between two groups of patients undergoing pancreaticoduodenectomy. Our analysis revealed several key insights into how these factors may influence surgical outcomes and recovery. This study indicates that there were no statistically significant differences in the nutritional status of patients before surgery between the two groups. Both groups had similar mean BMI, serum albumin, and total protein levels, suggesting that baseline nutritional status did not differ markedly between them. The mean BMI was within the normal range for most patients, and serum albumin and total protein levels were consistent with typical preoperative values observed in surgical patients¹⁰. This study highlights significant differences in intraoperative metrics between the two groups. Notably, the case group experienced less blood loss (540.00 ± 91.03 ml) compared to the control group (613.33 ± 83.38 ml), with a p-value of 0.029, indicating statistical significance. This reduced blood loss may reflect differences in surgical technique or patient management strategies. Similarly, the operation time was significantly shorter in the case group (4.40 ± 1.12 hours) compared to the control group (5.30 ± 0.65 hours) with a p-value of 0.012. Shorter operation times have been associated with reduced perioperative complications and improved recovery¹¹. Post-operative HB levels increase much more in the case group than in the control group. Serum albumin levels also increase more in the case group than control group. Lymphocyte counts initially pod similar in both groups but significantly increased in the case group than the control group later after starting early enteral feeding. That means early enteral feeding improves immunological function than delayed feeding. Recent research has shown that EOF enhances immunocompetence, decreases clinical infection rates, maintains gut structure and function, and can potentially attenuate, catabolic stress responses in patients after surgery^{8,12}.

Conclusion:

This study evaluated the effects of early versus delayed enteral feeding on postoperative outcomes in pancreaticoduodenectomy patients. The results show that early enteral feeding enhanced lymphocyte counts, indicating better immune function. These findings suggest that early enteral feeding supports better nutritional recovery, reduces surgical complications, and improves overall postoperative well-being. Future research could further validate these benefits in larger studies.

Conflict of Interest: None.

Acknowledgement:

We would like to express our sincere gratitude to the Department of Surgery at Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, for their support and collaboration in conducting this study. Special thanks to all the patients who participated in this research. We also extend our appreciation to the nursing staff and surgical team for their invaluable assistance during the postoperative care of the patients. Lastly, we acknowledge the ethical review board of BSMMU for their guidance and approval of this study.

References:

1. La TM, Ziparo V, Nigri G. Malnutrition and Pancreatic Surgery: Prevalence and Outcomes. *J Surg Oncol*. 2013; 107:702-8.
<https://doi.org/10.1002/jso.23304>
2. Yeo CJ, Cameron JL, Sohn TA, 2009. Six hundred-fifty combined enteral and parenteral nutrition in post-pancreaticoduodenectomy patients: a pilot study. *Nutrition Journal*. 2009; 8(24):1-8.
<https://doi.org/10.1186/1475-2891-8-24>
3. Cabrera P, Lofrano J, Llames L, Rodota L. Nutrition and cephalic pancreaticoduodenectomy. *Acta Gastroenterol Latinoam*. 2014;44(1):67-73.
4. B Salvatore, D Giuseppe, S Gabriele, F Silvia. Enteral nutrition in pancreatiduodenectomy: A Literature Review; 2015.
5. Liao Q, Zhao YP, Wang WB, Dai MH, Hu Y, Liu ZW. Perioperative nutrition support of the patients with pancreatic head cancer. *Acta Academiae Medicinae Sinicae*. 2005; 27(5):579-82.
6. Si Eun Hwang Mi Jin Jung, Balk Hwan Cho, and Hee Chul Yu. Clinical Feasibility and nutritional effects of early oral feeding after pancreaticoduodenectomy. *Korean J hepatobiliary pancreatic surgeons*. 2014; 18:84-89
<https://doi.org/10.14701/kjhbps.2014.18.3.84>
7. Nagata S, Fukuzawa K, Iwashita, Kabashima A, Kinoshita T, Wakasugi K. Comparison of enteral nutrition with combined enteral and parenteral nutrition in post-pancreaticoduodenectomy patients: a pilot study. *Nutrition Journal*. 2009; (24):1-8.
<https://doi.org/10.1186/1475-2891-8-24>

8. Weimann A, Braga M, Carli F, Higashiguchi T, Hübner M, Klek S, et al. ESPEN guideline: clinical nutrition in surgery. *Clinical nutrition*. 2017; Jun 1;36(3):623-50. <https://doi.org/10.1016/j.clnu.2017.02.013>
9. Liu C, Du Z, Lou C. Enteral nutrition is superior to total parenteral nutrition for pancreatic cancer patients who underwent pancreaticoduodenectomy. *Asia Pac J Clin Nutr*. 2011; 20:154-160.
10. Jiang H, Xu M, Wang H, et al. Early enteral nutrition reduces postoperative complications in patients undergoing pancreaticoduodenectomy: A systematic review and meta-analysis. *J Gastrointest Surg*. 2021;25(4):913-22.
11. Wischmeyer PE, Carli F, Evans DC. Individualized nutrition support and its effects on postoperative recovery: Current evidence and future directions. *Curr Opin Clin Nutr Metab Care*. 2018;21(3):160-6.
12. Gerritsen A, Besselink MG, Cieslak KP, Vriens MR & Steenhagen E, Hillegersberg RV. Efficacy and Complications of Nasojejunal, Jejunostomy and Parenteral Feeding After Pancreaticoduodenectomy. *J Gastrointest Surgery*. 2012; 16:1144-1151. <https://doi.org/10.1007/s11605-012-1887-5>

Safety of Topical Mometasone Furoate 0.1% Cream vs Topical Tacrolimus 0.03% Ointment in the Treatment of Atopic Dermatitis

Md Alauddin Khan¹, Mohammad Abu Hena Chowdhury², Lubna Khondker^{*3},
Dilshad Afroze⁴

Abstract

Introduction: Atopic dermatitis (AD) is an itchy, chronic, or chronically relapsing, inflammatory skin condition, affecting between 10% and 20% of children and 1% and 3% of adults. Atopic dermatitis causes significant physical, psychological and social distress. The prevalence of AD has increased steadily over the last 30 years. Topical steroids and calcineurin inhibitors are the current standard for topical anti-inflammatory therapy. Mometasone furoate cream 0.1% is a medium potency corticosteroid, effective in the treatment of atopic dermatitis in children. **Materials and Methods:** A clinical trial was conducted from September 2021 to February 2022 to compare the safety of mometasone furoate and tacrolimus in the treatment of Atopic Dermatitis. Patients of Atopic dermatitis attending outpatient department of Dermatology and Venereology, Bangabandhu Sheikh Mujib Medical University, Dhaka were the study population. Patients of atopic dermatitis diagnosed clinically and age more than 2 years were included in the study. **Results:** In this study, 73.33% of mometasone furoate treated patient and 60% of tacrolimus treated patients did not experience any side effects. Side effects recorded in group A were burning sensation (13.3%), dry skin (6.7%), Desquamation (3.3%) and irritation (3.3%) and in group B were burning (10.0%), dry skin (13.3%), desquamation (10.0%), irritation (3.3%) and erythema (3.3%) ($p > 0.05$). **Conclusion:** In the light of the findings of the study we conclude that each of the treatment of mometasone furoate and tacrolimus is individually safe in the treatment of atopic dermatitis. The safety and tolerability of mometasone furoate 0.1% is almost same as that of tacrolimus in the treatment of atopic dermatitis.

Key words: Safety of mometasone furoate, safety of tacrolimus, atopic dermatitis.

Number of Tables: 04; Number of References: 19; Number of Correspondences: 04.

1. Dr. Md Alauddin Khan

Assistant Professor
Department of Dermatology & Venereology
Bangabandhu Sheikh Mujib Medical University (BSMMU)
Dhaka, Bangladesh.
Cell: 01914330892

2. Prof. Mohammad Abu Hena Chowdhury

Professor
Department of Dermatology & Venereology
Bangabandhu Sheikh Mujib Medical University (BSMMU)
Dhaka, Bangladesh.

*3. Corresponding Author:

Dr. Lubna Khondker

Associate Professor
Department of Dermatology & Venereology
Bangabandhu Sheikh Mujib Medical University (BSMMU)
Dhaka, Bangladesh.
Email: lubnaderma@gmail.com

4. Dr. Dilshad Afroze

Medical Officer
Department of Internal Medicine
Bangabandhu Sheikh Mujib Medical University (BSMMU)
Dhaka, Bangladesh.

Introduction:

Atopic dermatitis (AD) accounts for 10% to 20% of all referral to dermatologists and about 30% of dermatologic consultations in general practice. The word atopy introduced by Coca 1925 meaning out of place or strange to signify the hereditary tendency to develop allergies to food & inhalant substances¹. Atopy is a syndrome may be defined as a genetically determined immune system maturation disorder of unknown origin, in which there is increased liability to form IgE antibodies & is frequently associated with personal or family history of atopic dermatitis, allergic rhinitis or asthma²⁻⁴. In atopic dermatitis (AD) there is activation of the T helper 2 (Th2) immune response, with synthesis of cytokines IL-4, IL-5, IL-10 & IL-13 and inhibition of T helper 1 (Th1) response. IL-4 & IL-5 produces elevated IgE level and eosinophilia in tissue & peripheral blood^{5,6}. Pruritus is the hallmark of atopic dermatitis in all stages. 60% infantile AD present first year of life^{7,8}. Pruritus is constant features and itching is paroxysmal type. Skin biopsy for histopathology show spongiosis & edema of the epidermis, hyperkeratosis and acanthosis in chronic stage along with perivascular infiltrate of in upper dermis^{9,10}. Topical corticosteroids are very effective in atopic dermatitis but there frequent and long term uses, particularly in children have many side effects¹¹. Mometasone furoate is a medium potency cortico-steroid, indicated for the relief of the inflammatory and pruritic manifestations of atopic dermatitis¹². Topical calcineurin inhibitors like tacrolimus may be used as alternate of steroid. Topical tacrolimus suppresses inflammation in a similar way to steroids and is equally as effective as a mid potency steroid¹⁰. It does not cause skin thinning or other steroid related

side-effects¹³. To the best of my knowledge, no study exploring the safety of topical mometasone furoate comparing with topical tacrolimus in the treatment of atopic dermatitis has yet been conducted in Bangladesh.

Materials and Methods:

A clinical trial was conducted in department of Dermatology and Venereology, Bangabandhu Sheikh Mujib Medical University, Dhaka. The duration of the study was from September 2021 to February 2022. Patients of Atopic dermatitis attending outpatient department of Dermatology and Venereology, Bangabandhu Sheikh Mujib Medical University, Dhaka were the study population. Purposive type of non-probability sampling method was followed in this study. Inclusion criterias were patients of atopic dermatitis diagnosed clinically, patient who gave informed written consent, age more than 2 years and patients of both male and female. Exclusion criterias were known case of topical mometasone or tacrolimus hypersensitivity and patients who have been suffering from hepatic, renal, cardiovascular and hematological diseases. Patients co-existing with acute infections, neoplasia, uncontrolled hypertension and diabetes mellitus. Patients suffering from any food allergy and other skin morbidity causing acute onset of skin rash. Skin disorders likely to affect drug absorption or disorders requiring medical treatment within 5 days before the start of the study and pregnancy and lactation.

Ethical issues: The researcher was duly careful about ethical issues related to this study. In this study all patients were given an explanation of the study including the potential risks and obtainable benefits, all patients were included in the trial after taking their informed written consent, the researcher also explained them that they have the right to refuse or accept to participate in the study and they have the right to refuse during study period, if he or she desire and the patients were not gain financial benefit from this study and all data obtained during study period from the patients remained confidential.

Procedure of data collection: A total number of 60 patients were primarily selected and they were randomized using computer-generated codes into two groups (group-A and group-B), each of which included 30 patients. Complete history, general physical and dermatological examinations were done for all enrolled patients. For women of reproductive age reproductive history, menstrual history, lactation and pregnancy plan was carefully judged. History and physical findings were recorded in a structured questionnaire. Finally those patients, who matched the inclusion and exclusion criteria according to history, physical examination and freely gave their informed consent, were selected for the study.

Intervention: Patients were divided into two groups (Group-A and group-B), group A was treated with mometasone furoate and group B with tacrolimus. Both preparations had to be administered in twice daily regimen and the duration of the total treatment period was 4 weeks. Unused medications were collected after the last assessment. Patients were clinically assessed monthly for three months. Each time the

severity index of the disease were calculated and recorded and clinical photographs were taken. The final clinical assessment was done and the severity index was calculated. Six clinical signs were recorded for each case by the senior consultant in the Unit for practical purposes: erythema, edema/papulation, oozing/crusting, excoriations, lichenification and dryness. These clinical signs are the most widely used and validated in atopic dermatitis currently available scoring system: Scoring of Atopic Dermatitis (SCORAD) index, The SCORAD scored the extent, six intensity criteria, and subjective symptoms of AD. Disease extent was measured using the rule of nines. The average intensity of each clinical sign was graded on a scale from 0 to 3 (0=absent, 1=mild, 2=moderate, and 3=severe) at a representative body site, per the SCORAD protocol. Subjective symptoms, pruritus, and sleep loss were evaluated with regard to the last 3 days and nights, and all were scored by the patients. Both subjective items were graded on a 10-cm visual analogue scale. The SCORAD index formula is: $A/5 + 7B/2 + C$. In this formula A is defined as the extent (0–100), B is defined as the intensity (0–18) and C is defined as the subjective symptoms (0–20). The maximum SCORAD score is 103 (i.e. patients with high score are rated “worse”). Safety of the medication of the treatment was assessed by observing the side effects during follow up schedule. The SCORAD Index (SCORing Atopic Dermatitis) is a scoring index for measuring the severity of atopic dermatitis. It is intended to standardize the assessment of therapeutic studies. It was designed to be easy to use in the outpatient setting. In order to evaluate the severity of atopic dermatitis as objectively as possible, the European Task Force on atopic dermatitis has developed a method allowing consistent assessment by means of severity index called SCORAD.

The SCORAD Index is based on sub scores:

1. A (extent score based on body surface area)
 2. B (intensity score based on 6 clinical findings in atopic dermatitis)
 3. C (subjective symptoms)
 - A=extent score=SUM (body surface area involved using rule of 9)
 - B=intensity score=SUM(points for 6 criteria-erythema, edema/papulation oozing/crusting, lichenification, excoriation and dryness)
 - C = subjective symptoms of pruritus and sleep disturbance = (score for pruritus from 0 to 10).
- SCORAD INDEX= $(A/5) + (7 \times B/2) + C$

Data processing and analysis:

Data analysis was performed by Statistical Package for Social Science (SPSS), version-12. Statistical analyses was done and level of significance was measured by using appropriate procedures like chi square test (χ^2), relative risk (RR) measurement, t-test, and proportion (d) test and others where applicable. Level of significance (p value) was set at 0.05 and confidence interval at 95%.

Results:

Total sixty patients of atopic dermatitis were enrolled and divided into group A and group B. Thirty of group A patients were treated by mometasone furoate and thirty of group B patients were treated by tacrolimus ointment. Mean age of Group A patients was 21.73 ± 4.30 and Group B was 19.70 ± 3.44 . 50.0% of group A and 58.3% of Group B was from the age group 2 to 10 years and 50.0% of group A and 33.3% of group B was from the age group of >10 years. Mean ($\pm$ SD) age of onset was 9.37 ± 4.07 years and 7.42 ± 3.12 years in group A and group B respectively ($p=0.420$). Mean duration of disease was 16.60 ± 17.21 months and 28.20 ± 38.71 months in group A and group B respectively ($p=0.139$).

Table I: Distribution of patients by age and mean of age at first appeared (yrs) and duration of disease (months).

Age in years	Group A (n=30)	Group B (n=30)	p value*
2 to 10	15 (50.0)#	20 (58.3)	
>10	15 (50.0)	10 (33.3)	
Total	30 (100.0)	30 (100.0)	
Mean $\pm$ SD	21.73 ± 4.30	19.70 ± 3.44	0.48
	Group A	Group B	p value**
Age at first appeared (yrs)	9.37 ± 4.07	7.42 ± 3.12	0.420
Duration of disease (months)	16.60 ± 17.21	28.20 ± 38.71	0.139

*unpaired t test and chi-square test** were done to measure the level of significance.

At baseline mean of total score of atopic dermatitis was 30.57 ± 13.62 and 30.90 ± 17.17 in group A and B, at 1st follow up it was 20.50 ± 13.64 and 21.17 ± 16.94 respectively in group A and B, at 2nd follow up it was 16.23 ± 12.74 and 15.83 ± 15.29 and at final follow up it was 11.87 ± 12.04 and 11.20 ± 13.85 respectively in group A and B ($p>0.05$). Percent reduction of severity from base line to final follow up was 69.20 ± 23.41 in group A and 74.77 ± 23.30 in group B ($p=0.360$).

Table II: SCORAD (Mean of total scoring of Atopic dermatitis) in different follow up

	Group A	Group B	p value*
Baseline	30.57 ± 13.62	30.90 ± 17.17	0.934
1st follow up	20.50 ± 13.64	21.17 ± 16.94	0.867
2nd follow up	16.23 ± 12.74	15.83 ± 15.29	0.913
Final follow up	11.87 ± 12.04	11.20 ± 13.85	0.846
Percent of reduction from base line to final follow up	69.20 ± 23.41	74.77 ± 23.30	0.360

*unpaired t test was done to measure the level of significance. Data was shown as Mean $\pm$ SD.

In this study, 73.33% of mometasone furoate treated patient and 60% of tacrolimus treated patients did not experience any side effects.

Table III: Distribution of patients by side effects

Side Effects	Group A		Group B	
	N	%	N	%
With side effects	8	26.67%	12	40%
Without side effects	22	73.33%	18	60%

Side effects recorded in group A were burning sensation (13.3%), dry skin (6.7%), Desquamation (3.3%) and irritation (3.3%) and in group B were burning (10.0%), dry skin (13.3%), desquamation (10.0%), irritation (3.3%) and

erythema (3.3%) ($p>0.05$).

Table IV: Distribution of different side effects by groups

	Group A	Group B	p value*
Burning sensation	4 (13.3)	3 (10.0)	0.688
Dry skin	2 (6.7)	4 (13.3)	0.389
Desquamation	1 (3.3)	3 (10.0)	0.301
Irritation	1 (3.3)	1 (3.3)	0.999
Erythema	0 (0.0)	1 (3.3)	0.313

*Chi-square test was done to measure the level of significance. Data was shown as Mean $\pm$ SD.

Discussion:

Mean age of Group A patients was 21.73 ± 4.30 and Group B was 19.70 ± 3.44 . Similar findings were observed by Sabry EY in his study done in Saudi Arabia to evaluate the effectiveness of combining two topical steroids, an antibiotic and an emollient as a single mixture in effectively controlling atopic dermatitis lesions in a six weeks treatment period. In total, 31 patients were assessed for eligibility to participate in this study; of these, age range of 19-26 years (mean age 22.9 ± 2.532 years) were enrolled¹⁴. Gradman et al were done a study in Denmark to see the suppressive effects of topical mometasone furoate and tacrolimus on skin prick testing in children. Skin prick tests were performed in 12 children with atopic eczema before and after 2 weeks of treatment with topical mometasone furoate and tacrolimus. Both treatments significantly suppressed the allergen wheal size. Mometasone furoate reduced the histamine wheal size as well. Skin prick testing in children treated with topical glucocorticoids or tacrolimus is associated with a risk of false-negative test results¹⁵. Pei AY were conducted a study to observe the effectiveness of wet wrap dressings using 0.1% mometasone furoate and 0.005% fluticasone propionate ointments in the treatment of moderate to severe atopic dermatitis in children. Various types of dressings have been used successfully in the treatment of atopic dermatitis. There was significant improvement in the disease severity from baseline during the first 2 weeks of the open application arm ($p=0.043$), however, additional beneficial effects were limited after week 2. Wet wraps further improved the disease severity and extent after week 2 ($p < 0.05$), and were well tolerated. They concluded that both 0.1% mometasone furoate and 0.005% fluticasone propionate ointments are effective in the treatment of atopic dermatitis, and that wet wraps are useful in further improving refractory disease in children¹⁶. In our study, at baseline mean of total score of atopic dermatitis was 30.57 ± 13.62 and 30.90 ± 17.17 in group A and B and at final follow up it was 11.87 ± 12.04 and 11.20 ± 13.85 respectively in group A and B ($p>0.05$). Percent reduction of severity from base line to final follow up was 69.20 ± 23.41 in group A and 74.77 ± 23.30 in group B ($p=0.360$). The significant improvement in the SCORAD index score and its six clinical intensity signs after three and six weeks of treatment were observed by Sabry EY in his study, done in Saudi Arabia to evaluate the effectiveness of combining two topical steroids, an antibiotic and an emollient as a single mixture in effectively controlling atopic dermatitis lesions in a six weeks treatment period. Thirty one females with atopic dermatitis were enrolled in this study. Disease

severity was measured using the Severity Score of Atopic Dermatitis (SCORAD) index at baseline, 3 weeks and 6 weeks of therapy. They were treated with a mixture of mometasone furoate, fusidic acid and betamethasone valerate twice daily for six weeks. Out of the 31 enrolled cases, 20 (64.5%) satisfied the inclusion criteria. They all completed the 6-week treatment regimen and evidenced no side effects from therapy. Statistical comparison between baseline and after three and six weeks interval using ANOVA and Tukey's multiple comparison tests revealed significant improvement of SCORAD index and its six clinical intensity signs with more effective improvement after the 6-week therapy. No correlation was ever detected by the Spearman test between index score and lesions' site or with allergic co-morbidities. The combined topical therapy mixture was effective and safe in rapidly controlling treated lesions. Sabry EY also recommended that mometasone furoate; is a highly effective topical corticosteroid with a less systemic absorption and a low potential for local and systemic side effects. Once-daily use of mometasone furoate was found to result in a greater percentage improvement in total atopic dermatitis scores compared with twice-daily betamethasone valerate in that study¹⁴. Schnopp C et al were carried out a vehicle-controlled trial with topical steroids under wet-wrap dressings in atopic dermatitis in the department of Dermatology and Allergy, Germany. The wet-wrap dressing technique were proved to be beneficial in cases of exacerbated atopic dermatitis (AD) skin lesions. The effect of wet-wrap dressings was investigated in a controlled trial comparing a steroid (mometasone furoate 0.1%)-containing and a steroid-free (vehicle) preparation in an in-patient comparison study. 20 children aged 2-17 years with exacerbated AD were treated twice daily with wet-wrap dressings over a 5-day period. AD in treated areas significantly improved in both study arms; however, the effect was significantly better in the mometasone-treated group ($p < 0.01$). Transepidermal water loss improved in both arms without any significant differences. *Staphylococcus aureus* colonization decreased during the first 3 days of active treatment independently of the therapeutic modalities chosen. At day 5, colony counts further dropped on the steroid-treated lesions. Application of the wet-wrap dressing technique for exacerbated AD lesions is effective, combination with a topical steroid being superior to a steroid-free application without bearing the risk of a bacterial superinfection. The treatment of facial atopic dermatitis in children who are intolerant of, or dependent on, topical corticosteroids: a randomized, controlled clinical trial¹⁷. Hoeger PH were conducted a study in Department of Paediatric Dermatology, Germany. The objective of primary study was to determine the efficacy of tacrolimus in children with mild-moderate facial AD dependent on/intolerant of TCS. Treatment with topical corticosteroids (TCS) is limited due to heightened risk of treatment-associated side-effects, thus necessitating alternative AD therapies. A multicentre, double-blind (DB) study of $< \text{ or } = 6$ weeks, followed by a 6-week, open-label (OL) phase was conducted. Two hundred patients (aged 2-11 years) were randomized 1:1 to tacrolimus ($n = 99$) or vehicle ($n = 101$) twice daily until clearance of facial AD or for a maximum of 6 weeks (DB phase). Sixteen

patients receiving vehicle were allowed to switch to the OL phase at day 22. Significantly more tacrolimus-treated vs. vehicle-treated patients were cleared/almost cleared of facial AD (Investigators' Global Assessment 0/1): 74.5% vs. 51.0%, $P < 0.001$ (day 43) [57.1% vs. 36.0%, $P = 0.004$ (day 22)]. Median time to clearance was 22.0 vs. 43.0 days (tacrolimus vs. vehicle, respectively). Adverse events were mainly mild-moderate, occurring with similar frequency in both treatment groups. In children with facial dermatitis intolerant of/dependent on TCS, tacrolimus effectively controls eczema and pruritus and is well tolerated¹⁸. Zuberbier et al were done a study with the aim of this post hoc analysis was to evaluate whether treatment of patients with atopic dermatitis (AD) with tacrolimus can decrease the development of flares necessitating the use of a topical corticosteroid on the face and thus reduce the need for use of topical corticosteroids in this sensitive skin area. In a controlled, double-blind, multicentre study, 140 patients, aged 2 to 17 years, with facial involvement and mild to moderate disease after treatment of the initial flare with prednicarbate 0.25% cream were randomized to an intermittent treatment with tacrolimus twice daily or vehicle for 24 weeks. If a flare occurred, defined as an exacerbation (unacceptable severity of itching/scratching or onset of oozing) not controlled by study medication, patients were treated with prednicarbate 0.25% cream instead. Patients in the vehicle group needed prednicarbate treatment on the face on 20.7% of the days vs. 11.7% of the study days in the tacrolimus group ($P = 0.0024$). Fifty per cent of patients in the tacrolimus group had no flare on the face during the treatment period compared with 37.5% of patients in the vehicle group ($P = 0.012$). The median time to first flare in tacrolimus -treated patients was twice as long as in patients receiving vehicle (138 vs. 68 days, $P = 0.01$). Three adverse events (one case of skin burning) suspected to be related to use of the study medication were reported for three patients (3.9%) in the tacrolimus group. Long-term intermittent treatment of facial AD in children and adolescents with tacrolimus cream 1% does significantly reduce the need for topical corticosteroids¹⁹. In our study, 73.33% of mometasone furoate treated patient and 60% of tacrolimus treated patients did not experience any side effects. Side effects recorded in group A were desquamation (13.3%), dry skin (6.7%), burning sensation (3.3%) and irritation (3.3%) and in group B were desquamation (10.0%), dry skin (13.3%), burning sensation (10.0%), irritation (3.3%) and erythema (3.3%) ($p > 0.05$). A study was done in Saudi Arabia to evaluate the effectiveness of combining two topical steroids, an antibiotic and an emollient as a single mixture in effectively controlling atopic dermatitis lesions in a six weeks treatment period. Disease severity was measured using the Severity Score of Atopic Dermatitis (SCORAD) index at baseline, 3 weeks and 6 weeks of therapy. They were treated with a mixture of mometasone furoate, fusidic acid and betamethasone valerate twice daily for six weeks. Out of the 31 enrolled cases, 20 (64.5%) satisfied the inclusion criteria. They all completed the 6-week treatment regimen and evidenced no side effects from therapy¹⁴.

Conclusion:

In the light of the findings of the study we conclude that each

of the treatment of mometasone furoate and tacrolimus is individually safe in the treatment of atopic dermatitis. The safety and tolerability of mometasone furoate 0.1% is almost same as that of tacrolimus in the treatment of atopic dermatitis. Study with a larger group of patients for longer period may result in superior outcome in clinical practice through improved compliance.

References:

- Atherton DJ. Topical corticosteroids in atopic dermatitis. Recent research reassures that they are safe and effective in the medium term. *BMJ*. 2003; 327: 942-3.
<https://doi.org/10.1136/bmj.327.7421.942>
PMid:14576221 PMCID:PMC259155
- Green C, Colquitt JL, Kirby J, et al. Clinical and cost-effectiveness of oncedaily versus more frequent use of same potency topical corticosteroids for atopic eczema: a systematic review and economic evaluation. *Health Technol Assess*. 2004; 8: 1-120.
<https://doi.org/10.3310/hta8470>
PMid:15527669
- Hauser C, Wuetrich B, Matter L, et al. *Staphylococcus aureus* skin colonization in atopic dermatitis. *Dermatologica*. 2005; 170: 35-9.
<https://doi.org/10.1159/000249493>
- McFadden JP, Noble WC, Camp RD. Superantigenic exotoxin secreting potential of staphylococci isolated from eczematous skin. *Br J Dermatol*. 2013; 128: 631-2.
<https://doi.org/10.1111/j.1365-2133.1993.tb00257.x>
PMid:8338746
- Dhar S. Should topical antibacterials be routinely combined with topical steroids in the treatment of atopic dermatitis? *Ind J Dermatol Venereol Leprol*. 2005; 71: 71-2.
<https://doi.org/10.4103/0378-6323.13987>
PMid:16394376
- Proksch E. The role of emollients in the management of diseases with chronic dry skin. *Skin Pharmacol Physiol*. 2018; 21: 75-80.
<https://doi.org/10.1159/000112957>
PMid:18187966
- Eichenfield LF, Hanifin JM, Luger TA, et al. Consensus conference on pediatric atopic dermatitis. *J Am Acad Dermatol*. 2013; 49: 1088-95.
[https://doi.org/10.1016/S0190-9622\(03\)02539-8](https://doi.org/10.1016/S0190-9622(03)02539-8)
PMid:14639390
- Gambichler T. Narrowband UVB phototherapy in skin conditions beyond psoriasis. *J Am Acad Dermatol*. 2005; 52: 660-70.
<https://doi.org/10.1016/j.jaad.2004.08.047>
PMid:15793518
- Rajka G, Avrach W, Gartner L, Overgaard-Petersen H. Mometasone furoate 0.1% fatty cream once daily versus betamethasone valerate 0.1% cream twice daily in the treatment of patients with atopic and allergic contact dermatitis. *Cur Ther Res Clin Exp*. 2005; 54: 23-9.
[https://doi.org/10.1016/S0011-393X\(05\)80614-9](https://doi.org/10.1016/S0011-393X(05)80614-9)
- Hoybye S, Balk MS, De Cunha BF, et al. Continuous and intermittent treatment of atopic dermatitis in adults with mometasone furoate versus hydrocortisone 17-butyrate. *Cur Ther Res Clin Exp*. 2014; 50: 67-72.
- Stalder JF, Tateb A. Severity scoring of atopic dermatitis: the SCORAD index. *Dermatology*. 2016; 186: 23-31.
<https://doi.org/10.1159/000247298>
PMid:8435513
- Williams H. New treatments for atopic dermatitis. *BMJ*. 2002; 324: 1533-4.
<https://doi.org/10.1136/bmj.324.7353.1533>
PMid:12089073 PMCID:PMC1123485
- Lagos BR, Maibach HI. Frequency of application of topical corticosteroids: an overview. *Br J Dermatol*. 2003; 139: 763-6.
<https://doi.org/10.1046/j.1365-2133.1998.02498.x>
PMid:9892939
- Sabry EY. Combined topical therapy mixture can effectively and rapidly control atopic dermatitis lesions- a pilot study. *Journal of Pakistan Association of Dermatologists*. 2010; 20: 28-34.
- Gradman J, Wolthers OD. Suppressive effects of topical mometasone furoate and tacrolimus on skin prick testing in children. *Pediatr Dermatol*. 2008 Mar-Apr;25(2):269-70.
<https://doi.org/10.1111/j.1525-1470.2008.00651.x>
PMid:18429800
- Pei AY, Chan HH, Ho KM. The effectiveness of wet wrap dressings using 0.1% mometasone furoate and 0.005% fluticasone propionate ointments in the treatment of moderate to severe atopic dermatitis in children. *Pediatr Dermatol*. 2011 Jul-Aug; 18(4):343-8.
<https://doi.org/10.1046/j.1525-1470.2001.01952.x>
PMid:11576413
- Schnopp C, Holtmann C, Stock S, Remling R, Fölster-Holst R, Ring J, et al. Topical steroids under wet-wrap dressings in atopic dermatitis-a vehicle-controlled trial. *Dermatology* 2012; 204(1):56-9.
<https://doi.org/10.1159/000051811>
PMid:11834851
- Hoeger PH, Lee KH, Jautova J, Wohlrab J, Guettner A, Mizutani G, et al. The treatment of facial atopic dermatitis in children who are intolerant of, or dependent on, topical corticosteroids: a randomized, controlled clinical trial. *Br J Dermatol*. 2009 Feb;160(2):415-22. Epub 2008 Nov 25.
<https://doi.org/10.1111/j.1365-2133.2008.08928.x>
PMid:19067708
- Zuberbier T, Bräutigam M. Long-term management of facial atopic eczema with pimecrolimus cream 1% in paediatric patients with mild to moderate disease. *J Eur Acad Dermatol Venereol*. 2008 Jun;22(6):718-21.
<https://doi.org/10.1111/j.1468-3083.2008.02586.x>
PMid:18312323

Efficacy of Serum Cystatin C as a Diagnostic Marker of Early Renal Dysfunction in Hypertensive Individuals

Saima Shakila^{*1}, MD. Monaim Farhad², Farhana Hasan³, Shaila Sharmin⁴,
MD. Monzurul Alam Bhuiyan⁵, Tuhin Sultana⁶, Iltutmish Akanda⁷

Abstract

Introduction: The aim of the present study was to find out the efficacy of serum Cystatin C as a diagnostic marker of early renal dysfunction in hypertensive individuals. **Materials and Methods:** This cross-sectional study was conducted from March 2022 to February 2023 in the Departments of Laboratory Medicine & Internal Medicine, BSMMU. All adult individuals (>18 years) attending OPD of Internal Medicine Department were enrolled in this study who fulfilling the inclusion and exclusion criteria. Then, 5 ml of venous blood was collected for the estimation of serum Cystatin C and serum creatinine. Five ml urine was collected for the estimation of spot urinary microalbumin. After data collection and processing, all statistical analysis was done by SPSS software windows version 26. **Result:** Total of 103 respondents from OPD of Internal Medicine was enrolled in this study. The mean age of the study population was 53.0±11.0 years. The male: female ratio is 2:1. The diagnostic performance of serum Cystatin C based on urinary microalbumin as the gold standard determining the best cut-off of 1.17 mg/L at an optimum sensitivity of 93.8% and specificity of 97.7%, PPV 88.2%, NPV 98.8% and accuracy 97.1%. The diagnostic performance of serum creatinine based on urinary microalbumin as the gold standard determining the best cut-off of 1.20 mg/L at an optimum sensitivity of 81.3%, specificity 98.9%, PPV 92.9%, NPV 96.6% and accuracy 96.1%. **Conclusion:** Serum Cystatin C level had significantly more correlation with microalbuminuria in hypertensive individuals. The area under the curve had shown that serum Cystatin C had an excellent discriminative ability to detect early renal dysfunction in hypertensive individuals.

Keywords: Hypertension, Serum Cystatin C, Serum creatinine, urinary microalbumin.

Number of Tables: 05; **Number of Figures:** 03; **Number of References:** 12; **Number of Correspondences:** 04.

*1. Corresponding Author:

Dr. Saima Shakila

Assistant Professor

Department of Laboratory Medicine

Chattagram Maa o Shishu Medical College and Hospital

Chattagram, Bangladesh.

Email: saimashakila81@gmail.com

Contact: 01855060613

2. Dr. MD. Monaim Farhad

Resident, Phase B

Department of Orthopedic Surgery

Chittagong Medical College and Hospital

Chattagram, Bangladesh.

3. Dr. Farhana Hasan

Consultant

Laboratory Medicine

Ibn Sina Diagnostic and Consultation Centre

Uttara, Dhaka, Bangladesh.

4. Dr. Shaila Sharmin

Clinical Pathologist

Dhaka Medical College

Dhaka, Bangladesh.

5. Dr. MD. Monzurul Alam Bhuiyan

Assistant Professor

Department of Laboratory Medicine

BSMMU

Dhaka, Bangladesh.

6. Prof. Dr. Tuhin Sultana

Professor

Department of Laboratory Medicine

BSMMU

Dhaka, Bangladesh.

7. Dr. MD. Iltutmish Akanda

Upazila Health and Family Planning Officer

Hakimpur, Dinajpur, Bangladesh.

Introduction:

Hypertension is a multifactorial disorder. It involves an abnormality of renal, neural, endocrine and vascular mechanisms. Blood pressure is the product of cardiac output and peripheral resistance. Hypertension is caused by increased cardiac output and/or increased peripheral resistance¹. Hypertension is an independent risk factor for renal impairment and end-stage renal disease². The best overall index of renal function is GFR. Isotope clearance procedures can be used to determine precise GFR, however, they are all time-consuming,

expensive and involve radiation exposure³. In routine clinical practice, GFR is estimated from a several equations like C & G formula, MDRD formula, and CKD-EPI formula which is expressed by eGFR⁴. Worldwide accepted and used endogenous filtration markers for GFR estimation are serum creatinine, alone or combined with creatinine clearance³. Serum creatinine levels are affected by age, gender, muscle mass, and body size and may remain within the normal limit for a long time until >50% loss of nephron has occurred⁵. The creatinine clearance determination may provide greater accuracy but it is difficult to perform for patients to collect 24-hour urine³. Microalbuminuria (MAU) is considered to be a marker of early renal damage from hypertension⁶. Hypertension may cause microalbuminuria and subsequent renal damage⁷. Microalbuminuria may be defined as increased excretion of albumin (30-300mg/day) through urine. Microalbuminuria can be measured by albumin creatinine ratio which is a spot test. The excreted urinary albumin can be adjusted to creatininuria due to variations in urine flow rate and concentration⁸. Cystatin C (Cys C) is a 120-amino acid, non-glycosylated LMW protein (Mr=13359) that is thought to be a better marker than serum creatinine because it is produced by all nucleated cells at a constant rate. It is freely filtered by the glomerulus and not secreted but completely reabsorbed and catabolized by proximal convoluted tubular epithelial cells⁹. Cystatin C is a better marker than serum creatinine because it does not depend on muscle mass, age, sex and body size and nutritional status⁵. The aim of the study was to find out the efficacy of serum Cystatin C as a marker in the diagnosis of early renal dysfunction in hypertensive individuals.

Materials & Methods:

A Cross sectional study was conducted from March 2022 to February 2023 among 103 patients attending at department of Laboratory Medicine and Internal Medicine, BSMMU, Dhaka after obtaining requisite consent from the hypertensive patients. Data were collected through interviewing of the patients. Then, 5 ml of venous blood was collected for the estimation of serum Cystatin C and serum creatinine. Five ml urine was collected for the estimation of spot urinary microalbumin. The collected data were entered into the computer and analyzed by using SPSS (version 26) to assess the efficacy of serum Cystatin C as a marker in the diagnosis of early renal dysfunction in hypertensive individuals. The study was approved by the institutional ethical committee. The interviews were held directly in the corridor just outside the Outpatient Department.

Results:

Table I reveals that maximum number of the patients (65%) was found below 60 years. The mean age of the study population was 53.0±11.0 years. Majority of the patients (67.0%) were male and 33% patients were female. The male: female ratio is 2:1

Table I: Socio-Demographic Characteristics of the study subjects (n=103)

Parameter	Number	
Percentage%		
Age (Range 20-75 years)		
< 60	67	65.0
≥ 60	36	35.0
Mean±SD	53.0±11.0	
Sex		
Male	69	67.0
Female	34	33.0
Male: female ratio	2 : 1	

ROC curve analysis of serum Cystatin C based on urine microalbumin as gold standard revealed an area under the curve (AUC) of 0.981, determining a best cut-off of 1.17 mg/L at an optimum sensitivity of 93.8% and specificity of 97.7% at 95%. Confidence interval (0.956-1.000) and p-value= <0.001. ROC curve analysis of serum creatinine based on urine microalbumin as gold standard revealed an area under the curve (AUC) of 0.895, determining a best cut-off of 1.2 mg/dl at an optimum sensitivity of 81.3% and specificity of 98.9% at 95%. Confidence interval (0.775-1.000) and p-value = <0.001 (Figure 1).

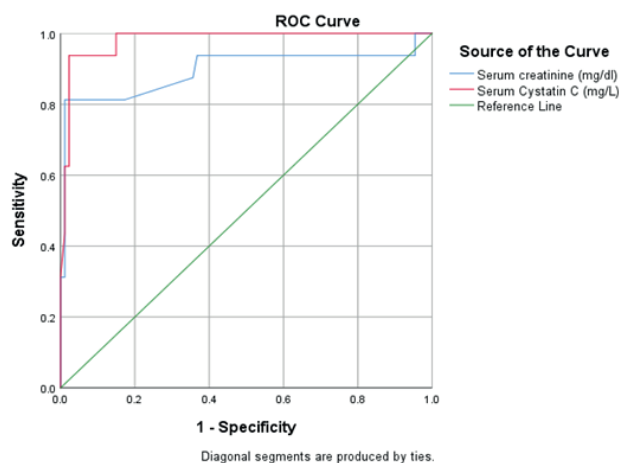


Figure 1: Receiver operating characteristic (ROC) curve of serum Cystatin C, serum creatinine and cut-off value for prediction of early renal dysfunction of hypertensive individual.

Table II reveals that 17 people had serum Cystatin c level was ≥1.17 mg/L of which 15 people had microalbuminuria and 2 people had normoalbuminuria and 86 people had serum cystatin c level was <1.17 mg/L of which 1 person had microalbuminuria and others were normoalbuminemic. Cut off value for serum Cystatin C was 1.17 mg/L according to ROC curve (Table II).

Table II: Diagnostic validity test of serum Cystatin C with urinary microalbumin (N=103)

Serum cystatin C (mg/L)	Microalbuminuric subjects (≥ 30 mg/g) (n=16)	Normoalbuminuric subjects (< 30 mg/g) (n=87)	Total
≥ 1.17	15(93.8%)	2(2.3%)	17(16.5%)
< 1.17	1(6.3%)	85(97.7%)	86(83.5%)
Total	16(100.0%)	87(100.0%)	103(100.0%)

Table III reveals that the diagnostic performance of serum Cystatin C based on urinary microalbumin as the gold standard determining the best cut-off of 1.17 mg/L at an optimum sensitivity of 93.8% and specificity of 97.7%, PPV 88.2%, NPV 98.8% and accuracy 97.1%.

Table III: Diagnostic performance of serum Cystatin C

Statistic	Value
Sensitivity	93.8%
Specificity	97.7%
PPV	88.2%
NPV	98.8%
Accuracy	97.1%

Table- IV reveals that 14 people had serum creatinine level was ≥ 1.20 mg/dl of which 13 people had microalbuminuria and 1 people had normoalbuminuria and 89 people had serum creatinine level was < 1.20 of which 3 person had microalbuminuria and others were normoalbuminuric. Cut off value for serum creatinine was 1.20 mg/dl according to ROC curve.

Table IV: Diagnostic validity test of serum creatinine with urinary microalbumin (N=103)

Serum creatinine (mg/dl)	Microalbuminuric subjects (≥ 30 mg/g) (n=16)	Normoalbuminuric subjects (< 30 mg/g) (n=87)	Total
≥ 1.20	13(81.3%)	1(1.1%)	14(13.6%)
< 1.20	3(18.8%)	86(98.9%)	89(86.4%)
Total	16(100.0%)	87(100.0%)	103(100.0%)

Table- V shows that the diagnostic performance of serum creatinine based on urinary microalbumin as the gold standard determining the best cut-off of 1.20 mg/L at an optimum sensitivity of 81.3%, specificity 98.9%, PPV 92.9%, NPV 96.6% and accuracy 96.1%.

Table V: Diagnostic performance of serum creatinine

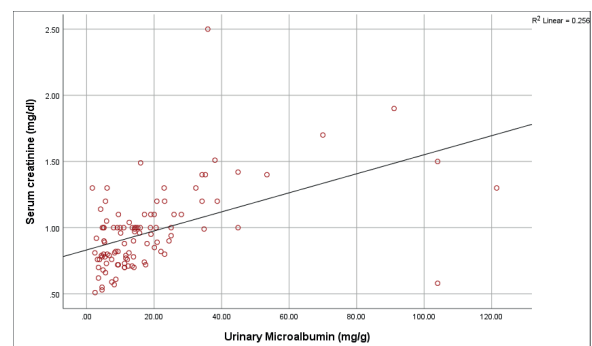
Statistic	Value
Sensitivity	81.3%
Specificity	98.9%
PPV	92.9%
NPV	96.6%
Accuracy	96.1%

Figure-2 Scatter diagram shows that serum Cystatin C had moderately significant correlation with urinary microalbumin in hypertensive individuals (r value = +0.662, $p < 0.001$). The Pearson's correlation was

statistically significant ($p < 0.001$)

**Figure-2: Correlation of serum Cystatin C with urinary microalbumin in hypertensive individuals.**

Figure-3 shows that serum creatinine had moderately significant correlation with urinary microalbumin in hypertensive individuals (r value = +0.530, $p < 0.001$). The Pearson's correlation was statistically significant ($p < 0.001$).

**Figure-3: correlation of serum creatinine with urinary microalbumin in hypertensive individuals.**

Discussion:

In this present study, it was observed that in hypertensive individuals the mean $\pm$ SD age was found 53.0 $\pm$ 11.0 years. The maximum of the patients (65%) was found below 60 years age group. Salgado et al., 2013 found the mean $\pm$ SD age was 60.6 $\pm$ 11.8 years¹⁰. In this study, it was observed that 67 % (69) were male and 33% (34) were female and the male-female ratio was 2:1. Rahman et al. (2018) found that there was no significant difference in sex among Bangladeshi hypertensive patients¹¹. In the present study, the diagnostic accuracy of serum Cystatin C and serum creatinine was also found by the ROC curve. Urinary microalbumin (30-300mg/g) was used as a gold standard. The area under the ROC curve (AUC) value for Cystatin C was found to be superior (AUC: 0.981) to serum creatinine (AUC: 0.895). It was determined the best cut-off of 1.17 mg/L at an optimum sensitivity of 93.8% and specificity of 97.7% at a 95% confidence interval and p-value= < 0.001 for serum Cystatin C. The PPV, NPV and diagnostic accuracy were 88.2%, 98.8% and 97.1% respectively according to the present study. This study also determined the best cut-off of 1.2 mg/dl at an optimum sensitivity of 81.3% and specificity of 98.9% at a

95% confidence interval and p -value = <0.001 for serum creatinine. According to this study, the PPV, NPV and diagnostic accuracy were 92.9%, 96.6% and 96.1% respectively. Ozer et al., 2005 showed a ROC curve in which eGFR was used as the gold standard. They found an area under the ROC curve (AUC) for serum Cystatin C was 0.900 and for serum creatinine was 0.847. The sensitivity and specificity of serum Cystatin C were 91.7% and 89.7% respectively, according to their study. They also found the PPV and NPV were 73.25 and 97.24 respectively. They found the sensitivity and specificity of serum creatinine were 100% and 59% respectively. The PPV and NPV were 42.83 and 100 respectively according to them (Ozer et al., 2005)¹². It was observed that serum Cystatin C level had a greater association with microalbuminuria than serum creatinine in hypertensive individuals. AUC suggested that serum Cystatin C level had an excellent discriminative ability than serum creatinine to detect early renal dysfunction in hypertensive individuals. So, serum Cystatin C may be used as a biomarker for the diagnosis of early renal dysfunction in hypertensive individuals. In the current study, the correlation of microalbuminuria with serum Cystatin C and serum creatinines in hypertensive group were done by Pearson's correlation coefficient test. Microalbuminuria had a greater correlation with serum Cystatin C level (r -value = +.662, $p < 0.001$) than serum creatinine level (r -value = +.530, $p < 0.001$). Microalbuminuria has a positive correlation with serum Cystatin C level (r -value = 0.38 and $p = < 0.001$) and serum creatinine (r -value = 0.31, $p = < 0.001$) which was observed by Salgado et al., 2013. This was consistent with our study¹⁰.

Conclusion:

It was observed that serum Cystatin C level was found significantly correlated with microalbuminuria in hypertensive individuals. The area under the curve had shown that serum Cystatin C had an excellent discriminative ability to detect early renal dysfunction in hypertensive individuals. Therefore, it may be used as a diagnostic marker for early renal dysfunction in hypertensive individuals.

Conflict of Interest: None.

Acknowledgements:

The authors are grateful to the entire staff of department of Laboratory Medicine and Internal Medicine, BSMMU during the study period.

References:

1. Cain, A.E. and Khalil, R.A. January. Pathophysiology of essential hypertension: role of the pump, the vessel, and the kidney. In *Seminars in nephrology*. WB Saunders. 2002; 22(1):3-16.
<https://doi.org/10.1053/snep.2002.28639>
2. Sur, A., Pk, M., Swain, M. and Mohapatra, N. Study of

relationship between kidney function and systolic blood pressure: new insights from cystatin C. *Biochem Anal Biochem*. 2015; 4(4):1-5.

<https://doi.org/10.4172/2161-1009.1000226>

3. Perrone, R.D., Madias, N.E. and Levey, A.S. Serum creatinine as an index of renal function: new insights into old concepts. *Clinical chemistry*. 1992; 38(10):1933-1953.

<https://doi.org/10.1093/clinchem/38.10.1933>

4. Levey, A.S., Inker, L.A. and Coresh, J. GFR estimation: from physiology to public health. *American Journal of Kidney Diseases*. 2014; 63(5):820-834.

<https://doi.org/10.1053/j.ajkd.2013.12.006>

5. Delanaye, P., Cavalier, E., Saint-Remy, A., et al. Discrepancies between creatinine-based and cystatin C-based equations in estimating prevalence of stage 3 chronic kidney disease in an elderly population. *Scandinavian Journal of Clinical and Laboratory Investigation*. 2009; 69(3):344-349.

<https://doi.org/10.1080/00365510802609856>

6. Kuang, Z.M., Wang, Y., Feng, S.J., et al. Association between plasma homocysteine and microalbuminuria in untreated patients with essential hypertension: a case-control study. *Kidney and Blood Pressure Research*. 2017; 42(6):1303-1311.

<https://doi.org/10.1159/000486013>

7. Koroshi, A. Microalbuminuria, is it so important? *Hippokratia*. 2007; 11(3): 105.

8. Poudel, B., Yadav, B.K., Nepal, A.K., et al. Prevalence and association of microalbuminuria in essential hypertensive patients. *North American journal of medical sciences*. 2012; 4(8):331.

<https://doi.org/10.4103/1947-2714.99501>

9. Laterza, o.f., Price, C.P., Mitchell G Scott. Cystatin C: An Improved Estimator of Glomerular Filtration Rate? *Clinical Chemistry*. 2002 May 1; 48(5):699-707.

<https://doi.org/10.1093/clinchem/48.5.699>

10. Salgado, J.V., França, A.K., Cabral, N.A., et al. Cystatin C, kidney function, and cardiovascular risk factors in primary hypertension. *Revista da Associação Médica Brasileira*. 2013; 59: 21-27.

<https://doi.org/10.1590/S0104-42302013000100007>

[https://doi.org/10.1016/S2255-4823\(13\)70425-9](https://doi.org/10.1016/S2255-4823(13)70425-9)

11. Rahman, M.A., Halder, H.R., Yadav, U.N. et al. Prevalence of and factors associated with hypertension according to JNC 7 and ACC/AHA 2017 guidelines in Bangladesh. *Scientific reports*. 2021; 11(1):15420.

<https://doi.org/10.1038/s41598-021-94947-2>

12. Ozer, B.A., Baykal, A., Dursun, B., et al. Can cystatin C be a better marker for the early detection of renal damage in primary hypertensive patients? *Renal failure*. 2005;27 (3):247-253.

<https://doi.org/10.1081/JDI-56635>

Efficacy of Intra-cameral Mydriatic and Anesthetics- in Small Incision Cataract Surgery (SICS)

Md. Mahmud-ul-Huda^{*1}, Sajed Abdul Khaleque², Md. Zinnurain³, Md. Musharraf Hossain⁴,
Rowjatul Jannat Munjifa⁵

Abstract

Introduction: Aim: To observe the per operative efficacy (in term of time of papillary dilatation and its maintenance till end of the surgery) of intra-cameral mydriatic and anesthetics (tropicamide 0.02%, phenylephrine 0.31% and lidocaine 1%) (ICM) in small incision cataract surgery (SICS). **Materials and Methods:** This is a cross sectional analytical study done in the department of ophthalmology Sheikh Hasina Medical College Jamalpur, from 27 April 2022 to 24 May 2022. This study includes 52 eyes of 52 patients. All patients received 0.2 ml intra cameral injection of mydriatic and anesthetic after opening anterior chamber. The pupillary size was measured periodically upto the end of the surgery with caliper. **Result :** The mean pupil diameter was 7.6 mm $\pm$ 0.72 before capsulorhexis, 7.3mm $\pm$ 0.78 before lens implantation and 7mm $\pm$ 0.83 before sub-conjunctival injection(at the end of the surgery). In 94.2 % of the cases papillary diameter was achieved and maintained $\geq$ 6mm till the end of the surgery. **Conclusion:** Intra-cameral combination of tropicamide 0.02%, phenylephrine 0.31% and lidocaine 1% could be a good alternative of standard regimen in SICS.

Keywords: Small incision cataract surgery, intra-cameral injection, mydriatics, anesthetics, mydriasis, stable pupil dilatation.

Number of Tables; 08; Number of References: 17; Number of Correspondences: 03.

*1. Corresponding Author:

Dr. Md. Mahmud-ul-Huda

FCPS (Ophthalmology)

Associate Professor

Department of Ophthalmology

Sheikh Hasina Medical College

Jamalpur, Bangladesh.

Email: drlavlu@yahoo.com

Mob: 01714448494

2. Prof. Dr. Sajed Abdul Khaleque

Professor and Head

Department of Ophthalmology

Ibn Sina Medical College, Dhaka, Bangladesh.

3. Dr. Md. Zinnurain

Associate Professor

Department of Ophthalmology

Mymensingh Medical College

Mymensingh, Bangladesh.

4. Dr. Md. Musharraf Hossain

Associate Professor

Department of Ophthalmology

Netrokona Medical College

Netrokona, Bangladesh.

5. Dr. Rowjatul Jannat Munjifa

MS (Ophthalmology)

Resident Surgeon

Department of Ophthalmology

Sheikh Hasina Medical College Hospital

Jamalpur, Bangladesh.

Introduction:

Small incision cataract surgery (SICS) with intraocular lens (IOL) implantation is one of the most common surgical procedures for cataract in developing countries. The key element of SICS is adequate and stable dilatation throughout the procedure. Insufficient pupillary dilation is an important factor for intra-operative complication^{1,2}. As a standard procedure a specifically scheduled topical drops are used for mydriasis and anesthesia. These drugs and preservatives have some disadvantages. They can be toxic to corneal epithelium and endothelium, which may cause corneal decomposition leading to corneal opacity³. This routine preparation has several other disadvantages such as its slow penetration through the cornea delays the onset of mydriasis; the limited bioavailability of topically administered substances with significant systemic absorption may increase the risk for systemic side effects (e.g. from the cardiovascular system)⁴; even if good mydriasis is achieved initially with topical mydriatics (TM), the effect tends to wear off during surgery; its time-consuming and inconvenient for patients. Topical anesthesia saves the patients from the risks of globe perforations, optic nerve injury, and life threatening respiratory arrest and above all, the pain and fear perceived because of the peribulbar or retro-bulbar injections. Drug containing mydriatics and anesthetics can be an alternative to the traditional preparation for cataract surgery. In 2015, the first ready-to-use, standardized, commercially manufactured medicinal product Mydrane (Laboratoires Thea, France)⁵ was approved for use in several European countries. In Bangladesh, this product is also approved and available from 2022. A combination of IC mydriatics and anesthetics injected after instillation of surface anesthesia, could give better surgeon and patient comfort intra-operatively.

This study is designed for SICS, which is commonly done in our country. Worldwide, study shows that, this preparation is used for phaco emulsification cataract surgery.

Materials and Methods:

The study was a cross sectional analytical study to see the efficacy of intra-cameral mydriatic with anesthetics in Sheikh Hasina Medical College Hospital, Jamalpur, Bangladesh from 27 April 2022 to 24 May 2022. Informed consent was taken and data was collected on data collection sheet. All patients admitted for cataract surgery in this period were included. The exclusion criteria were papillary diameter < 6 mm, history of intra-ocular surgery of trauma, corneal diseases, exfoliation and pseudo-exfoliation syndrome and other ocular diseases. The age of the patients was 35 – 80 years. Cataract grading was done according to World Health Organization (WHO) grading system 2002⁶. The injection is available at 1 ml/ampoule. Surface anesthesia was given and then 0.2 ml intra-cameral injection containing 0.04 mg of tropicamide, 0.62mg of phenylephrine hydrochloride and 2 mg of lidocaine hydrochloride was given just after opening the anterior chamber. Pupillary diameter was measured per-operatively with a caliper by the surgeon at specific stages of operation: before corneal incision, before capsulorhexis, before IOL implantation and before sub-conjunctival injection. The time taken for maximum dilatation after ICM injection was measured. If any additional measure needed to obtain and maintain dilatation or anaesthesia was also noted.

Result:

55 randomly selected patients, who consented to participate in the study, were included in the study. Out of 55 patients 2 patient was excluded from the study for small papillary (5 mm) and 1 patient due to incomplete data. So, the final sample size was 52 patients.

Out of 52 patients, 28 patients (53.8%) were male and 24 patients (46.2%) were female (Table I).

Table I: Gender distribution

	Number of patient	Percentage (%)
Male	28	53.8
Female	24	46.2

The age of the patients was 35 – 80 years (Table II). Most of the patients (44.2%) were 60-69 years age group followed by 70-79 years age group (26.9%). The mean age of the total population was 61.4 ±10.55.

Table II: Age distribution

Age	Number of patient	Percentage (%)
<40	1	1.9
40 – 49	5	9.6
50 – 59	6	11.5
60 – 69	23	44.2
70 – 79	14	26.9
≥ 80	3	5.8

According to nuclear sclerotic grading (NS) of WHO6 46 patients (88.5%) were nuclear sclerotic. Hard nucleus (N3 & N4) was in most of the cases (71.7%) (Table III).

Table III: Distribution of nuclear sclerotic grading of cataract (WHO)

WHO grading scale	Number of patients	Percentage (%)
No NS	0	0
NS1	5	10.9
NS2	8	17.4
NS3	23	50
NS4	10	21.7

The pupillary diameter at the beginning of the surgery was 3 to <4 mm in most of the cases (n=28, 53.8%), 4 to <5 mm in 21 cases (40.4%) and 3 mm or less was in 3 cases (5.8%)(Table IV).

Table IV: Pupillary diameter at the beginning of the surgery

Pupillary diameter(mm)	Number of patients	Percentage (%)
<2	0	0
2 to <3	3	5.8
3 to <4	28	53.8
4 to <5	21	40.4
<5	0	0

The time taken for the pupil to dilate maximally within 20 – 24 second in most of the patients 21 (40.5%), followed by 15-19 seconds in 19 patients (36.5%). The mean time for maximum pupillary diameter was 18(±4.1) second (Table V).

Table V: Time taken to achieve pupillary diameter ≥6mm.

Time(Second)	Number of patients	Percentage (%)
<10	1	1.9
10 to 14	9	17.3
15 to 19	19	36.5
20 to 24	21	40.5
≥ 25	2	3.9

The pupillary diameter at the beginning of the capsulorhexis was 8 to <9 mm in most of the patients 21 (40.5%), 7 to <8 mm in 18 patients (34.6%) and 6 to <7 mm was in 6 patients (11.5%) (Table VI).

Table VI: Pupillary diameter at the beginning of the capsulorhexis

Pupillary diameter(mm)	Number of patients	Percentage (%)
6 to <7	6	11.5
7 to <8	18	34.6
8 to <9	21	40.5
9 to <10	5	10.9
≥10	2	3.9

The pupillary diameter before intraocular lens (IOL) implantation was 7 to <8 mm in 19 patients (36.5%), 8 to <9

mm in 16 patients (34.6%) and 6 to <7 mm was in 12 patients (23.1%) (Table VII).

Table VII: Pupillary diameter before intraocular lens(IOL) implantation.

Pupillary diameter(mm)	Number 1	Percentage (%)
<6	1	1.9
6 to <7	12	23.1
7 to <8	19	36.5
8 to <9	18	34.6
9 to <10	1	1.9
>=10	1	1.9

The pupillary diameter at the end of the surgery was 7 to <8 mm in 19 patients (36.5%), 6 to <7 mm was in 16 patients (30.8%) and 8 to <9 mm in 10 patients (19.2%) (Table VIII).

Table VIII: Pupillary diameter at the end of the surgery:

Pupillary diameter(mm)	Number of patients	Percentage (%)
<6	3	5.8
6 to <7	16	30.8
7 to <8	19	36.5
8 to <9	10	19.2
9 to <10	4	7.7
>=10	0	0

Discussion:

The evolution of cataract surgery had gone through 'couching' to now 'phacoemulsification'. There was also evolution of anesthesia for cataract surgery from regional anesthesia, retro-bulbar anesthesia, peribulbar anesthesia, topical anesthesia and intra-cameral anesthesia. The use of topical anesthesia for cataract surgery was first described by Smith⁷. Non-myelinated Type A-delta and Type C fibers of the fifth cranial nerve transmit the pain sensation of the cornea and ciliary body and are blocked by lower concentrations of drugs than with motor fibers. Topical anesthetics inhibit the sodium channels of nerve endings and block the nerve impulse production. The part of the drug that penetrate to the anterior chamber blocks pain arises from the iris and ciliary body and usually last up to 15-20 min. In intra-cameral anesthesia dose can be repeated per-operatively if needed⁸. It is better over periocular anesthesia in consistency of mydriasis and analgesia. No need to stop aspirin or any other anticoagulants. Patients fear and pain of taking injection in the eye is absent. Visual recovery was immediate as blinking and ocular motility were retained, so no need of pad and bandage. There was no injection related complications with intra-cameral anesthesia. There were some limitations as there was no akinesia, patient selection was an important factor. Very anxious patient, non-cooperative patient, patient with movement disorder

and myotic pupil were excluded. Regarding demography, we found male preponderance (53.8%) which is also found in other studies on gender distribution of cataract surgical patients^{9,10,11}. Our area is one of the poorest areas of the country. Male preponderance may be due to social-economic structure of our area, where women are deprived and their expectations are low. Same findings reported by Geneaue al.¹², most of the patients (71%) were 60-79 years age group, which was similar to the study by Al-Qrainet al.¹³ in Saudi Arabia. It signifies that the age related cataract is the most common type. According to WHO cataract grading most of the cases was (Grade III & IV) 71.1%. This reflects the socioeconomic condition of the society, which is almost similar to the study done by Dariusz Ke'ciket al.¹⁵. The size of the pupil at the beginning of the surgery was 3 to <5 in most of the cases (94.2%). Time taken to dilate maximally in most of the cases (77%) was within 15 to 24 seconds. At the beginning of capsulorhexis, pupillary diameter was ≥ 6 mm in 96.4% (53 cases, N 55). Which was 96.8% in the study done by Labetoulle M, et al¹⁶. At the time of IOL implantation pupillary size was ≥ 6 mm in 98.1% cases which is similar to the study of Dariusz Keciket al.¹⁵. Pupillary diameter of ≥ 7 mm found in 63.4% of cases at the end of the surgery.

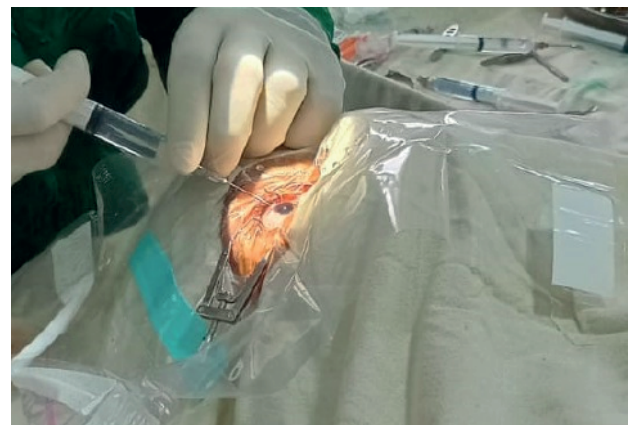


Photo- 1: Injecting intra-cameral mydriatic and anesthetics.



Photo- 2: Full mydriasis after injection.

Gradual reduction pupillary size is reported almost all studies^{14,15,16}. It may be due to manipulation of iris during surgery. Surgical time also had a relation with pupillary size, greater the surgical time smaller the pupillary size¹⁷. The decrease in patient preparation and surgical time may result in a more cost-effective cataract surgery and more patients could be scheduled on surgical days due to the faster turnover of patients. The merit of the study of use intra-cameralmydriatic and anesthetic in SICS and it is done for the first time in our country.

Conclusion:

Intra-cameral mydriatic and anesthetic gives rapid dilatation, maintenance of dilatation throughout the surgery and patient's comfort during intraocular manipulation. It reduces patient preparation and nursing time, so patient turnover is more and cost effective. It also eliminates the fear and pain of taking injection. So intra-cameral mydriatic and anesthetic injection is a better option for SICS.

Conflicts of Interest: None.

References:

1. Artzen D, Lundstrom M, Behndig A, Stenevi U, Lydahl E, Montan P. Capsule complication during cataractsurgery: casecontrol study of preoperative and intraoperative risk factors: Swedish Capsule Rupture Study Group report 2. *J Cataract Refract Surg.* 2009; 35: 1688-1693.
<https://doi.org/10.1016/j.jcrs.2009.05.026>
2. Vasavada A, Singh R. Phacoemulsification in eyes with a small pupil. *J Cataract Refract Surg.* 2000; 26: 1210-1218.
[https://doi.org/10.1016/S0886-3350\(00\)00361-8](https://doi.org/10.1016/S0886-3350(00)00361-8)
3. Kanski J, Bowling B. *Clinical Ophthalmology.* Philadelphia, Elsevier; 2012.
<https://doi.org/10.1016/B978-0-7020-4093-1.00019-7>
4. Fraunfelder FT, Scafidi AF. Possible adverse effects from topical ocular 10% phenylephrine. *Am J Ophthalmol.* 1978;85:447-53.
[https://doi.org/10.1016/S0002-9394\(14\)75239-0](https://doi.org/10.1016/S0002-9394(14)75239-0)
5. G Nazim-Lipski, et al. Mydrancintracameral injection can be an alternative to mydriatic drops instillation in cataract surgery. *Journal of Physiology and Pharmacology.* 2020; 71(2):243-48. www.jpp.krakow.pl
6. Thylefors, et al. A simplified cataract grading system The WHO Cataract Grading Group. *Ophthalmic Epidemiology.* 2002;9(2): 83-95.
<https://doi.org/10.1076/oep.9.2.83.1523>
7. Smith R. Cataract extraction without retrobulbaranaesthetic injection. *Br J Ophthalmol.* 1990;74:205 7.
<https://doi.org/10.1136/bjo.74.4.205>
8. Topical intracameral anesthesia in manual small incision cataract surgery: A pilot study in a Tertiary Eye Care Center in Africa NJ Uche, O Okoye, OI Okoye, O Arinze, NN Okoloagu Department of Ophthalmology, University of Nigeria Teaching Hospital, Ituku Ozalla, Enugu, Nigerian Journal of Clinical Practice. Mar-Apr 2016 ;19(2):201 - 206.
<https://doi.org/10.4103/1119-3077.175972>
9. Onyekonwu CG. Uptake of ocular surgeries at Ebonyi State University Teaching Hospital (EBSUTH), Abakiliki, Nigeria. *Niger J Ophthalmol.* 2008;16:39-43.
<https://doi.org/10.4314/njo.v16i2.46743>
10. Lewallen S, Mousa A, Bassett K, Courtright P. Cataract surgical coverage remains lower in women. *Br J Ophthalmol.* 2009; 93:295-8.
<https://doi.org/10.1136/bjo.2008.140301>
11. Lewallen S, Courtright P. Gender and use of cataract surgical services in developing countries. *Bull World Health Organ.* 2002; 80:300-3.
12. Geneau R, Lewallen S, Bronsard A, Paul I, Courtright P. The social and family dynamics behind the uptake of cataract surgery: Findings from Kilimanjaro region, Tanzania. *Br J Ophthalmol.* 2005;89:1399-402.
<https://doi.org/10.1136/bjo.2005.075572>
13. Al-Qrainy AN, Anjad S, Omar A, Jahan S. Co-morbidity of age related cataract surgical patients in a tertiary care hospital in Saudi Arabia. *Saudi J Ophthalmol.* 2007;21:105-9.
https://doi.org/10.4103/ijo.IJO_262_17
14. Ajay K, Saranya S, Sundaresh DD, Hithashree HR, Hemalatha BC, Krishnaswamy M, et al. Efficacy and safety of intraoperative intracameralmydriasis in manual small incision cataract surgery A randomized controlled trial. *Indian J Ophthalmol.* 2017;65:584 8.
https://doi.org/10.4103/ijo.IJO_262_17
15. Dariusz Kecik, Iwona Grabska-Liberek, Piotr Jurowski, et al. Stable Mydriasis After Intracameral Injection of a Combination of Mydriatics and Anesthetic During Cataract Surgery: A Real-Life, Multicenter Study. *Journal of Ocular Pharmacology and Therapeutics.* 2020; 36(10).
<https://doi.org/10.1089/jop.2020.0001>
16. Labetoulle M, et al. Evaluation of the efficacy and safety of a standardized intra-cameral combination of mydriatics and anaesthetics for cataract surgery. *Br J Ophthalmol.* 2016;100:976-985.
<https://doi.org/10.1136/bjophthalmol-2015-307587>
17. Bhat KT, Wadgaonkar SP, Undre AA, Heda AS. Evaluation of efficacy of intracameral lidocaine and tropicamide injection in manual small incision cataract surgery: A prospective clinical study. *Indian J Ophthalmol.* 2022;70:3849-52.
https://doi.org/10.4103/ijo.IJO_2050_22
8. Topical intracameral anesthesia in manual small incision

Assessment of Physical Deconditioning due to COVID-19 Lock Down: A Comparison between COVID-19 Affected and Non-affected Person

Golam Nobil^{*1}, Md. Obaidul Alam², ABM Mehedi³, Abul Kalam Azad⁴,
Immamur Rashid⁵, M. A. Shakoor⁶, Nadia Rahman⁷

Abstract

Introduction: The COVID-19 lockdown significantly reduced physical activity due to home confinement and limited access to fitness facilities, leading to physical deconditioning characterized by decreased strength, endurance, and mobility. Those infected with COVID-19 may have experienced more severe deconditioning due to illness-related inactivity, respiratory issues, and prolonged recovery, particularly in long-COVID cases. **Objectives:** To find out the physical deconditioning pattern due to lock down. **Materials and Methods:** This is a Case-control Study carried out Post COVID-19 clinic and Department of Physical medicine & rehabilitation in BSMMU during the period of 01-7-2021 to 30-06-2022. The patients (As Case) attending in post COVID-19 clinic at OPD of BSMMU and persons (As Control) attending the OPD. The subjects were divided into two groups as designated below: Group A: The case group was COVID-19 positive previously and Group B: Control group was the normal individual. So, total sample size is 150 in each group. The data was collected by semi structured questionnaire. The data was analyzed statistically by using Statistical Package for Social Science (SPSS) for Windows version 23. **Results:** Most participants were in service (98, 30.1%), housewives (81, 24.8%), businessmen (37, 11.3%), and physicians (28, 8.6%), with 82 (25.2%) from various other occupations like garment workers, students, teachers, and bankers. The case group showed mostly mild to moderate fatigue, while the control group had mild or no fatigue ($P=0.001$). In cases, most had Grade-1 & 2 dyspnea by MMRC, while the control group had Grade-0, 1, & 2. Deconditioning in activities like feeding, dressing, and grooming was common in cases but rare in controls ($P=0.001$). Personal hygiene deconditioning was mild to moderate in cases, while 108 controls had none, and 63 had mild issues ($P=0.001$). Moderate deconditioning was common in cases for outlet and active recreation, while controls had no deconditioning. Cases also showed mild to moderate deconditioning in socialization, whereas controls had no or mild deconditioning ($P=0.001$). **Conclusion:** This study concluded that deconditioning symptoms were more severe in COVID-19 patients compared to non-infected individuals. Fatigue and dyspnea were common, especially in those with co-morbidities. Daily activities were more significantly affected in COVID-19 patients. Exercise is recommended during lockdowns to reduce physical deconditioning.

Key words: Physical Deconditioning due to COVID-19 Lock down, COVID-19 affected and non-affected person.

Number of Tables: 04; Number of Figures: 02; Number of References: 26; Number of Correspondences: 03.

*1. Corresponding Author:

Dr. Golam Nobil

Assistant Professor
Dept. of Physical Medicine and Rehabilitation, BSMMU,
Dhaka, Bangladesh.
Phone: 01715698367
Email: gazadpmr@gmail.com

2. Dr. Md. Obaidul Alam

Resident
Dept. of Physical Medicine and Rehabilitation, BSMMU,
Dhaka, Bangladesh.

3. Dr. ABM Mehedi

Dept. of Physical Medicine and Rehabilitation, BSMMU,
Dhaka, Bangladesh.

4. Dr. Abul Kalam Azad

Assistant Professor
Dept. of Physical Medicine and Rehabilitation, BSMMU,
Dhaka, Bangladesh.

5. Dr. Immamur Rashid

Assistant Professor
Dept. of Physical Medicine and Rehabilitation, BSMMU,
Dhaka, Bangladesh.

6. Prof. Dr. M. A. Shakoor

Professor
Dept. of Physical Medicine and Rehabilitation, BSMMU,
Dhaka, Bangladesh.

7. Dr. Nadia Rahman

Assistant Professor
Department of Physical Medicine & Rehabilitation, BSMMU,
Dhaka, Bangladesh.

Introduction:

Acute respiratory syndrome due to COVID-19 was found in patients with severe pneumonia in Wuhan at first. It has spread rapidly since its recent identification China. As of 10 April 2020. COVID-19 has been reported in more than 195 countries and some areas across 6

continents and >2.3 million cases are confirmed, with an estimated mortality risk of ~3.4%¹. There is no current specific treatment for covid-19, the race is on to develop or repurpose drugs to help end this pandemic. The World Health Organization (WHO) has now launched the SOLIDARITY trial to investigate four potential treatments: chloroquine/hydroxychloroquine; lopinavir and ritonavir; and lopinavir and ritonavir plus interferon- β ². COVID-19 pandemic has resulted in a devastating threat to human society in terms of health, economy, and lifestyle. Although the virus usually first invades and infects the lung and respiratory track tissue, in extreme cases, almost all major organs in the body are now known to be negatively impacted often leading to severe systemic failure in some people^{3,4}. COVID-19 illness may therefore affect physical, cognitive and psychological function in multiple ways; a combination of low muscle strength due to frailty and impaired endurance due to cardiorespiratory disease is common, complicated by cognitive and psychological deficits^{5,6}. Data from the global ISARIC survey (ISARIC) COVID-19 Report, 2020 confirm that people most severely affected by COVID-19 will have had prolonged hospital stays, often spending much of this in bed, contributing to functional decline along with deconditioning. Prolonged immobility in the hospital is associated with a number of impairments including decline in muscle strength, muscle mass, cognitive function, muscle protein synthesis and physical function. Hospitalization is also associated with a decline in activity of daily living (ADL) performance⁷. The workforce delivering COVID-19 rehabilitation must be able to ensure that each patient will need an individualized programme, including aerobic exercise, strength training, balance training, breathlessness management, energy conservation, functional and vocational rehabilitation, and psychological support⁸. Such a programme can be delivered effectively only by a multidisciplinary team, which needs to have access to the full range of physical and occupational therapy, medical, nursing, dietetic, psychology and speech and language staff. The “deconditioning syndrome,” a side effect of hospital admission and a consequence of inactivity⁹. Although less dramatic, the months of isolation at home as a result of the Covid-19 pandemic will have an immense deconditioning effect, affecting millions of people. Spending months at reduced levels of activity will have an impact on all 4 aspects of physical fitness—strength, stamina, suppleness, and skill. It is important to appreciate also that there will be a loss of cognitive and emotional wellbeing as a result of isolation and loneliness, and this will increase the risk of dementia⁷. After the pandemic there may be reduction of risk of physical inactivity, dementia, frailty etc but still social care will be needed¹⁰. It was found that COVID-19 was followed by a deconditioning pandemic. So. reconditioning programme needs to be taken to support physical, cognitive, and emotional activity for all the people living in a community (Douglas et al. 2020)¹¹. By this study, an attempt was made to reverse the deconditioning due to COVID-19 and to

prevent further harm. It will lead many people to rethink what is happening to them as they live longer and take proper precaution to protect themselves from deconditioning due to COVID-19.

Materials and Methods:

This is a Case-control Study carried out Post COVID-19 clinic and Department of Physical medicine & rehabilitation in BSMMU during the period of 01-7-2021 to 30-06-2022. The patients (As Case) attending in post COVID-19 clinic at OPD of BSMMU and persons (As Control) attending the OPD of department of physical medicine and rehabilitation in BSMMU during the study period was constituted as study population. The subjects were divided into two groups as designated below: Group A: The case group was COVID-19 positive previously and Group B: Control group was the normal individual. So, total sample size is 163 in each group. All participants were assessed by standard measuring instruments: Canadian occupational performance measure (COPM), and exercise performance or dyspnea will be assessed by modified medical research council scale (MMRC scale). The physical functioning after Covid-19 recovery, the condition of exercise performance was assessed. Physical deconditioning were compared between two groups. Collected data was stored under secured lock and key. Occupational performance problems, concerns and issues, interview the client asking about daily activities in self-care, productivity and leisure. Ask the clients about daily activities which they want to do, need to do or are expected to do by encouraging them to think about a typical day. Then ask the client to identify which of these activities are difficult for them to do now to their satisfaction. These activity problems was recorded in Steps 1A, 1B or 1C. Using the scoring card provided, ask the client to rate on a scale 1 to 10, (mild, moderate or severe) the importance of each activity. Place the ratings in the corresponding boxes in 1A, 1B or 1C. The data was analyzed statistically by using Statistical Package for Social Science (SPSS) for Windows version 23.

Results:

Regarding occupation of the participants, most of them were involved in service 98(30.1%), house wives, 81 (24.8 %), businessman 37 (11.3 %) and physician 28 (8.6%). But there are some other participants 82 (25.2 %) of different occupation was found in our findings; they were garments workers, Students, Teachers, Bankers and others (Figure 1). Regarding deconditioning status according to fatigue, it was observed that majority respondents had mild and moderate fatigue in case. But mild fatigue or no fatigue was found more in control group ($P=0.001$) (Table-I). It was observed that most of the respondents had Grade-1 & 2 dyspnea by MMRC in case. But it was observed that most of the respondents had Grade-0 & 1 & 2 dyspnea by MMRC in case (Figure 2). It was observed that most of the respondents had deconditioning on feeding, dressing, bathing and grooming in case. But only a few had deconditioning on feeding, dressing, bathing and grooming in control (Table-II). It was observed

that most of the respondents had deconditioning associated with mild to moderate personal hygiene but 108 respondents had no decondition and 63 had mild problem regarding personal hygiene in control group (Table- III). It was observed that more than majority patients had moderate deconditioning on outlet recreation in case and no moderate deconditioning on outlet recreation in control. Majority had moderate deconditioning on active recreation in case and had mild deconditioning on active recreation in control. Most of the cases had mild to moderate deconditioning on socialization but no or mild deconditioning found on socialization in control (Table-IV).

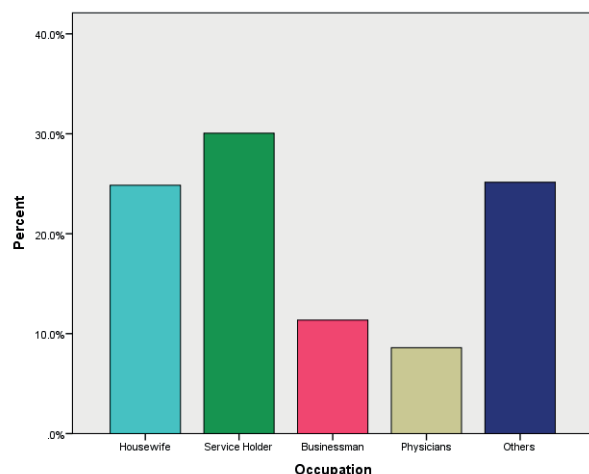


Figure.1: Distribution of occupation of the patients included in the study (N=326).

Table I: Distribution of fatigue of the study subject (N=326)

	Fatigue				P-value
	No (n)	Mild(n)	Moderate (n)	Severe (n)	
Case	17	53	67	18	0.001
Control	61	106	4	0	

Results were expressed as frequency and percentage (%), n= Number of patients in each group

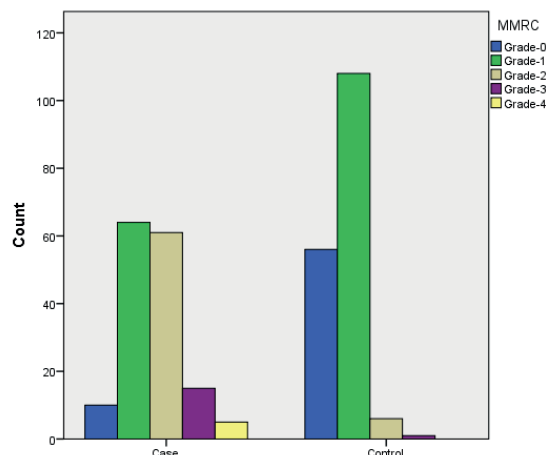


Figure-2: Bar diagram shows the distribution of the deconditioning severity according to MMRC.

Table II: Distribution of the deconditioning status according to personal care (N=326)

	Feeding				P-value
	No (n)	Mild(n)	Moderate (n)	Severe (n)	
Case	68	58	23	6	0.001
Control	169	1	1	0	
	Dressing				
	No (n)	Mild(n)	Moderate (n)	Severe (n)	
Case	65	60	23	7	0.001
Control	166	5	0	0	
	Bathing				
	No (n)	Mild(n)	Moderate (n)	Severe (n)	
Case	42	60	46	7	0.001
Control	160	11	0	0	
	Grooming				
	No (n)	Mild(n)	Moderate (n)	Severe (n)	
Case	64	58	29	4	0.001
Control	151	20	0	0	

Results were expressed as frequency, n= Number of patients in each group

Table III: Distribution of the deconditioning severity associated With functional mobility (N=326)

	Transfers				P-value
	No (n)	Mild(n)	Moderate (n)	Severe (n)	
Case	11	56	72	16	0.001
Control	132	39	0	0	
	Indoors				
	No (n)	Mild(n)	Moderate (n)	Severe (n)	
Case	19	58	62	16	0.001
Control	52	118	1	0	
	Outdoors				
	No (n)	Mild(n)	Moderate (n)	Severe (n)	
Case	6	51	79	19	0.001
Control	15	149	7	0	

Results were expressed as frequency, n= Number of patients in each group

Table IV: Distribution of the deconditioning severity according to leisure (N=326)

	Outlet recreation				P-value
	No (n)	Mild(n)	Moderate (n)	Severe (n)	
Case	16	60	65	14	0.001
Control	84	87	0	0	

Results were expressed as frequency, n= Number of patients in each group

Discussion:

In the present series, a total of 326 respondents were included. Out of them, 213 (65.3 %) were male and 113 (34.7 %) were

female and male: female ratio was 1:0.64. The mean age of the patients in the study were 40.76 ± 11.46 years. In a study, Townsend et al.¹² reported that out of 128 participants, mean age was (49.5 ± 15) years; and 54% were female that is some extent similar to this study. Researchers reported that the deconditioning can occur at any age, but amongst older adults can occur more rapidly and be more severe^{13,14,15,16}. Many respondents in case group had HTN (61 in number) and only 10 had TB. Rinaldo,¹⁷ reported that twenty-six (34%) had a diagnosis of systemic hypertension, 9 (12%) of diabetes, 3 (4%) of ischemic heart disease, and 3 (4%) of arrhythmia which correlates well with our study. In another study, researchers reported that older people and individuals with underlying chronic diseases are at high risk of responding worse to the viral infection and death¹⁸. Majority respondents had mild and moderate fatigue in case. But mild fatigue or no fatigue was found more in control group. In our study, the distribution of fatigue of the study patients in relation to deconditioning status showed that majority (89.4%) patients had fatigue in case and 106 (64.6%) in control. Similarly, Pasini et al.¹⁹ reported that many patients who have been suffering by Covid-19 suffer of long-Covid syndrome, with symptoms of fatigue and muscular weakness that characterize post-acute sequelae SARS-CoV-2 infection (PASC). In a study, Townsend¹² examined potential predictors of fatigue following COVID-19 infection, evaluating indicators of COVID-19 severity, markers of peripheral immune activation and circulating pro-inflammatory cytokines. In that study out of 128 participants, more than half reported persistent fatigue (67/128; 52.3%) at median of 10 weeks after initial COVID-19 symptoms. Werner et al.²⁰ emphasized that patients with fatigue often complain that physical exertion produces an increase of complaints, leading to a greater need for rest and more time spent in bed. They also emphasized that this is due to a bad physical fitness and that physical deconditioning is a perpetuating factor in fatigue. We also used MMRC scale in our study. In a report, WHO,⁶ stated that out of seventy-five patients, 39 patients had a critical, 18 severe, and 18 mild-moderate disease assessed by MMRC. Most of the respondents had deconditioning on feeding, dressing, bathing and grooming in case. But only a few had deconditioning on feeding, dressing, bathing and grooming in control. It was found that most of the respondents had deconditioning associated with mild to moderate personal hygiene but 108 respondents had no decondition and 63 had mild problem regarding personal hygiene in control group. In a study, Guilcher et al.²¹ concluded that participants described a substantial lack of physical, cognitive, and social activities, which led to deconditioning. Recommendations to address deconditioning include: (1) measuring physical/psychological function and well-being throughout hospitalization; (2) redesigning hospital environments (e.g., create social spaces); and (3) increasing access to rehabilitation during acute hospital stays, while patients wait for the next point-of-care. The finding of the higher number of patients observed in indoor as compared to control is correlated well with the physical inactivity which

lead to deconditioning. Fettes et al.²² stated that prolonged physical and social isolation related to increased disability in basic and instrumental activities of daily living, and greater difficulty in daily activities. These findings suggest disability in daily activities is associated with prolonged physical or social isolation and inactivity. It was observed that majority respondents had mild to moderate deconditioning on transfers, indoors activity and outdoor performances in case group but majority respondents had mild deconditioning on transfers, indoors activity and outdoor performances in control group. In the context of our findings, Bentlage et al.²³ observed that diminished habitual physical activity and increased sedentary levels have been found as a result of COVID-19 home-confinement. Consequences of inactivity, including a higher mortality rate and poorer general health and fitness, have been reported. In this context, Bethesda et al.²⁴ reported that the access to health care, medications and medical supplies, food security, finances, transportation, and affordability of technology were needs and concerns of older adults with low socioeconomic status during the pandemic. Majority patients had deconditioning on transportation in case, but less amount found in control. About three fourth patients had deconditioning on shopping in case and in control it was less in amount. Majority patients had deconditioning on finances in case and less amount in control. Crawford et al.²⁵ reported that as employees restart work and leadership tries to get back to meeting production and revenue standards, it is important to consider ways to reintegrate employees into standard work without increasing MSD (Musculoskeletal disorder) risk by providing right tools and ergonomic equipments and a wide range of workplace adjustment. Most of the respondents had deconditioning on paid/unpaid work in case and also in control. Majority patients had deconditioning on household management more or less same in case and in control. Maximum respondents had deconditioning on play skills in case and less in control. More than majority patients had moderate deconditioning on outlet recreation in case and no moderate deconditioning on outlet recreation in control. Majority had moderate deconditioning on active recreation in case and had mild deconditioning on active recreation in control. Most of the cases had mild to moderate deconditioning on socialization but no or mild deconditioning found on socialization in control. Di Lorito et al.²⁶ reported that the added risks and effects of deconditioning on people with reduced capability to do paid/unpaid work, require considerable efforts among clinicians to ensure that they initiate and maintain physical activity in prolonged periods of social distancing. Delivering rehabilitation in the same way as before the pandemic might not be feasible or sustainable and innovative approaches must be found. The recommendations provided by many international organizations to maintain active lifestyles during these times mainly target the general population²³. Supervised physical activity programs are urgently needed, with the option to group-play physical activity programs. In a study^{18,19} it was found that COVID -19 has an unforeseen impact on physical activity and sport, affecting professional, elite,

collegiate, tactical, occupational, and recreational activities.

Conclusions:

From the present study, it may be concluded that deconditioning features were more in COVID-19 affected individuals than the normal persons. Deconditioning like fatigue and dyspnea were most common features and the people with multiple co-morbidities. During COVID-19 pandemic activity of daily livings was also affected in normal individual but more in COVID-19 affected patients. During any lockdown period exercises should be recommended for all individual.

Conflict of Interest: None.

References:

1. Dhama K, et al. An Update on SARS-COV-2/-COVID-19 with particular reference on its clinical pathology, pathogenesis, immunopathology and mitigation strategies - A Review. Preprints [Internet]. 2020;(-March):1-29.
<https://doi.org/10.1016/j.tmaid.2020.101755>
PMid:32479816 PMCID:PMC7260597
2. Dong L, Hu S, Gao J. Discovering drugs to treat coronavirus disease 2019 (COVID-19). *Drug Discov Ther.* 2020;14(1):58-60.
<https://doi.org/10.5582/ddt.2020.01012>
PMid:32147628
3. Wang, Zhang, Zhao, Zhang, Jiang, F., et al. Mitigate the effects of home confinement on children during the COVID-19 outbreak. *The Lancet.* 2020; 395(10228):945-947.
[https://doi.org/10.1016/S0140-6736\(20\)30547-X](https://doi.org/10.1016/S0140-6736(20)30547-X)
PMid:32145186
4. Woods, J., Hutchinson, N.T., Powers, S.K., et al. The COVID-19 pandemic and physical activity. 2020; 2(2):55-64.
<https://doi.org/10.1016/j.smhs.2020.05.006>
PMid:34189484 PMCID:PMC7261095
5. Copeland, J.L., Ashe, M.C., Biddle, S.J., et al. Sedentary time in older adults: a critical review of measurement, associations with health, and interventions. *British Journal of Sports Medicine.* 2017; 51(21):1539-1539.
<https://doi.org/10.1136/bjsports-2016-097210>
PMid:28724714
6. WHO Clinical management of COVID-19: interim guidance, 27 May 2020. <https://apps.who.int/iris/handle/10665/332196>.
7. Bodilsen AC, Pedersen MM, Petersen J, et al. Acute hospitalization of the older patient: changes in muscle strength and functional performance during hospitalization and 30 days after discharge. *Am J Phys Med Rehabil.* 2013; 92:789-796.
<https://doi.org/10.1097/PHM.0b013e31828cd2b6>
PMid:23552331
8. Balbi, B., Berney, S. and Brooks, D. Report of an ad-hoc international task force to develop an expert-based opinion on early and short-term rehabilitative interventions (after the acute hospital setting) in COVID-19

survivors (version April 3, 2020). 2020.

9. Arora, A. Prevalence, severity, and nature of preventable patient harm across medical care settings: systematic review and meta analysis, <https://www.bmj.com/content/366/bmj.l4185/rapid-responses>; 2019.
<https://doi.org/10.1136/bmj.l4185>
PMid:31315828 PMCID:PMC6939648
10. McNally, S., Nunan, D., Dixon, A., et al. Focus on physical activity can help avoid unnecessary social care. *Bmj.* 2017; 359: p.4609.
<https://doi.org/10.1136/bmj.j4609>
PMid:29042359
11. Douglas, M., Katikireddi, S.V., Taulbut, M., et al. Mitigating the wider health effects of covid-19 pandemic response. *Bmj.* 2020; 369:141-143.
<https://doi.org/10.1136/bmj.m1557>
PMid:32341002 PMCID:PMC7184317
12. Townsend, L., Dyer, A.H., Jones, K., et al. Persistent fatigue following SARS-CoV-2 infection is common and independent of severity of initial infection. *Plos one.* 2020; 15(11): p.e0240784.
<https://doi.org/10.1371/journal.pone.0240784>
PMid:33166287 PMCID:PMC7652254
13. Kirwan, R., McCullough, D., Butler, T., et al. Sarcopenia during COVID-19 lockdown restrictions: long-term health effects of short-term muscle loss. *GeroScience.* 2020; 42(6): 1547-1578.
<https://doi.org/10.1007/s11357-020-00272-3>
PMid:33001410 PMCID:PMC7528158
14. Onder, G., Rezza, G. and Brusaferro, S., et al. Case-fatality rate and characteristics of patients dying in relation to COVID-19 in Italy. *Jama.* 2020; 323(18): 1775-1776.
<https://doi.org/10.1001/jama.2020.4683>
PMid:32203977
15. Casey, P., Ang, Y. and Sultan, J. COVID-19-induced sarcopenia and physical deconditioning may require reassessment of surgical risk for patients with cancer. *World Journal of Surgical Oncology.* 2021; 19(1):1-4.
<https://doi.org/10.1186/s12957-020-02117-x>
PMid:33430881 PMCID:PMC7798369
16. Van Bavel, J.J., Baicker, K., Boggio, P.S., et al. Using social and behavioural science to support COVID-19 pandemic response. *Nature human behavior.* 2020; 4(5): 460-471.
<https://doi.org/10.1038/s41562-020-0884-z>
PMid:32355299
17. Rinaldo, R.F., Mondoni, M., Parazzini, E.M., et al. Deconditioning as main mechanism of impaired exercise response in COVID-19 survivors. *European Respiratory Journal;* 2021.
<https://doi.org/10.1183/13993003.00870-2021>
PMid:33926969 PMCID:PMC8082950
18. Ghram, A., Briki, W., Mansoor, H., et al. Home-based exercise can be beneficial for counteracting sedentary behavior and physical inactivity during the COVID-19

pandemic in older adults. *Postgraduate medicine*. 2021; 133(5):469-480.

<https://doi.org/10.1080/00325481.2020.1860394>
PMid:33275479

19. Pasini, E., Corsetti, G., Romano, C., et al. Serum Metabolic Profile in Patients With Long-Covid (PASC) Syndrome: Clinical Implications. *Frontiers in medicine*. 2021; p.1182.

<https://doi.org/10.3389/fmed.2021.714426>
PMid:34368201 PMCID:PMC8339407

20. Werner, C., Scullen, T., Mathkour, M., et al. Neurological impact of coronavirus disease (COVID-19): practical considerations for the neuroscience community. *World Neurosurgery*. 2020; 139:344-354.

<https://doi.org/10.1016/j.wneu.2020.04.222>
PMid:32387786 PMCID:PMC7202815

21. Guilcher, S.J., Everall, A.C., Cadel, L., et al. A qualitative study exploring the lived experiences of deconditioning in hospital in Ontario, Canada. *BMC geriatrics*. 2021; 21(1):1-9.

<https://doi.org/10.1186/s12877-021-02111-2>
PMid:33750320 PMCID:PMC7941932

22. Fettes, L., Bayly, J., De Bruin, L.M., et al. Relationships between prolonged physical and social isolation during the COVID-19 pandemic, reduced physical activity and disability in activities of daily living among

people with advanced respiratory disease. *Chronic Respiratory Disease*. 2021; 18: p.14799731211035822.

<https://doi.org/10.1177/14799731211035822>
PMid:34382888 PMCID:PMC8370888

23. Bentlage, E., Ammar, A., How, D., et al. Practical recommendations for maintaining active lifestyle during the COVID-19 pandemic: a systematic literature review. *International journal of environmental research and public health*. 2020; 17(17):6265.

<https://doi.org/10.3390/ijerph17176265>
PMid:32872154 PMCID:PMC7503956

24. Bethesda, MD. NORC at the University of Chicago. Needs Assessment and Environmental Scan Report: Maintaining Physical and Mental Well-Being of Older Adults and Their Caregivers During Public Health Emergencies. NORC at the University of Chicago; 2021.

25. Crawford, J.O., Giagloglou, E., Davis, A., et al. Working with Chronic Musculoskeletal Disorders: Good Practice Advice Report; 2021.

26. Di Lorito, C., Masud, T., Gladman, J., et al. Deconditioning in people living with dementia during the COVID-19 pandemic: findings from the Promoting Activity, Independence and Stability in Early Dementia (PrAISED) process evaluation; 2020.

<https://doi.org/10.1101/2020.11.16.20231100>

Outcome of Gartland Type III Paediatric Supracondylar Humerus Fracture Fixation with the Kapandji Technique in the Prone Position

Partho Protim Chakroborty^{*1}, Biplab Mozumder², Syed Ariful Islam³,
Mohammad Aman Ullah Kabir⁴, Tripty Chakroborty⁵, Chandan Kumar Das⁶

Abstract

Introduction with Objective: The aim of the present study was to evaluate the Outcome of Gartland Type III Paediatric Supracondylar Humerus Fracture Fixation with the Kapandji Technique in the Prone Position. **Materials and Methods:** This prospective study was carried out at the Department of Orthopedic Surgery at Chittagong Medical College Hospital, Chittagong within the defined period from January 2020 to February 2022. All the data were compiled and sorted properly and the quantitative data was analyzed statistically by using Statistical Package for Social Science. The results were expressed as percentage and mean $\pm$ SD and $p < 0.05$ was considered as the level of significant. **Result:** Out of 30 patients, the mean $\pm$ SD age of the patients was 7.7 ± 2.2 years. Most of the patients (56.7%) belonged to male. Out of 30 patients, Most of the (n=13, 43.3%) patients time from injury to procedure was 5 days. Mean $\pm$ SD time from injury to procedure was 4.77 ± 1.331 (range: 3-7) days. Majority of the (n=12, 40%) patients needed 30 minutes for operation from manipulation to casting. Mean $\pm$ SD time of procedure was 30.5 ± 5.309 (range: 20-40) minutes. After 1st week follow-up, all the 30 (100%) patients' outcome was poor; after 4th week follow-up, 27 (90%) patients had fair and 3 (10%) patients had poor outcome and after 18th week final follow-up, excellent outcome was in 27 (90%) patients and good outcome was in 03 (10%) patients. **Conclusion:** After analyzing the Results of present study, it can be concluded that management of Gartland type III supracondylar humerus fractures in children using the Kapandji technique in the prone position is a feasible and safe method. So, it could be an alternative technique.

Keywords: Kapandji Technique, Paediatric, Supracondylar humerus fracture, outcome.

Number of Tables: 04; Number of Figurers: 03; Number of References: 12; Number of Correspondences: 04.

*1. Corresponding Author:

Dr. Partho Protim Chakroborty

Resident Surgeon

Department of Orthopaedic and Traumatology

250 Beded Hospital

Magura, Bangladesh.

Email: partho.sbmc@gmail.com

Phone: 01714836367

2. Dr. Biplab Mozumder

Registrar

National Institute of Traumatology and Orthopaedic Rehabilitation

Dhaka, Bangladesh.

3. Dr. Syed Ariful Islam

Medical Officer

Department of Orthopaedic and Traumatology

Chittagong Medical College Hospital

Chittagong, Bangladesh.

4. Dr. Mohammad Aman Ullah Kabir

Junior Consultant

Department of Orthopaedic and Traumatology

Central Police Hospital

Rajarbag, Bangladesh.

5. Dr. Tripty Chakroborty

Lecturer

Department of Microbiology

Jashore Medical College

Jashore, Bangladesh.

6. Prof. Dr. Chandan Kumar Das

Professor and Head

Department of Orthopaedic and Traumatology

Chittagong Medical College Hospital

Chittagong, Bangladesh.

Introduction:

Supracondylar humerus fractures are the most common elbow injuries in children¹. It accounts for 60% of all fractures around the elbow joint and represent approximately 3% of all fractures among children² with a peak incidence between the ages of 5 – 7 years³, because this is the period of maximum ligamentous laxity. Supracondylar fractures of the humerus are the most common paediatric fracture requiring surgery⁴. Paediatric supracondylar fractures occurs at the supracondylar area or the metaphysis of the distal humerus. Among all the fracture in upper limb, supracondylar fracture of humerus is not only the most common injury but also it may cause serious complications including nerve injury, vascular injury, malunion and compartment syndrome if not treated appropriately⁵. The most common and widely accepted method

of treatment consists of closed reduction, if needed, with percutaneous Kirschner wire fixation. Controversy exists regarding the optimal K-wire configuration in fixation of type – II and type– III fractures. Two main techniques are in use⁶. The cross-wire technique involves the placement of two K-wires, one inserted through the lateral condyle and another through the medial condyle^{7,8}. The conventional treatment with closed reduction and application of plaster slab or cast is inappropriate in the management of Gartland type III supracondylar fractures of the humerus as this method is potentially hazardous to circulation, as it may enhance circulatory insufficiency which is already hallmark of supracondylar humerus fracture and it is difficult to obtain satisfactory reduction and to maintain the reduction. Hence, surgical management like percutaneous pinning after closed reduction or open reduction and internal fixation with K wires plays an important role in this type of fractures. Closed reduction and percutaneous pinning for extension Gartland type III supracondylar fracture of humerus has given new window of management which is excellent method.

Materials & Methods:

This Prospective Interventional Study study was carried out among 30 patients attending at the department of Orthopaedic Surgery at Chittagong Medical College Hospital, Chittagong for the treatment displaced paediatric supracondylar of humerus fracture within the defined period from January 2020 to February 2022. Ethical clearance was obtained from the Institutional Review Board (IRB) of CMCH. Purposive sampling was done according to availability of the patients. The collected data were entered into the computer and analyzed by using SPSS (version 20.1) to evaluate the Outcome of Gartland Type III Paediatric Supracondylar Humerus Fracture Fixation with the Kapandji Technique in the Prone Position. Outcomes were assessed by Flynn's Criteria. Flynn's Criteria were given below.

Result rating	Cosmetic factor (Carrying angle loss) in Degree	Functional factor (Loss of motion) in Degree
Excellent	0 – 5	0 – 5
Good	6 – 10	6 – 10
Fair	11 – 15	11 – 15
Poor	>15	>15

Results:

Table I shows, out of 30 patients, the mean $\pm$ SD age of the patients was 7.7 ± 2.2 years. The youngest and the oldest patient were 4.5 and 11.5 years. About 17 patients (56.7%) were male and 13 (43.3%) were female.

Table I: Age and Gender Distribution of the study patients (n=30)

Parameter	Mean $\pm$ SD	Range
Age (years)	7.7 ± 2.2	4.5-11.5
Gender Distribution	Number	Percentage
Male	17	56.7
Female	13	43.3

Data was expressed as frequency (%) or mean $\pm$ SD (range)

Histogram showing, Out of 30 patients, Most of the (n=13, 43.3%) patients time from injury to procedure was 5 days. Mean $\pm$ SD time from injury to procedure was 4.77 ± 1.331 (range: 3-7) days.

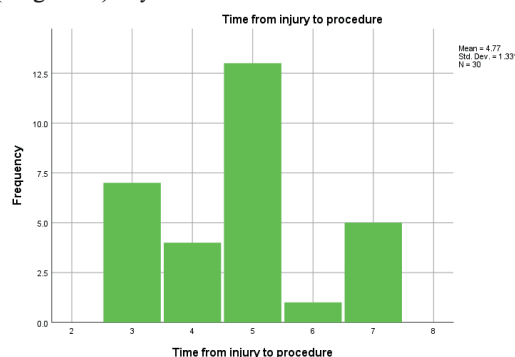


Figure 1: Time from injury to procedure (n=30)

Histogram showing, among 30 patients, Majority of the (n=12, 40%) patients needed 30 minutes for operation from manipulation to casting. Mean $\pm$ SD time of procedure was 30.5 ± 5.309 (range: 20-40) minutes.

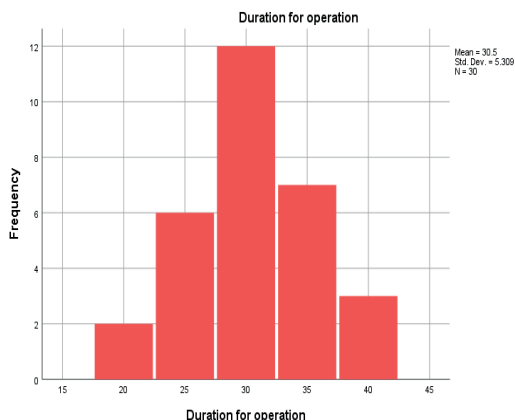


Figure 2: Duration of operation (n=30)

Table II shows, mean $\pm$ SD of Baumann's angle after 18th week, Baumann's angle of healthy side and Baumann's angle changes were 70.4 ± 5.5 (range: 60-81), 71.5 ± 4.2 (range: 64-80) and 4.5 ± 3.6 (range: 1-18) degree. Mean $\pm$ SD of humerocapitellar angle after 18th week, humerocapitellar angle of healthy side and humerocapitellar angle changes were 35.6 ± 10.1 (range: 15-59), 40.4 ± 12.4 (range: 23-70) and 7.4 ± 6.0 (range: 0-25) degree.

Table II: Baumann's and Humerocapitellar angle change of the patients (n=30)

Variables	Mean $\pm$ SD	Range
Baumann's angle (o)		
After 18th week	70.4 ± 5.5	60-81
Healthy side	71.5 ± 4.2	64-80
Change	4.5 ± 3.6	1-18
Humerocapitellar angle (o)		
After 18th week	35.6 ± 10.1	15-59
Healthy side	40.4 ± 12.4	23-70
Change	7.4 ± 6.0	0-25

Data was expressed as mean $\pm$ SD (range)

Figure III showing, among 30 patients, 11 (36.7%) patients ROM of elbow after 18th week was 140°. Mean $\pm$ SD range of motion of elbow was 139.6 ± 5.403 (range: 130- 150) degree.

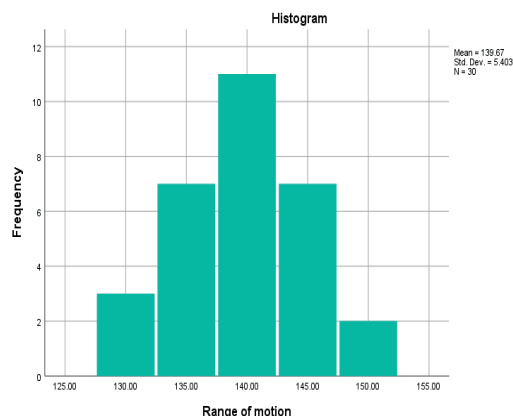


Figure 3: Range of motion (ROM) of elbow of the patients after 18th week (n=30)

Table III shows, mean $\pm$ SD loss of carrying angle was 4.1 ± 1.4 (range: 2-8) degree and mean $\pm$ SD loss of motion was 4.8 ± 5.0 (range: 3-8) degree.

Table III: Loss of carrying angle and loss of motion of the patients (n=30)

Variables	Mean $\pm$ SD	Range
Loss of carrying angle (o)	4.1 ± 1.4	2-8
Loss of motion (o)	4.8 ± 5.0	3-8

Data was expressed as mean $\pm$ SD (range)

Table IV shows, after 1st week follow-up, all the 30 (100%) patients' outcome was poor; after 4th week follow-up, 27 (90%) patients had fair and 3 (10%) patients had poor outcome and after 18th week final follow-up, excellent outcome was in 27 (90%) patients and good outcome was in 03 (10%) patients.

Table IV: Outcome after 1st week, 4th week and 18th week according to Flynn's Criteria (n= 30)

Outcome	1st week	4th week	18th week
Excellent	0	0	27 (90%)
Good	0	0	03 (10%)
Fair	0	27(90%)	0
Poor	30 (100%)	03 (10%)	0

Discussion:

The results of current study demonstrate, the mean ($\pm$ SD) age of the patients was 7.7 ± 2.2 years. The youngest and the oldest patient was 4.5 and 11.5 years. Similarly, Gular et al. (2016) found the mean $\pm$ SD age was 6.9 ± 1.5 years among the patients of prone position in their study⁹. In their study by Havlas et al. (2008) found that the mean age was 7.5 years (range: 3-14 years)¹⁰. Present study shows, among 30 patients, 17 (56.7%) were male and 13 (43.3%) were female. Similarly, male prominence was found in the study by Kao et

al. (2014)¹¹. Mean $\pm$ SD Baumann's angle after 18th week, Baumann's angle of healthy side and Baumann's angle changes were 70.4 ± 5.5 (range: 60-81), 71.5 ± 4.2 (range: 64-80) and 4.5 ± 3.6 (range: 1-18) degree. Kao et al. (2014) found the mean Baumann's angle was 71.2 degrees (range, 60-80 degrees) immediately after K-wire fixation and 72.8 degrees (range, 63-87 degrees) 3 months later¹¹. When the change in radiographic measurement was presented in absolute value, the mean change in the Baumann's angle was 5.1 ± 3.9 degrees (range, 1-20 degrees). In their study by Guler et al. (2016) reported the mean $\pm$ SD Baumann angle was $73.1^\circ \pm 3.5^\circ$. Mean $\pm$ SD humerocapitellar angle after 18th week, humerocapitellar angle of healthy side and humerocapitellar angle changes were 35.6 ± 10.1 (range: 15-59), 40.4 ± 12.4 (range: 23-70) and 7.4 ± 6.0 (range: 0-25) degree. In the study by Kao et al. (2014), the mean lateral humerocapitellar angle was 37.9 degrees (range, 13-61 degrees) after K-wire fixation and 43 degrees (range, 23-95 degrees) 3 months later¹¹. The mean change in the humerocapitellar angle was 9 ± 10 degrees (range, 0-55 degrees). Among 30 patients, 11 (36.7%) patients ROM after 18th week were 140°. Mean $\pm$ SD range of motion was 139.6 ± 5.403 (range: 130-150) degree. Kao et al. (2014) found that, the mean range of elbow motion was 139.6 degrees (range, 120-160 degrees) at the last follow-up¹¹. In this study, mean $\pm$ SD loss of carrying angle was 4.1 ± 1.4 (range: 2-8) degree and mean $\pm$ SD loss of motion was 4.8 ± 5.0 (range: 3-8) degree. Outcome was determined by Flynn's criteria. After 1st week follow-up, all the 30 (100%) patients' outcome was poor; after 4th week follow-up, 27 (90%) patients had fair and 3 (10%) patients had poor outcome and after 18th week final follow-up, excellent outcome was in 27 (90%) patients and good outcome was in 03 (10%) patients. Kao et al. (2014) showed the clinical outcome was excellent in 31 patients, good in 2, and poor in 1 (97% excellent or good) patient, using the criteria of Flynn et al. (1974)¹¹. Venkatadass et al. (2015) found satisfactory result in 87% of patients in their study¹². Another study by Guler et al. (2016) revealed that 23 patients' outcome was very good and 4 patients' outcome was good⁹.

Conclusion:

After analyzing the results of present study, it can be concluded that management of Gartland type III supracondylar humerus fractures in children using the Kapandji technique in the prone position is a feasible and safe method. The range of elbow motion was restored properly. So, it could be an alternative technique.

Conflict of Interest: None.

Acknowledgements:

The authors are grateful to the entire staff of department of Orthopaedic Surgery at Chittagong Medical College Hospital, Chittagong during the study period.

Reference:

1. De Pellegrin, M., Fracassetti, D., Moharamzadeh, D., et al. Advantages and disadvantages of the prone position in the

surgical treatment of supracondylar humerus fractures in children. *Injury*. 2018; 49: 37-42.

<https://doi.org/10.1016/j.injury.2018.09.046>

PMid:30286976

2. Saroff, D. A. Time to treatment: the question of beneficial surgical delays. *J Bone Joint Surg Am*. 2001; 83-A (11):1755-1756.

<https://doi.org/10.2106/00004623-200111000-00023>

PMid:11701803

3. Kaye, E. and Beauty, H. J. Supracondylar fractures of the distal humerus Chapter - 14 in Rockwood and Wilkin's Fracture in Children, Philadelphia: Lippincott Williams and Williams. 2001; 3: 577-620.

4. Khoshbin, A., Leroux, T., Wasserstein, D., et al. The epidemiology of paediatric supracondylar fracture fixation: a population-based study. *Injury*. 2013; 45:701-708.

<https://doi.org/10.1016/j.injury.2013.10.004>

PMid:24183392

5. Dim'eglio, A. Growth in pediatric orthopaedics. In: Morrissy RT, Weinstein SL, editors. Lovell and winter's pediatric orthopaedics. Philadelphia: Lippincott Williams and Wilkins. 2005:pp. 35-65.

6. Skaggs, D. L., Hale, J. M., Bassett, J., et al. Operative treatment of supracondylar fractures of humerus in children. The consequences of pin placement. *J Bone Joint Surg Am*. 2001; 83A (5):735-740.

<https://doi.org/10.2106/00004623-200105000-00013>

7. Cheng, J. C., Lam, T. P. and Shen, W. Y. Closed reduction and percutaneous pinning for type III displaced supracondylar fractures of the humerus in children. *J Orthop Trauma*. 1995; 9: 511-515.

<https://doi.org/10.1097/00005131-199509060-00009>

PMid:8592265

8. Brown, I. C. and Zinar, D. M. Traumatic and iatrogenic neurological complications after supracondylar humerus fractures in children. *J Pediatr Orthop*. 1995;15: 440-3.

<https://doi.org/10.1097/01241398-199507000-00005>

PMid:7560030

9. Guler, O., Mutlu, S., Isyar, M., et al. Prone versus supine position during surgery for supracondylar humeral fractures. *Journal of Orthopaedic Surgery*. 2016; 24(2):167-169.

<https://doi.org/10.1177/1602400209>

PMid:27574256

10. Havlas, V., Trc, T., Gaheer, R., et al. Manipulation of pediatric supracondylar fractures of humerus in prone position under general anesthesia. *J Pediatr Orthop*. 2008; 28: 660-664.

<https://doi.org/10.1097/BPO.0b013e318183245b>

PMid:18724204

11. Kao, H., Yang, W., Li, W. and Chang, et al. Treatment of Gartland Type III Pediatric Supracondylar Humerus Fractures with the Kapandji Technique in the Prone Position. *J Orthop Trauma*. 2014;28:354-359.

<https://doi.org/10.1097/BOT.0000000000000015>

PMid:24096310

12. Venkatadass, K., Balachandar, G., Rajasekaran, S. Is Prone Position Ideal for Manipulation and Pinning of Displaced Pediatric Extension Type Supracondylar Fractures of Humerus? A Randomized Control Trial. *J Pediatr Orthop*. 2015;35: 672- 676.

<https://doi.org/10.1097/BPO.0000000000000360>

PMid:2539356

Multimodal Treatment of Unilateral Temporomandibular Disorder (TMD)- Study of 120 Cases

Mohammad Iqbal Kabir^{1*}, Md. Atiqul Islam Rabby², Samira Taufique Reshma³,
Md. Abdur Rab⁴, Ismat Ara Haider⁵, Golam Mohiuddin Chowdhury⁶

Abstract

Introduction: Temporomandibular disorder (TMD) comprises a variety of conditions affecting the anatomy and functional characteristics of the TM joint (TMJ). Its prevalence has been reported to be between 3.7% and 12%, and is three to five times more frequent in women. Conservative treatments for TMD include medication, physiotherapy, occlusal splints, self-management strategies, and interventions based on cognitive behavioral approaches. **Materials and Methods:** It was a prospective study done over a period of 6 months in the department of Dental Surgery of Bangladesh Navy Hospital, BNS Potenga, Chattagram. Total 120 patients were included in the study. The patients who met the inclusion criteria were assigned randomly to the treatment. And all the patient got 1 month, 4 months & 6 months of follow up individually. Our treatment has been given in three phase (phase I, Phase II & Phase III). **Result:** After first line treatment total 51 (42.5%) patients were cure and rest of the 69 (57.5%) had the persistence symptoms. Then rests of the patients were received treatment under phase II guideline. And after phase II 48 (40%) patient became symptom free. Rests 21 (17.5%) patient were enrolled for phase III treatment where they were treated with occlusal splint following arthrocentesis plus Methylprednisolone injection. Among them 15 (12.5%) patients were cured but 6 (5%) had persistence moderate symptoms. Total success after completion of the study was 114 (95%). **Conclusion:** Analgesic with muscle relaxant, alone with soft diet and jaw exercise is a good first line treatment option in primary temporomandibular disorder. But in progressive cases occlusal splint with soft diet and jaw exercise give significant improvement.

Key words: Temporomandibular disorder, soft diet, jaw exercise, occlusal splint.

Number of Tables: 3; Number of Figure: 3; Number of References: 34; Number of Correspondence: 06.

*1. Corresponding Author:

Lt. Col. (Dr.) Mohammad Iqbal Kabir
ADC, FCPS, MCPS, D-OMF
A/CO and Classified Spl in OMF Surgery
Head of the Department of OMF Surgery
Military Dental Centre
Savar Cantonment
Dhaka, Bangladesh.
E-mail: iqbalkabir61@gmail.com
Cell: 01712-212145

2. Dr. Md. Atiqul Islam Rabby, BDS

Lecturer
Marks Medical College (Dental Unit)
Dhaka, Bangladesh.

3. Dr. Samira Taufique Reshma, MBBS, FCPS

Asst. Professor & Head
Department of Haematology
Ma O Shishu Medical College & Hospital
Agrabad, Chottogram, Bangladesh.

4. Brig. Gen Dr. Md. Abdur Rab

Commandant & Head
Oral & Maxillofacial Surgery
Military Dental Centre
Dhaka, Bangladesh.

5. Prof. Dr. Ismat Ara Haider

Professor & Head of OMS
Dhaka Dental College
Dhaka, Bangladesh.

6. Maj Gen. Prof. Dr. Golam Mohiuddin Chowdhury

Professor, Oral & Maxillofacial Surgery
Ex- Consultant Dental Surgeon General
Bangladesh Armed Forces, Dhaka, Bangladesh.

Introduction:

According to health sciences definitions, temporomandibular disorder (TMD) comprises a variety of conditions affecting the anatomy and functional characteristics of the TM joint (TMJ). Factors contributing to TMD complexity are related to dentition, clenching, and other related systems that frequently provoke symptoms of muscular, articular and periarticular pain¹. TMD has considerable prevalence, with significant impact on physical and psychosocial factors². Its prevalence has been reported to be between 3.7% and 12%, and is three to five times more frequent in women³. TMD also contributes to a high proportion of socioeconomic costs, which are usually associated with co-morbidities, such as depression and other psychological factors⁴. Also, the loss of work and work productivity is a major issue to consider in TMD patients being treated early on, and it requires significant public education. Although before the 1980s, malocclusion and other related factors were considered fundamental and key causes

of TMD, during this decade authors began to publish critical articles on these subjects⁵. In current clinical practice, orthodontic treatments are still used to treat TMD; however, it was established in the 1990s that the role of malocclusion in TMD is very limited or nonexistent⁶ and thus these disorders should not be treated with orthodontics⁷. During the 2000–2010 decade, invasive treatments and surgical options for TMD came into use. However, by the end of this decade, clinical experience and several studies included in systematic reviews, such as Guo et al, reported a lack of evidence supporting the use of arthrocentesis or arthroscopy for TMD treatment⁸. Although the cognitive and behavioral profiles of patients with TMD have been debated for some years,⁸ it was in the present decade that health professionals began to propose behavior-based therapies⁹ as a promising treatment related to cost-effectiveness¹⁰. This paradigm has since been changing and developing a wider focus, leaving behind the biomedical structural model. Thanks to advances in neuroscience,¹¹ biopsychosocial models for diagnostics and treatment (including physical, psychological, and pharmacological therapies) currently have more clinical support and scientific growth¹². A suitable therapeutic approach for TMD should be aimed at alleviating the main signs and symptoms of this condition¹³. The most relevant signs of TMD are the presence of joint sounds (clicking and crepitation), reduced mouth opening, and disrupted jaw movements¹⁴. However, pain is the primary problem of this pathology, and it is typically the reason these patients request medical care¹⁵. Also, it is likely the reason that most studies have been aimed at evaluating the effectiveness of various intervention measures related to pain as the main variable¹⁶. Conservative treatments for TMD include medication, physiotherapy, occlusal splints, self-management strategies, and interventions based on cognitive behavioral approaches¹⁷. At present, a conservative treatment approach prevails over surgery, given it is less aggressive and usually results in satisfactory clinical outcomes in mild–moderate TMD¹⁸. In fact, the evidence for the greatest effectiveness of surgical versus conservative intervention to reduce short-term pain in arthrogenic TMD is controversial and inconclusive¹⁹. Indications for the application of each of the interventions, as well as their potential effects for the treatment of patients with TMD, are described in the following sections. Untreated or inadequately treated internal derangement of TMD can cause chronic disc displacement, which may lead to deformation of the disc and breakdown of the fibrocartilage covering the condyle and fossa, resulting in osteoarthritis of the TMJ²⁰. Treatment methods fall into two categories: conservative methods and surgical methods. Conservative treatments include manipulation, medication, modification of habits, physical therapy, and splint therapy²¹. Surgical treatments include arthrocentesis, arthroscopy, and open joint surgeries²². The contemporary treatment strategy for ID of the TMJ consists of conservative methods initially. If there is no response to conservative methods, arthrocentesis is generally performed as a second-step therapy. Splint therapy

is used to reduce the excessive loading on the joint, relax the masticatory muscles, and support the adaptation of the articular structures and regenerative processes in the joint^{21,23}. The first-line treatment has been debated in the literature²⁴. Thus, the aim of this prospective clinical study was to evaluate and compare the effectiveness of two different conservative treatment modalities (Medication with physiotherapy/ jaw exercise and splint therapy only) on pain, function, and disability and psychological status of patients.

Materials & Methods:

Patient recruitment and definitions

This prospective clinical study was performed in the Bangladesh Navy Hospital, BNS Potenga, Chattagram. The study protocol was approved by the ethics committee of the hospital. The patients were informed about the study protocol and provided written informed consent to participate. A sample size calculation was performed for the main outcome measure. In order to obtain a power of 0.80, 110 patients were required (estimated effect size 0.20). Considering data loss due to dropouts, a 10% increase in sample size was added (total patient 120). **The inclusion criteria** for the study were clinical and orthopantomogram (OPG) diagnosis of unilateral TMJ persistent pain over 2 weeks. Patients had no history of taking any anti-inflammatory/ muscle relaxant drugs, diet advice and physiotherapy/ jaw exercise. **Exclusion criteria were as follows:** patients with a diagnosis of systemic rheumatic disease, myalgia, degenerative joint disease, or collagen vascular disease, those who were pregnant, and patients who had medical contraindications, were unwilling to receive one of the study treatments, had undergone prior open TMJ surgery, had a malocclusion, or were aged <16 years were excluded from the study. The clinical diagnosis was made based on the clinical Diagnostic Criteria for Temporomandibular Disorders (DC/ TMD)²⁵. TMJ disorders was diagnosed by a history of reduction in mouth opening (unassisted maximum inter-incisal mouth opening <35 mm), mandibular opening with assistance increased by 3 mm over unassisted opening, and TMJ pain during palpation and/or function. A previous history of click, click disappearance, and decreased mouth opening must have coincided. The patients who met the inclusion criteria were assigned randomly to the treatment groups. The patients who met the inclusion criteria were assigned randomly to the treatment. And the entire patient got every month follow of every study phase. Our treatment has been given in three phases: Phase I (first/one month), Phase II three months (2nd to 4th months) & Phase III 2 months (5th-6th months).

Phase I- in that phase all the patients received first line Tab. NESO (Naproxen 500+ Esomeprasol 20 Combination) as analgesic and anti-inflammatory drug with PPI, 12 hourly for three weeks, with Tab. Myolax 50mg (Tolperisone Hydrochloride) as muscle relaxant 12 hourly for three weeks. Along with medication all the patients were advised to take soft diet, jaw exercise and physiotherapy for three weeks. After three weeks of first line treatment all patients who were cured were instructed to stop the medication and follow the

conservative advices. And the patients who had persistence symptoms were under went to Phase II treatment.

Phase II- in that phase II patients treated with intra oral customized fabricated occlusal splint with jaw exercise and soft diet advice. We took follow-up of all individual patients in every month of this phase for rest three months. All patients were instructed to use pain medication and muscle relaxant when needed (SOS). And the patients who had persistence symptoms after phase II were under went to Phase III treatment.

Phase III- in this phase, patients were treated with occlusal splint following arthrocentesis plus Methylprednisolone injection. Arthrocentesis was performed under local anaesthesia, which was achieved using intra-articular and overlying skin anaesthesia (4 ml of 2% lidocaine hydrochloride (Jasocaine 2%; Jayson Pharmaceuticals Ltd., Dhaka, Bangladesh). A 21- gauge needle was inserted into the upper joint space via a posterolateral approach. In this technique, the first needle puncture is made 10 mm anterior to the tragus and 2 mm inferior to an imaginary line connecting the tragus and lateral canthus. After superior joint space distension with 2 ml isotonic sodium chloride, a second needle was placed approximately 5 mm anterior to the first needle. The joint was then washed with 120 ml of isotonic sodium chloride. Finally, injection of 1 ml of Depo-Medrol (Pfizer, Belgium) as Methylprednisolone (40mg/ml) was performed. All arthrocentesis procedures were performed by the same surgeon. Anatomical land mark for needle punching has been shown in figure 1.

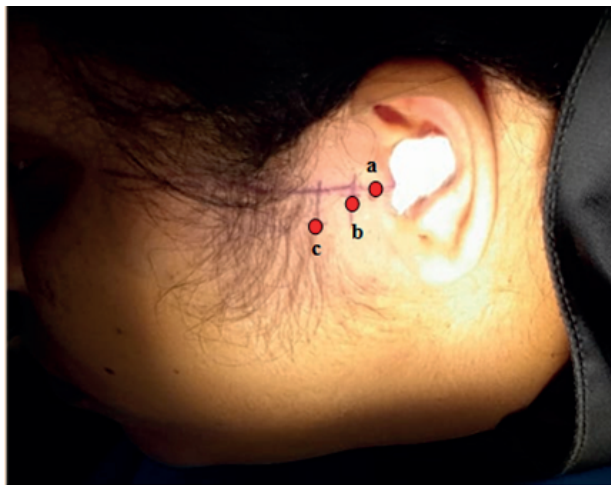


Figure 1: Anatomical landmark for the first and second punctures.

From the center of tragus to lateral canthus is connected for making line. The first puncture point is marked on the line 10 mm front from the mid of tragus (a), and set 2 mm below perpendicularly (b). The second puncture point for outflow needle is 20 mm front from tragus point and 10 mm below from the line (c).

Data collection, outcome assessment & measure

All patients completed the Research Diagnostic Criteria for Temporomandibular Disorders questionnaire at baseline and

at every month of total study period thereafter, in order to evaluate the intensity of pain, pain-related disability (including maximum mouth opening) and psychological status. The questionnaire was translated into Bangla also (as mother/ first language of all patients). The clinical records of the patients were also collected at baseline and every month of total study period thereafter. Clinical assessments involved the standardized evaluation of TMD findings, including maximum mouth opening (MMO; measured between the edges of the upper and lower central incisors in millimetres), joint pain on palpation, and mandibular function. Pain was evaluated by patient self-assessment using a visual analogue scale (VAS, 0–10)²⁶. The success criteria for surgery for ID of the TMJ were those proposed by the American Association of Oral and Maxillofacial Surgeons (AAOMS), indicating an absence of pain or mild pain and a MMO of 35 mm²⁷. Thus treatment was considered successful in the presence of a MMO 35 mm and pain VAS score <3 at the follow-up visits. The percentage of patients who met these criteria was considered as the success rate. These measurements were performed by principle researcher who was unaware of the treatment allocation.

Statistical Analysis

Data were expressed as mean & standard deviation (SD). Descriptive analyses and the χ^2 test were used to compare the patient characteristics and success rates. Repeated measures analysis of variance (ANOVA) was used to test changes over the four time intervals. One-way ANOVA was used to test differences at the same time interval between groups. Comparisons of two time intervals were performed with the paired-sample t-test. The level of significance was set at $P < 0.05$. All statistical analyses were performed using SPSS for Windows, version 20.0 (SPSS, Inc, an IBM Company, Chicago, Illinois).

Result:

A total of 120 patients who fulfilled the inclusion criteria were included in the study, and received first line treatment (phase I). After first line treatment total 51 (42.5%) patients were cure and rest of the 69 (57.5%) had the persistence symptoms. Then rests of the patients were received treatment under phase II guideline. And after phase II 48 (40%) patient became symptom free. Rests 21 (17.5%) patient were enrolled for phase III treatment where they were treated with occlusal splint following arthrocentesis plus Methylprednisolone injection. Among them 15 (12.5%) patients were cured but 6 (5%) had persistence moderate symptoms. Total success after completion of the study was 114 (95%) (Figure 2 and 3). None of the participants dropped out of the study. The baseline characteristics of the study groups, including age, sex, the affected side, and the presence of bruxism, are shown in Table I. There were no differences among the groups in terms of baseline characteristics ($P > 0.05$). Mean age of our study population was 36.5 ± 9.2 . Female were predominate in our study. In table II we can observe that average pain score at base line was 6.8 ± 1.5 , and

after first line treatment of phase I significant ($p=0.000$) pain reduction (1.2 ± 2.4) was observed among the cured patient. But patient who had persistent pain had no significant improvement after phase I ($p=0.734$). After completion of phase II treatment significant improvement in pain relief was observed among 48 patients ($p < 0.000$). Rests 21 patients who were received treatment under phase III; and at end of this phase significant improvement was observe among 15 patients, pain score was 0.5 ± 1.2 ($p < 0.000$). But rest 6 patients had persistence moderate pain 4.1 ± 1.2 . And table II showed that average maximum mouth opening MMO (mm) of all patient at base line was 27.6 ± 3.6 , after phase I treatment significant ($p=0.000$) mouth opening (37.5 ± 4.6) was observed among 51 patients patient. But patient who had persistent restricted mouth opening had no significant improvement after phase I ($p=0.075$). After completion of phase II treatment, significant improvement in MMO was observed among rest 48 patients ($p < 0.000$). Patients, who had no improvement of MMO after phase II, were treated by arthocentesis with methyl prednisolone. Significant improvement ($p=0.000$) in MMO was observed in majority of the cases after phase III.

Table I: Baseline characteristics of the participants

Characteristics	In total study population n(120)	Patient who were cured after			P
		Phase I n(51)	Phase II n(48)	Phase III n(15)	
Age (years) mean $\pm$ SD	36.5 $\pm$ 9.2	36.4 $\pm$ 8.9	38.7 $\pm$ 7.6	35.3 $\pm$ 10.5	0.088 ^a
Gender (female), n(%)	81 (67.5)	33 (64.8)	32 (66.7)	10 (66.7)	0.173 ^b
Side R, n(%)	66 (55)	26 (51.9)	28 (57.6)	8 (53.3)	0.413 ^b
Bruxism, n(%)	57 (47.5)	26 (51.85)	22 (45.45)	8 (53.3)	0.113 ^b

^ap-value by one-way ANOVA; ^bp-value by χ^2

Table II. Comparisons of pain scores (VAS) after follow-up visits of treatment phases.

Base line	Mean $\pm$ SD	P	Comparison with
After Phase I (one month)	6.8 $\pm$ 1.5		
(Cured patient)	1.2 $\pm$ 2.4	0.000	baseline
After Phase I (one month)			
(persistence symptom patient)	6.1 $\pm$ 2.1	0.734	baseline
After Phase II (four months)	1.4 $\pm$ 0.8	0.000	After phase I of persistent symptom group
(Cured patient)			
After Phase II (four months)	5.5 $\pm$ 1.2	0.084	
(persistence symptom patient)			
After Phase III (six months)	0.5 $\pm$ 1.2	0.000	After phase II of persistent symptom group
(Cured patient)			
After Phase II (Six months)	4.1 $\pm$ 1.2	0.312	
(persistence symptom patient)			

Table III: Comparisons of MMO values (millimetres) after follow-up visits of treatment phases

Base line	Mean $\pm$ SD	P	Comparison with
After Phase I (one month)	27.6 $\pm$ 3.6		
(Cured patient)	37.5 $\pm$ 4.6	0.000	baseline
After Phase I (one month)			
(persistence restricted mouth opening)	28.2 $\pm$ 2.9	0.275	baseline
After Phase II (four months)	40.3 $\pm$ 4.4	0.000	After phase I of persistent symptom group
(Cured patient)			
After Phase II (four months)	29.81 $\pm$ 1.0	0.086	
(persistence restricted mouth opening)			
After Phase III (six months)	38.1 $\pm$ 4.1	0.000	After phase II of persistent symptom group
(Cured patient)			
After Phase II (Six months)	30.53 $\pm$ 2.2	0.074	
(persistence restricted mouth opening)			

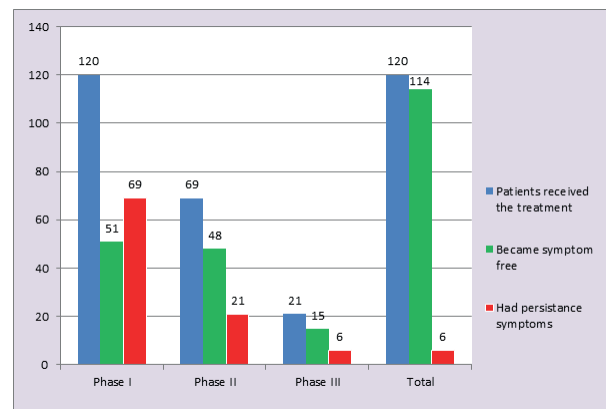


Figure 2: Phase to phase treatment outcome (n) of study population (n).

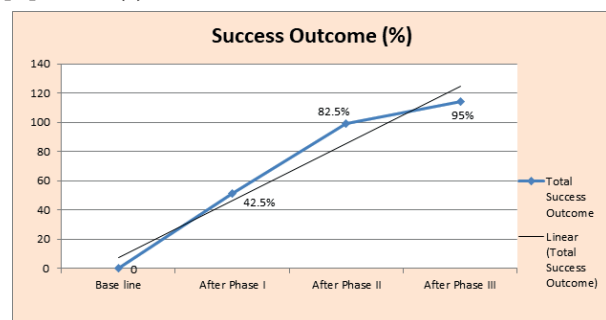


Figure 3: Overall success outcome (%) (phase by phase).

Discussion:

Temporomandibular disorders (TMD) involving inflammation of the articular structures, changes in the intra-articular pressure, alterations in the volume and biochemical composition of the synovial fluid. Splints are considered to cause alterations in the mechanical sensory input arising from the periodontal tissues and masticatory muscles and therefore to decrease intra-articular pressure in the TMJ²³. Thus, splints are used for the non-surgical treatment of ID of the TMJ to reduce bruxism, stress, and excessive loading on the joint structures. This study compared the effectiveness of medication with life style advices (Soft diet, jaw exercise), splint treatment, and a combination of both therapies in the treatment of unilateral TMD. Based on the results, all three treatment methods yielded significantly improved outcomes regarding pain, joint function, disability and psychological status of the patients compared to baseline. The results indicate that soft diet, jaw exercise with medication as the initial treatment provides comparable results whether used alone or in combination therapy. Furthermore, the improvement after splint therapy reaches similar success rates to those of the other methods during 6 months of follow-up. The splint therapy showed more effective with diet advice and jaw exercise than splint therapy alone. These findings are consistent with those of previous studies. Machon et al. evaluated the effectiveness of various therapeutic options in the treatment of unilateral TMD,

and showed that soft diet and jaw exercise combined with splint therapy achieved higher success rates than splint treatment alone²⁸. Vos et al. showed that arthrocentesis reduced the pain and functional impairment more rapidly than conservative treatment in TMJ arthropathy patients²⁹. However, the authors observed comparable results for arthrocentesis treatment and conservative treatment after 26 weeks. The authors did not separate the participants according to disc displacement with/without reduction, or unilateral/ bilateral TMD. Strengths of our study include the randomized allocation of participants with only unilateral involvement to the treatment groups, the blinded follow-up recordings, a sufficient sample size. A possible weakness of the study was that the duration after symptom onset was not recorded. The possible differences in the duration of TMD could have affected the results, since it has been shown that the initiation of treatment within a short period after symptom onset increases the treatment efficacy³⁰⁻³¹. However, the duration of TMD in the patients was assumed to be similar, since the study hospital is the only reference centre in the region for the treatment of TMD. In our treatment methods overall 51 (42.5%) patients were cured after first line 1 month of treatment and rest of the 69 (57.5%) patients received treatment under phase II, among them 48 (40%) patient were became totally symptom free after phase II treatment. Rests 21 (17.5%) patient were enrolled for phase III treatment where they were treated with occlusal splint following arthrocentesis plus Methylprednisolone injection. Among them 15 (12.5%) patients were cured but 6 (5%) had persistence moderate symptoms. Total success after completion of the study was 114 (95%). In the literature, the success rates of splint therapy and arthrocentesis have been reported to be 30–90% and 70–95%, respectively³²⁻³³. The success rates of the treatment methods were also evaluated in the present study, and they were found to be consistent with those reported in the literature. The mean values of all parameters measured for the patients treated with splint therapy were favourable and improved significantly compared to baseline. However, in terms of the success rate, 60% of the patients met the success criteria, while the success rates for the other treatment methods were over 90% at 6 months³⁴. In our study average pain score at base line was 6.8 ± 1.5 , and after first line treatment of phase I treatment significant ($p = 0.000$) pain reduction (1.2 ± 2.4) was observed among the cured patient. But patient who had persistent pain had no significant improvement after phase I ($p = 0.734$). After completion of phase II & phase III treatment significant improvement in pain relief was observed after both time period, (1.4 ± 0.8) and (0.5 ± 1.2) respectively ($p < 0.000$). Tatli U also reported similar significant reduction of pain score after 6 months of treatment.³³ we also got significant improvement in maximum mouth opening ($p < 0.000$).

Conclusion:

Analgesic with muscle relaxant, along with soft diet and jaw exercise is a good first line treatment option in primary temporomandibular disorder. But in progressive cases occlusal splint with soft diet and jaw exercise followed by (if needed) arthrocentesis plus Methylprednisolone injection give significant improvement.

Conflict of Interest: None.

Acknowledgement:

Department of Oral & Maxillofacial Surgery (OMS) of Bangladesh Navy Hospital, BNS Patenga, Chattogram.

Reference:

1. Ibsen OA, Phelan JA. Oral pathology for the dental hygienist. Saunders; 2004
2. Conti PC, Pinto-Fiamengui LM, Cunha CO, Conti AC. Orofacial pain and temporomandibular disorders: the impact on oral health and quality of life. Brazilian oral research. 2012;26:120-3.
<https://doi.org/10.1590/S1806-83242012000700018>
PMid:23318754
3. Magnusson T, Egermark I, Carlsson GE. A longitudinal epidemiologic study of signs and symptoms of temporomandibular disorders from 15 to 35 years of age. Journal of orofacial pain. 2000 Oct 1;14(4).
4. Giannakopoulos NN, Keller L, Rammelsberg P, Kronmüller KT, Schmitter M. Anxiety and depression in patients with chronic temporomandibular pain and in controls. Journal of dentistry. 2010 May 1;38(5):369-76.
<https://doi.org/10.1016/j.jdent.2010.01.003>
PMid:20079799
5. Greene CS. Orthodontics and temporomandibular disorders. Dental Clinics of North America. 1988 Jul 1;32(3):529-38.
[https://doi.org/10.1016/S0011-8532\(22\)00326-3](https://doi.org/10.1016/S0011-8532(22)00326-3)
PMid:3042477
6. Bales JM, Epstein JB. The role of malocclusion and orthodontics in temporomandibular disorders. Journal (Canadian Dental Association). 1994 Oct 1;60(10):899-905.
7. McNamara JA, Türp JC. Orthodontic treatment and temporomandibular disorders: is there a relationship? Part 1: clinical studies. Journal of Orofacial Orthopedics/Fortschritte der Kieferorthopädie. 1997 Mar;58:74-89.
8. Guo C, Shi Z, Revington P. Arthrocentesis and lavage for treating temporomandibular joint disorders. Cochrane Database of Systematic Reviews. 2009(4).
<https://doi.org/10.1002/14651858.CD004973.pub2>
9. Orlando B, Manfredini D, Salvetti G, Bosco M. Evaluation of the effectiveness of biobehavioral therapy in the treatment of temporomandibular disorders: a literature review. Behavioral medicine. 2007 Sep 1;33(3):101-18.
<https://doi.org/10.3200/BMED.33.3.101-118>
PMid:18055333
10. Stowell AW, Gatchel RJ, Wildenstein L. Cost-effectiveness

of treatments for temporomandibular disorders: biopsychosocial intervention versus treatment as usual. *The Journal of the American Dental Association*. 2007 Feb 1;138(2):202-8.

<https://doi.org/10.14219/jada.archive.2007.0137>

PMid:17272375

11. Lin CS. Brain signature of chronic orofacial pain: a systematic review and meta-analysis on neuroimaging research of trigeminal neuropathic pain and temporomandibular joint disorders. *PLoS One*. 2014 Apr 23;9(4):e94300.

<https://doi.org/10.1371/journal.pone.0094300>

PMid:24759798 PMCID:PMC3997345

12. Suvinen TI, Kempainen P, Le Bell Y, Valjakka A, Vahlberg T, Forssell H. Research Diagnostic Criteria Axis II in screening and as a part of biopsychosocial subtyping of Finnish patients with temporomandibular disorder pain. *J Orofac Pain*. 2013 Sep 1;27(4):314-24.

<https://doi.org/10.11607/jop.1145>

PMid:24171181

13. Gauer RL, Semidey MJ. Diagnosis and treatment of temporomandibular disorders. *American family physician*. 2015 Mar 15;91(6):378-86.

14. Dworkin SF, Huggins KH, LeResche L, Von Korff M, Howard J, Truelove E, Sommers E. Epidemiology of signs and symptoms in temporomandibular disorders: clinical signs in cases and controls. *The Journal of the American Dental Association*. 1990 Mar 1;120(3):273-81.

<https://doi.org/10.14219/jada.archive.1990.0043>

PMid:2312947

15. Oral K, Bal Küçük BU, Ebeoğlu B, Dincer S. Etiology of temporomandibular disorder pain. *Agri*. 2009 Jul 1;21(3):89-94.

16. Friction JR, Ouyang W, Nixdorf DR, Schiffman EL, Velly AM, Look JO. Critical appraisal of methods used in randomized controlled trials of treatments for temporomandibular disorders. *Journal of orofacial pain*. 2010;24(2):139.

17. Ingawale S, Goswami T. Temporomandibular joint: disorders, treatments, and biomechanics. *Annals of biomedical engineering*. 2009 May;37:976-96.

<https://doi.org/10.1007/s10439-009-9659-4>

PMid:19252985

18. Scrivani SJ, Keith DA, Kaban LB. Temporomandibular disorders. *New England Journal of Medicine*. 2008 Dec 18;359(25):2693-705.

<https://doi.org/10.1056/NEJMra0802472>

PMid:19092154

19. List T, Axelsson S. Management of TMD: evidence from systematic reviews and meta-analyses. *Journal of oral rehabilitation*. 2010 Jun;37(6):430-51.

<https://doi.org/10.1111/j.1365-2842.2010.02089.x>

PMid:20438615

20. Dimitroulis G. The prevalence of osteoarthritis in cases of advanced internal derangement of the temporomandibular joint: a clinical, surgical and histological study. *International journal of oral and maxillofacial surgery*. 2005 Jun 1;34(4):345-9.

<https://doi.org/10.1016/j.ijom.2004.10.013>

PMid:1605384

21. Okeson JP. Joint intracapsular disorders: diagnostic and nonsurgical management considerations. *Dental Clinics*. 2007 Jan 1;51(1):85-103.

<https://doi.org/10.1016/j.cden.2006.09.009>

PMid:17185061

22. Dimitroulis G, McCullough M, Morrison W. Quality-of-life survey comparing patients before and after discectomy of the temporomandibular joint. *Journal of oral and maxillofacial surgery*. 2010 Jan 1;68(1):101-6.

<https://doi.org/10.1016/j.joms.2009.07.092>

PMid:20006162

23. Casares G, Thomas A, Carmona J, Acero J, Vila CN. Influence of oral stabilization appliances in intra-articular pressure of the temporomandibular joint. *CRANIO®*. 2014 Jul 1;32(3):219-23.

<https://doi.org/10.1179/0886963413Z.000000000030>

PMid:2500016

24. Alpaslan CA, Kahraman SE, Güner B, Cula S. Does the use of soft or hard splints affect the short-term outcome of temporomandibular joint arthrocentesis?. *International journal of oral and maxillofacial surgery*. 2008 May 1;37(5):424-7.

<https://doi.org/10.1016/j.ijom.2008.01.022>

PMid:18356022

25. Schiffman E, Ohrbach R, Truelove E, Look J, Anderson G, Goulet JP, List T, Svensson P, Gonzalez Y, Lobbezoo F, Michelotti A. Diagnostic criteria for temporomandibular disorders (DC/TMD) for clinical and research applications: recommendations of the International RDC/TMD Consortium Network and Orofacial Pain Special Interest Group. *Journal of oral & facial pain and headache*. 2014;28(1):6.

<https://doi.org/10.11607/jop.1151>

PMid:24482784 PMCID:PMC4478082

26. Scott J, Huskisson EC. Graphic presentation of pain. *Pain* 1976;2:175-184.

[https://doi.org/10.1016/0304-3959\(76\)90113-5](https://doi.org/10.1016/0304-3959(76)90113-5)

PMid:1026900

27. Dolwick ME. Criteria for TMJ meniscus surgery. Rosemont, IL: American Association of Oral and Maxillofacial Surgeons; 1984: 1-40.

28. Machon V, Hirjak D, Lukas J. Therapy of the osteoarthritis of the temporomandibular joint. *Journal of Cranio-Maxillofacial Surgery*. 2011 Mar 1;39(2):127-30.

<https://doi.org/10.1016/j.jcms.2010.04.010>

PMid:20692843

29. Vos LM, Slater JH, Stegenga B. Arthrocentesis as initial treatment for temporomandibular joint arthropathy: a randomized controlled trial. *Journal of Cranio-Maxillofacial Surgery*. 2014 Jul 1;42(5):e134-9.

<https://doi.org/10.1016/j.jcms.2013.07.010>

PMid:23994055

30. Machoň V, Šedý J, Klíma K, Hirjak D, Foltán R. Arthroscopic lysis and lavage in patients with temporomandibular anterior disc displacement without reduction. *International journal of oral and maxillofacial surgery*. 2012 Jan 1;41(1):109-13.

<https://doi.org/10.1016/j.ijom.2011.07.907>

PMid:21885248

31. EMSHOFF R. Clinical factors affecting the outcome of occlusal splint therapy of temporomandibular joint disorders. *Journal of oral rehabilitation*. 2006 Jun;33(6):393-401.

<https://doi.org/10.1111/j.1365-2842.2005.01584.x>

PMid:16671984

32. Murakami K, Hosaka H, Moriya Y, Segami N, Iizuka T.

Short-term treatment outcome study for the management of temporomandibular joint closed lock: a comparison of arthrocentesis to nonsurgical therapy and arthroscopic lysis and lavage. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 1995 Sep 1;80(3):253-7.

[https://doi.org/10.1016/S1079-2104\(05\)80379-8](https://doi.org/10.1016/S1079-2104(05)80379-8)

PMid:7489265

33. EMSHOFF R. Clinical factors affecting the outcome of occlusal splint therapy of temporomandibular joint disorders. *Journal of oral rehabilitation*. 2006 Jun;33(6):393-401.

<https://doi.org/10.1111/j.1365-2842.2005.01584.x>

PMid:16671984

34. Tatli U, Benlidayi ME, Ekren O, Salimov F. Comparison of the effectiveness of three different treatment methods for temporomandibular joint disc displacement without reduction. *International journal of oral and maxillofacial surgery*. 2017 May 1;46(5):603-9.

<https://doi.org/10.1016/j.ijom.2017.01.018>

PMid:28222947

A Decade of Antibiotic Resistance in E. Coli in Urinary Tract Infections : A Study from a Tertiary Care Hospital in Bangladesh

Md. Mahabubul Islam Majumder^{*1}, Ashrafur Rahaman Mahadi², Tareq Ahmed³, Nazmus Sakib⁴,
Mostaque Ahmed⁵, Mohammad Nazim Uddin⁶, Hossain Mohammad Shihab⁷

Abstract

Introduction: This study aimed to discern evolving bacteriology and antibiotic resistance trends of *E. coli* among uropathogens, contrasting with a previous study. **Materials and Methods:** This study was conducted at Cumilla Medical College Hospital, Bangladesh, between June 2011 and June 2021, it encompassed three phases: 2011, 2016, and 2021, with participant counts of 551, 658, and 2312, respectively. Notably, females exhibited higher UTI prevalence. **Results:** Urine samples, 551 (2011), 658 (2016), and 2312 (2021), were cultivated for *E. coli* resistance assessment. Predominantly, females (18-40 years old, rural, married, sexually active, middle-income) exhibited symptoms like dysuria, fever, urgency, and abdominal pain. In 2021, UTI prevalence was higher in females (32.06%) than males (22.86%). *E. coli* dominated isolates, constituting 61.6% (2021), 86.0% (2016), and 75.5% (2011). Antibiotic susceptibility tests on 410 *E. coli* isolates from 2021 unveiled high resistance to cephalosporins (61.75-83.33%), fluoroquinolones (43.36-51.72%), macrolides (89.49%), cotrimoxazole (52.79%), and nitrofurantoin (25.38%). Resistance rates were lower for carbapenems (1.47-3.92%), aminoglycosides (5.91-20.79%), and piperacillin/tazobactam (11.55%). Comparing the three phases highlighted escalating *E. coli* resistance from 2011 to 2021: imipenem (0 to 4.2%, $p=0.007$), meropenem (2.0 to 3.4%, $p=0.021$), amikacin (2.0 to 6.2%, $p=0.017$), gentamicin (14.0 to 23.7%, $p=0.043$), and nitrofurantoin (9.0 to 31.2%, $p=0.002$). Amoxicillin/clavulanic acid resistance decreased (24.0 to 17.4%, $p=0.036$). **Conclusion:** In summary, this study illuminated burgeoning *E. coli* resistance in UTIs, notably against common oral antibiotics. The findings underscore the indispensability of urine culture and susceptibility tests in steering appropriate empirical antibiotic therapies.

Keywords: Antibiotic resistance, *E. coli*, Bangladesh, urinary tract infection, tertiary care.

Number of Tables: 05; Number of Figure: 01; Number of References: 37; Number of Correspondences: 03.

*1. Corresponding Author:

Prof. Dr. Md. Mahabubul Islam Majumder
Professor & Head
Department of Medicine
Central Medical College
Cumilla, Bangladesh.
E-mail: m.i.majumder@gmail.com
01713459545

2. Dr. Ashrafur Rahaman Mahadi

Department of Medicine
Central Medical College, Cumilla, Bangladesh.

3. Prof. Dr. Tareq Ahmed

Cumilla Medical College
Cumilla, Bangladesh.

4. Dr. Nazmus Sakib

Zonal Medical Officer
Save the Children
Coxsavar, Bangladesh.

5. Dr. Mostaque Ahmed

Associate Professor
Department of Medicine
Central Medical College
Cumilla, Bangladesh.

6. Dr. Mohammad Nazim Uddin

Assistant Professor
Department of Medicine
Central Medical College
Cumilla, Bangladesh.

7. Dr. Hossain Mohammad Shihab

Department of Medicine
Central Medical College
Cumilla, Bangladesh.

Introduction:

Urinary tract infections (UTIs) stand as one of the most prevalent and recurrent bacterial afflictions within the realm of clinical practice. They account for a substantial one-third fraction of all infections, be they acquired within the community or contracted within the confines of medical institutions¹. Per the literary echelons, it becomes apparent that the surge of bacterial maladies is on an ascendant trajectory in South Asia, paralleling the global trend². Within the constellation of pathogens capable of inducing UTIs, a myriad of bacterial contenders exists, yet preeminently, it is *Escherichia coli* (*E. coli*) that claims the spotlight¹. A pivotal stride in the annals of modern medicine was the unearthing of antibiotics; however, the omnipresence and escalated deployment thereof have precipitated a gradual march towards microbial defiance, effectively rendering them less efficacious for patients³. Illumination

emanating from the written word intimates that approximately 15% of all antibiotic prescriptions are earmarked for the rectification of UTIs⁴. Alarming estimates postulate that roughly 20–50% of all antibiotic regimens are administered without precise justification, thereby exacerbating the specter of adverse reactions, augmented treatment expenditures, and elevated drug resistance⁵. Central to the therapeutic schema for bacterial UTIs is the initiation of treatment with a potent antibiotic. Yet, the crux of the matter resides in the selection of the apt antibiotic, particularly in the precincts of primary health care (PHC), where treatment transpires prior to the isolation of the culpable agent and subsequent sensitivity testing. While the inclination is to deploy broad-spectrum antibiotics to combat UTIs, a nuanced consideration reveals that a narrower-spectrum counterpart might suffice for efficacious intervention⁶. Notably, the unwarranted widespread dissemination of antibiotics has unfurled the banner of antibiotic resistance on a global scale, thereby transmuting it into an epochal quandary in recent years^{7, 8}. Antibiotic resistance conveys itself as a pivotal and profoundly weighty conundrum in Bangladesh, a region saddled with a substantial burden of infectious diseases. A recent probe across the seas in the United Kingdom has unveiled a wane in the prescription of antibiotics within primary care circles. A contrary tale unfolds within the Bangladeshi milieu, where antibiotic prescriptions continue to hold fort⁹. A disconcerting predilection among numerous medical practitioners in Bangladesh entails prescribing antibiotics based on the symptomatology of UTIs, sans recourse to a diagnosis grounded in urinary culture. Regrettably, the panorama in rural pockets of Bangladesh remains bereft of culture facilities, a lacuna that might usher in a reign of self-medication and unwarranted antibiotic exploitation^{10,11}. The canvas of antibiotic resistance is a mutable tableau, swayed by the tides of time and the nuances of geographic locale¹². Furthermore, the landscape of UTIs is entwined with the factors of age and gender, precipitating the necessity for physicians to apprise themselves of the prevailing strains and their antibiotic resistance profiles within the local ambit. This cognizance serves as the keystone for the judicious and efficacious management of patients¹³. Currently, there is a widespread global occurrence of recurring and chronic urinary tract infections (UTIs), with *Escherichia coli* (*E. coli*) being the primary causative agent. *E. coli* resistance trend is responsible for up to 80% of UTIs, making it the predominant bacterial contributor to this common infectious disease¹⁴. A previous research 15 provided a detailed analysis of bacteriology and antibiotic resistance patterns among uropathogens over a 10-year period, focusing specifically on patients with positive urine cultures. In this current investigation, we extend our exploration to encompass the entire dataset, including both positive and negative urine cultures. This broader perspective allows for a comprehensive examination of sociodemographic and clinical characteristics, offering insights into the nuanced dynamics surrounding UTIs beyond cases with confirmed growth of microorganisms.

Furthermore, our focus in the present study shifts specifically to the resistance trend of *Escherichia coli*, a predominant uropathogens. While our previous work addressed multiple uropathogens, the current manuscript hones in on *E. coli*, providing a detailed analysis of its antibiotic resistance patterns¹⁵. By isolating and analyzing the temporal trends in resistance of this *E.coli*, we aim to contribute valuable insights for guiding empirical antibiotic use in UTIs. The inclusion of both positive and negative urine cultures in our analysis allows for a more inclusive understanding of UTIs, considering cases where cultures did not yield growth. This approach provides a holistic view of trends and patterns, enhancing our ability to inform clinical practices and public health policies. This endeavor also strives to unravel the tapestry of antibiotics resistance patterns within a tertiary healthcare institution in Bangladesh, poised against the backdrop of an antecedent study conducted within the same precincts in 2011 and 2016^{16,17}. The findings of this study bear the potential to furnish enlightenment in the sphere of empirical antibiotic choices for UTI treatment, not merely within the expanse of this tertiary facility but also at the broader national echelon. Our current study builds upon our prior research by broadening the scope of our analysis, emphasizing resistance trend of *Escherichia coli*, and offering a more comprehensive understanding of the sociodemographic and clinical landscape of UTIs.

Materials & Methods:

It was a cross sectional study conducted in the department of medicine of Cumilla medical college hospital, Bangladesh during the period of June 2011-June 2021. Data were collected in three phases with five years interval in 2011, 2016 and 2021. All the patients aged above 12 years visiting the outpatient and inpatient department of the study center with a suspected diagnosis of UTI (dysuria, frequency, fever and pain in lower abdomen) and undergone urine culture test were included in the study. Patients with active menstruation, PID, tubo-ovarian disease, appendicitis, colitis, epididymitis, orchitis identified clinically or by examinations were excluded from this research. Patients who were on antibiotics told to cease taking them for 48 hours before participating in this study.

Ethical Approval: The ethical permission received from the ethics review committee of Cumilla medical college, Cumilla, Bangladesh. A formal letter of approval was given prior to data collection. Prior to data collection, patients were told about the project and consented, and anonymity was maintained throughout the study by removing their names and other personal identifiers. Confidentiality was strictly maintained during data processing and report writing. Our study was conducted in accordance with the Declaration of Helsinki. This research is fully compliant with the STROCSS 2021 criteria¹⁸.

Urine Sample collection : Clean voided mid-stream urine (MSU) specimens were collected in sterile tubes from UTI suspect patients by the patient's family members with the assistance of a nurse and an investigator and transferred to the laboratory within 2 hours of collection. Contamination was

controlled by providing clear instructions on how to collect the sample properly. Catheters were utilized when the patient was unable to deliver a urine sample.

Culture and identification techniques : Using a calibrated inoculating loop with a capacity of 0.001 ml, urine from each patient was inoculated onto cysteine-lactose-electrolyte deficient agar CLED/ (Oxoid, Basingstoke, Hampshire, England) plates. The inoculation plates were aerobically incubated for 24–48 hours at 37 °C. If growth observed, Plates with a colony count of $\geq 10^5$ cfu/ml were considered significant bacteriuria¹⁹. Then sub-cultured to Mac-Conkey agar (Oxoid, Basingstoke, Hampshire, England) and 5% sheep blood agar (Oxoid, Basingstoke, Hampshire, England)¹⁹. Gram stain and biochemical tests were used to characterize/identify bacterial isolates; for Gram-positive bacteria, catalase, novobiocin disk, and coagulase tests were performed; for Gram-negative bacteria, triple sugar iron agar test, indole motility test, citrate agar test, lysine decarboxylase agar test, urea agar test, and oxidase tests were performed.

Antimicrobial susceptibility testing (AST): On Muller Hinton agar, an antimicrobial susceptibility test was performed using the Kirby-Bauer disc diffusion technique according to Clinical Laboratory Standards Institute (CLSI) standards²⁰. A suspension of 3–5 colonies of freshly grown test organism was introduced, corresponding to 0.5 McFarland standards. By spinning the swab with the suspension, the surface of the Muller-Hinton agar was thoroughly covered. After allowing the plates to dry for 3–5 minutes, the discs were equally spread on the inoculation plate with sterile forceps and incubated at 37 °C for 18–24 hours. A ruler was used to measure the diameter of the zone of inhibition surrounding the disc. Based on the CLSI 2018 guidelines, the results were classified²⁰. The following routinely used antimicrobials were tested: ampicillin [10 µg], gentamycin [10 µg], amox-clav [20/10 µg], cefoxitin [30 µg], cefotaxime [30 µg], ciprofloxacin [5 µg]; meropenem [10 µg], cotrimoxazole [trimethoprim, 1.25/sulfamethoxazole, 23.75 µg], ceftazidime [30 µg], chloramphenicol [30 µg], tetracycline [30 µg], nitrofurantoin [300 µg], and erythromycin [15 µg]²⁰.

Statistical analysis: Data entry and analysis were done by using SPSS version 25.0. Descriptive statistics were used to summarize socio-demographic data, bacterial profile and susceptibility patterns of isolates. The results are summarized and presented by age groups, sex with other demographic variables and isolation types. The prevalence rate of the isolates, frequency, susceptibility and resistance patterns and other descriptive statistics were computed. Chi-square test was used to compare antibiotic resistance pattern in three phases. P-value <0.05 was considered as statistically significant. Graphical analyses were conducted in R version 4.2.2 using “ggplot2” package.

Results:

A total of 3521 patients (2312 patients in 2021, 658 patients in 2016 and 551 patients in 2011) were screened and undergone urine culture test. Among their urine sample, a

total of 995 (28.3%) yielded growth of microorganisms. Table I describes the demographic and clinical characteristics of the study participants across the 3 time periods. The majority of UTI patients were females in the age group 18–40 years. Most resided in rural areas, had middle incomes, were married and sexually active. The most frequently reported UTI symptoms were dysuria (69.8–77.9%), urgency (68.5–78%), fever (66.4–77.9%), and abdominal pain (68.8–76.9%). About 40–48% had already taken antibiotics prior to urine culture.

Table I: Sociodemographic and clinical characteristics of the patients

Characteristics	2021		2016		2011	
	n	%	n	%	n	%
Age						
<18	377	16.04	65	14.13	83	15.06
18–40	995	42.34	204	44.35	236	42.83
41–60	633	26.94	106	23.04	130	23.59
>60	345	14.68	85	18.48	102	18.51
Sex						
Female	1497	64.75	326	70.87	330	59.89
Male	815	35.25	134	29.13	221	40.11
Residence						
Urban	746	31.74	136	29.57	170	30.85
Rural	1604	68.26	334	72.61	381	69.15
Education						
Educated	1658	70.55	303	65.87	331	60.07
Not educated	692	29.45	157	34.13	220	39.93
Marital status						
Married	1745	74.26	338	73.48	392	71.14
Unmarried	605	25.74	122	26.52	159	28.86
Sexual activity						
Active	1645	70.00	285	61.96	345	62.61
Not active	705	30.00	175	38.04	206	37.39
Economic status						
Lower class	493	20.98	49	10.65	78	14.16
Middle class	1576	67.06	393	85.43	422	76.59
Higher class	281	11.96	18	3.91	51	9.26
Co-morbid condition						
DM	247	10.51	55	11.96	61	11.07
HTN	124	5.28	15	3.26	34	6.17
IHD	65	2.77	8	1.74	18	3.27
Others	98	4.17	34	7.39	27	4.90
Clinical feature						
Dysuria	1696	72.17	321	69.78	429	77.86
Urgency	1610	68.51	359	78.04	397	72.05
Fever	1832	77.96	336	73.04	366	66.42
Abdominal pain	1642	69.87	354	76.96	379	68.78
Treated with antibiotics						
Yes	923	39.28	221	48.04	226	41.02
No	1427	60.72	239	51.96	325	58.98
Growth in culture						
Positive	666	28.79	198	30.09	131	23.77
Negative	1647	71.21	460	69.01	420	76.22

Table II shows the gender-wise distribution of positive urine cultures. In 2021, 22.9% of males and 32.1% of females had positive cultures, indicating a higher prevalence of UTIs in females. Overall culture positivity rates were 28.79% in 2021, 31% in 2016, and 23.77% in 2011.

Table II: Gender distribution for rate of isolation in urine culture during different point of time

Sex	Growth of uropathogens, n (%)		
	2021	2016	2011
Male	186 (22.82)	75 (38)	35 (26.7)
Female	480 (32.06)	123 (62)	96 (73.3)
Total	666 (28.79)	198 (31)	131 (23.77)

Table III gives the frequency of E. coli among the positive urine cultures. E. coli was the predominant uropathogen in all 3 time periods, being isolated from 61.6% cultures in 2021, 86% in 2016, and 75.5% in 2011.

Table III: Distribution of E.coli microorganism among patients with urinary tract infection.

Organism	2021	2016	2011
Escherichia coli	410 (61.6)	171 (86.0)	98 (75.5)

Table IV elaborates the antibiotic resistance profile of the 410 E. coli isolates from 2021. Very high resistance rates (>80%) were seen for cephalosporins like cephadrine (83.3%) and cefixime (77.9%), fluoroquinolones like nalidixic acid (83.4%), and macrolides like azithromycin (89.5%). Moderate resistance (50-80%) was observed for ceftazidime, cefuroxime, ceftriaxone, cefepime, ciprofloxacin, cotrimoxazole and doxycycline. Low resistance rates (<10%) were found for carbapenems, amikacin, amoxicillin/clavulanate, vancomycin, linezolid and tigecycline. Figure 1 graphically depicts the resistance patterns.

Table IV: Antibiotic resistance pattern of E.coli isolated from the urine specimen of the patients (combined of all years)

Antibiotic	E.coli R (%)
Carbapenem	
Imipenem	3.92
Meropenem	1.47
Cephalosporin	
Cephadrine	83.33
Cefotaxime	61.75
Ceftazidime	50.00
Cefuroxime	65.77
Ceftriaxone	58.62
Cefixime	77.94
Cefepime	50.51
Quinolone	
Ciprofloxacin	51.72
Levofloxacin	43.36
Nalidixic Acid	83.38
Aminoglycoside	
Amikacin	5.91
Gentamycin	20.79
Penicillin	
Amoxiclav	35.38
Amoxycillin	NA
Ampicillin	62.50
Macrolides	
Azithromycin	89.49
Erythromycin	NA
Clindamycin	NA
Others	
Nitrofurantoin	25.38
Cotrimoxazole	52.79
Piperacillin/ Tazobactam	11.55
Vancomycin	2.82
Fusidic Acid	NA
Doxycycline	46.00
Linezolid	1.35
Tigecycline	0.00

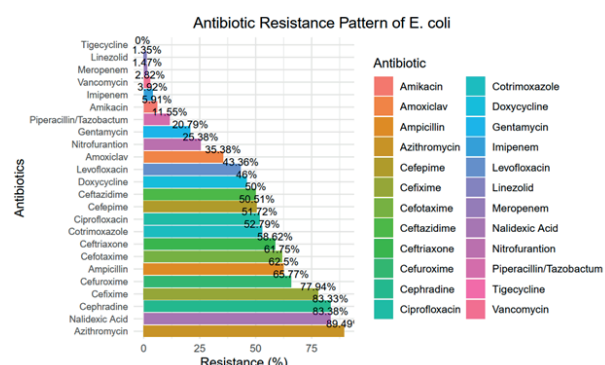


Figure 1: Antibiotic resistance pattern of E.coli isolated from the urine specimen

Comparisons between the three time periods found significant increases in E. coli resistance from 2011 to 2021 for imipenem (0 to 4.2%, $p=0.007$), meropenem (2.0 to 3.4%, $p=0.021$), amikacin (2.0 to 6.2%, $p=0.017$), gentamicin (14.0 to 23.7%, $p=0.043$), and nitrofurantoin (9.0 to 31.2%, $p=0.002$). A significant decrease was seen for amoxicillin/clavulanic acid (24.0 to 17.4%, $p=0.036$) (Table 5). Table 5 statistically compares the E. coli resistance rates between 2011, 2016 and 2021 for key antibiotic classes. Significant increases were seen over the 10 years for imipenem, meropenem, amikacin, gentamicin and nitrofurantoin. Amoxicillin/clavulanate resistance significantly declined. No significant changes were noted for cephalosporins, fluoroquinolones and cotrimoxazole.

Table V: Comparison of antibiotic resistance pattern of UTI causing organism during different point of time

Name of antibiotics	2021	2016	2011	p-value
Carbapenem				
Imipenem	4.2	0.5	0.0	0.007
Meropenem	3.4	0.0	2.0	0.021
Cephalosporin				
Cephadrine	81.6	65.0	63.0	0.782
Cefotaxime	61.6	58.0	61.0	0.241
Cefuroxime	64.3	55.0	63.0	0.638
Ceftriaxone	58.8	55.0	60.0	0.078
Cefixime	78.9	60.0	70.0	0.254
Quinolone				
Nalidixic acid	86.5	55.0	75.0	0.440
Ciprofloxacin	52.8	48.0	66.0	0.084
Aminoglycosides				
Amikacin	6.2	1.0	2.0	0.017
Gentamycin	23.7	10.0	14.0	0.043
Penicillin				
Amoxyclav	77.4	76.0	24.0	0.036
Amoxycillin	NA	86.0	87.0	0.990
Others				
Nitrofurantoin	31.2	12.0	9.0	0.002
Cotrimoxazole	58.7	47.0	62.0	0.089

In summary, very high and increasing E. coli antibiotic resistance was observed, especially for commonly used oral drugs like cephalosporins, fluoroquinolones, and cotrimoxazole. This indicates the need for culture-guided UTI treatment. Carbapenems and aminoglycosides retained low

resistance likely due to restricted use, making them suitable for empirical therapy.

Discussion:

Owing to the widespread pervasiveness of infections in both communal and medical environments, urinary tract infections (UTIs) have imposed a substantial fiscal burden upon the healthcare system²¹. The efficacious treatment of individuals afflicted with bacterial UTIs frequently hinges upon the accurate identification of pathogens and the judicious selection of antibiotics. This selection is guided by the constant vigilance over the susceptibility patterns of urinary tract pathogens within distinct geographical areas²². The findings from the present investigation have illuminated the landscape of antimicrobial resistance within Bangladesh, a nation characterized by limited data on antimicrobial resistance surveillance. Our current investigation, building upon our earlier work¹⁵, brings forth several noteworthy contributions to the understanding of urinary tract infections (UTIs). The decision to include the entire dataset, incorporating both positive and negative urine cultures, allows for a more comprehensive exploration of the sociodemographic and clinical characteristics related to UTIs. This approach provides a nuanced view of the landscape, capturing aspects beyond confirmed growth of microorganisms. Within the purview of this inquiry, it was observed that within the annals of the year 2021, a total of 666 urine specimens (constituting 28.79%) manifested considerable microbial proliferation, while 1647 samples exhibited an absence of bacterial growth (comprising 71.21%). This prevalence rate is strikingly akin to the metrics of the year 2016, which were documented at 31%¹⁶. Nevertheless, it surges above the figures reported for 2011, which stood at 23.77%, with a discernibly upward trajectory in the trend¹⁷. Furthermore, these observations harmonize with multiple reports hailing from Bangladesh, India, and Pakistan^{22,23}. Upon an analysis spanning a decade, the distribution of uropathogens favored female patients over their male counterparts (Table: II), an outcome attributed to an array of predisposing factors contributing to the higher incidence of UTIs among women²⁵. The well-recognized gender disparity in UTI prevalence, with its greater occurrence in females, finds endorsement within our data, corroborating the findings of a prior study conducted by Deshpande et al.²⁶. Moreover, the prevalence trends concerning uropathogens align seamlessly with an assemblage of antecedent reports²⁷. The observed trend in *Escherichia coli* (*E. coli*) resistance is a noteworthy aspect in the context of this study¹⁴. Analyzing the patterns and dynamics of *E. coli* resistance trend over time provides valuable insights into the evolving nature of antimicrobial resistance, influencing the efficacy of treatment strategies and public health interventions. As the calendar of 2021 unfolded, the age bracket most susceptible to UTIs emerged as the 18-40 years cohort, constituting 42.34% of cases, followed by individuals aged 41-60 years (26.94%), those below 18 years (16.4%), and lastly, those aged above 60 years (14.68%). It is

noteworthy that the elderly demographic displayed a heightened vulnerability to UTIs, a phenomenon possibly influenced by genitourinary atrophy and postmenopausal vaginal prolapse, both of which conspire to alter vaginal pH and diminish the normative vaginal flora. This perturbation creates a conducive milieu for the proliferation of Gram-negative bacteria, heralding them as uropathogens²⁸. Within the contours of our investigation, an intricate tapestry of antibiotic resistance among *E. coli* isolates garnered from UTI cases in Bangladesh was meticulously woven, all the while considering the patients' ages and genders. Among the pantheon of antibiotic therapies, meropenem and imipenem stood forth as beacons of high susceptibility percentages among the isolates. Nonetheless, given their intravenous administration route, a stringent oversight becomes imperative. Additionally, their elevated cost renders them infrequent contenders for routine UTI management. Echoing harmonious sentiments, antecedent research has also unveiled parallel findings regarding meropenem and imipenem²⁹⁻³². In the realm of bacterial resistance, *E. coli* conspicuously exhibited multifaceted resistance, with upwards of 70% of the isolates displaying resistance to over five classes of antibiotics. This congruence aligns neatly with a study conducted in a tertiary hospital situated in Pakistan²⁸. The historical dominance of cotrimoxazole as a frontline therapeutic choice has waned, as contemporary realities betray its susceptibility limitations in the context of UTI patients³³. Nalidixic acid and ciprofloxacin rose to prominence, though within our study, resistance to these agents, alongside third-generation antibiotics like cefixime and ceftriaxone, emerged prominently. Cotrimoxazole's resistance rate in our sample mirrors figures from Senegal, Spain, and Taiwan, yet it remains significantly lower than that observed in India a decade prior^{33,34}. Previous scrutiny had unearthed high *E. coli* resistance rates against nitrofurantoin³⁶, a precedent that finds resonance within our study, wherein nitrofurantoin resistance surpassed even the elevated figures from a parallel 2015 study conducted in Sudan. On a heartening note, our findings celebrate the susceptibility of *E. coli* from UTIs to amikacin, meropenem, and imipenem. While Akram et al. had documented markedly higher bacterial resistance to amikacin in 2007 (51%), a more sanguine scenario materialized regarding imipenem resistance in India³⁷. Furthermore, our focused analysis on *Escherichia coli* in the present study offers a deeper insight into the temporal trends of antibiotic resistance specific to this key uropathogen. By isolating and examining the resistance patterns of *E. coli*, we aim to guide empirical antibiotic use more effectively, addressing the evolving challenges posed by antimicrobial resistance in the context of UTIs. The present investigation boasts several salient strengths. Notably, our study offers a pioneering elucidation of the antibiotic susceptibility and resistance profiles of *E. coli* isolates stemming from UTI cases, with meticulous considerations of age and gender disparities. Such findings are of pronounced significance to the medical fraternity,

constituting a cornerstone for judicious antibiotic prescription, thereby forestalling the emergence of novel antibiotic-resistant strains fostered by improper usage. In summation, the prevalence of *E. coli*-induced UTIs has exhibited an unequivocal uptrend within the year 2021. This study substantiates an escalating trajectory of resistance across all antibiotic categories under examination. Noteworthy surges in sensitivity patterns emerged for imipenem, meropenem, tazobactam, amikacin, and nitrofurantoin. A comparative analysis spanning 2021, 2016, and 2011 unfurled a conspicuous amplification in resistance to diverse antibiotic classes among the study participants, particularly within the carbapenem and aminoglycoside clusters. The resistance to both imipenem and meropenem, nearly negligible in earlier years, soared to approximately 4% in 2021. A corollary surge was also detected in the instances of amikacin, gentamycin, amoxiclav, and nitrofurantoin. In summary, the current study not only broadens the scope of our analysis but also sharpens the focus on *E. coli*, contributing valuable insights that extend beyond our previous work. These findings enhance our understanding of UTIs and provide a basis for informed decision-making in clinical practices and public health strategies.

Conclusion:

The discernible resistance exhibited against antibiotics entrenched in routine practice conveys a sobering reality. This underscores the salience of antibiotic resistance within the context of Bangladesh. The quagmire of antibiotic resistance can be attributed to manifold factors: inadequacies in treatment regimens, patient non-adherence, the unregulated flow of drugs in the market, and the specter of antibiotic scarcity coupled with compromised quality. It behooves us, therefore, to curtail the incidence of urinary tract infections and to perpetually monitor the susceptibility of key microorganisms to commonly administered antibacterial agents. These findings are not merely insightful but also wield the potential to steer local policies, objectives, and practices. The need of the hour is for large healthcare establishments to proactively monitor and analyze the emergent patterns and trends of antimicrobial resistance, culminating in the formulation, prioritization, and enforcement of health facility-centric antimicrobial stewardship guidelines and policies. Ultimately, the exigency for an exhaustive inquiry and comprehensive research dedicated to unraveling the labyrinthine tapestry of antibiotic resistance resonates strongly, as it holds the promise of comprehending this national crisis and conceiving pragmatic solutions for its management.

Conflict of Interest: None.

Acknowledgements:

We would want to express our gratitude to all of the patients who voluntarily offered their time, illustrated their situations attentively, and provided honest and significant responses. Additionally, we appreciate the research assistants and authors who supported with the data collection for this research.

References:

1. A. L. Flores-Mireles, J. N. Walker, M. Caparon, and S. J. Hultgren. Urinary tract infections: epidemiology, mechanisms of infection and treatment options. *Nature Reviews Microbiology*. Apr. 2015;13:5: 269-284.
<https://doi.org/10.1038/nrmicro3432>
PMid:25853778 PMCID:PMC4457377
2. B. Basnyat. South Asia today: William Osler's world with antibiotics. *Lancet Glob Health*. Jul. 2018; 6(7):e718-e719.
[https://doi.org/10.1016/S2214-109X\(18\)30264-X](https://doi.org/10.1016/S2214-109X(18)30264-X)
PMid:29903367
3. T. Gottlieb and G. R. Nimmo. Antibiotic resistance is an emerging threat to public health: an urgent call to action at the Antimicrobial Resistance Summit 2011. *Med J Aust*. 2011; 194(6):281-283.
<https://doi.org/10.5694/j.1326-5377.2011.tb02973.x>
PMid:21426279
4. T. A. Waller, S. A. L. Pantin, A. L. Yenior, and G. G. A. Pujalte. Urinary Tract Infection Antibiotic Resistance in the United States. *Prim Care*. Sep. 2018; 45(3):455-466.
<https://doi.org/10.1016/j.pop.2018.05.005>
PMid:30115334
5. M. Čížman. The use and resistance to antibiotics in the community. *Int J Antimicrob Agents*. Apr. 2003; 21(4):297-307.
[https://doi.org/10.1016/S0924-8579\(02\)00394-1](https://doi.org/10.1016/S0924-8579(02)00394-1)
PMid:12672574
6. A. Kotwani and K. Holloway. Trends in antibiotic use among outpatients in New Delhi, India. *BMC Infect Dis*. Apr. 2011;11(1):1-9.
<https://doi.org/10.1186/1471-2334-11-99>
PMid:21507212 PMCID:PMC3097160
7. T. P. Robinson, et al. Antibiotic resistance is the quintessential One Health issue. *Trans R Soc Trop Med Hyg*. 2016;110(7):377.
<https://doi.org/10.1093/trstmh/trw048>
PMid:27475987 PMCID:PMC4975175
8. K. Zaykova, S. Nikolova, R. Pancheva, and A. Serbezova. A survey of knowledge, attitudes and use of antibiotics among Bulgarian population. *Biotechnology & Biotechnological Equipment*. Dec. 2022; 36(1):933-941.
<https://doi.org/10.1080/13102818.2022.2145237>
9. R. E. Glover, M. Dangoor, and N. Mays. Antibiotic resistance: don't blame patients. *BMJ*. 2019; vol. 364.
<https://doi.org/10.1136/bmj.11218>
PMid:30890532
10. S. Rahman, A. K. Parvez, R. Islam, and M. H. Khan. Antibacterial activity of natural spices on multiple drug resistant *Escherichia coli* isolated from drinking water, Bangladesh. *Ann Clin Microbiol Antimicrob*. Mar. 2011;10(1):1-4.

<https://doi.org/10.1186/1476-0711-10-10>

PMid:21406097 PMCID:PMC3070620

11. B. Li and T. J. Webster. Bacteria antibiotic resistance: New challenges and opportunities for implant-associated orthopedic infections. *J Orthop Res*. Jan. 2018; 36(1):22-32.

<https://doi.org/10.1002/jor.23656>

PMid:28722231 PMCID:PMC5775060

12. L. Sun, E. Y. Klein, and R. Laxminarayan. Seasonality and temporal correlation between community antibiotic use and resistance in the United States. *Clin Infect Dis*. Sep. 2012;55(5):687-694.

<https://doi.org/10.1093/cid/cis509>

PMid:22752512

13. L. Huang, C. Huang, Y. Yan, L. Sun, and H. Li. Urinary Tract Infection Etiological Profiles and Antibiotic Resistance Patterns Varied Among Different Age Categories: A Retrospective Study From a Tertiary General Hospital During a 12-Year Period. *Front Microbiol*. Jan 2022 vol.12.

<https://doi.org/10.3389/fmicb.2021.813145>

PMid:35154037 PMCID:PMC8829000

14. A. A. Van Driel, et al. Antibiotic resistance of *Escherichia coli* isolated from uncomplicated UTI in general practice patients over a 10-year period. *European Journal of Clinical Microbiology and Infectious Diseases*. Nov. 2019; 38(11): 2151-2158.

<https://doi.org/10.1007/s10096-019-03655-3>

PMid:31440915 PMCID:PMC6800841

15. M. M. I. Majumder, A. R. Mahadi, T. Ahmed, M. Ahmed, M. N. Uddin, and M. Z. Alam. Antibiotic resistance pattern of microorganisms causing urinary tract infection: a 10-year comparative analysis in a tertiary care hospital of Bangladesh. *Antimicrob Resist Infect Control*. Dec. 2022; 11(1):1-8.

<https://doi.org/10.1186/s13756-022-01197-6>

PMid:36496392 PMCID:PMC9736704

16. "Bacteriology and antibiotic sensitivity patterns of urinary tract infections in a tertiary hospital in Bangladesh - PubMed." Accessed: Feb. 14, 2024. [Online]. Available: <https://pubmed.ncbi.nlm.nih.gov/24584381/>

17. M. Majumder, T. Ahmed, N. Sakib, A. Khan, and C. Saha, "A Follow up Study of Bacteriology and Antibiotic Sensitivity Pattern of Urinary Tract Infection in a Tertiary Care Hospital in Bangladesh," *J Bacteriol Parasitol*. 2017;09(01).

<https://doi.org/10.4172/2155-9597.1000334>

18. G. Mathew, et al. "STROCSS 2021: Strengthening the reporting of cohort, cross-sectional and case-control studies in surgery," *International Journal of Surgery*. Dec. 2021; 96:p. 106165.

<https://doi.org/10.1016/j.ijso.2021.100430>

19. C. P. Nelson, et al. Antimicrobial Resistance and Urinary Tract Infection Recurrence. *Pediatrics*. Apr. 2016; 137(4).

<https://doi.org/10.1542/peds.2015-2490>

PMid:26969273 PMCID:PMC4811311

20. "M100 Performance Standards for Antimicrobial Susceptibility Testing An informational supplement for global application developed through the Clinical and Laboratory Standards Institute consensus process", Accessed: Feb. 14, 2024. [Online]. Available: www.clsi.org.

21. F. N. Mbatia, J. Orwa, M. B. Adam, G. Mahomoud, and R. D. Adam. Outpatient management of urinary tract infections by medical officers in Nairobi, Kenya: lack of benefit from audit and feedback on adherence to treatment guidelines. *BMC Infect Dis*. Dec. 2023; 23, (1).

<https://doi.org/10.1186/s12879-023-08567-4>

PMid:37723454 PMCID:PMC10506338

22. R. Haque, M. L. Akter, and M. A. Salam. Prevalence and susceptibility of uropathogens: a recent report from a teaching hospital in Bangladesh. *BMC Res Notes*. Sep. 2015; 8, (1): p. 416.

<https://doi.org/10.1186/s13104-015-1408-1>

PMid:26342570 PMCID:PMC4560919

23. M. Khalid. Comparison of Chromogenic (HiCrome Urinary Tract Infection Agar) Medium with Cysteine Lactose Electrolyte Deficient Agar in a Resource-Limited Setting. *Int J Appl Basic Med Res*. 2021; 11(1):p. 9.

https://doi.org/10.4103/ijabmr.IJABMR_306_19

PMid:33842289 PMCID:PMC8025950

24. R. Parveen, S. Saha, S. Shamshuzzaman, A. Rashid, A. Chowdhury, and N. Muazzam. Detection of Uropathogens by Using Chromogenic Media (Hicrome UTI agar), CLED agar and other Conventional Media. *Faridpur Medical College Journal*. Jan. 1970; 6(1): 46-50.

<https://doi.org/10.3329/fmcj.v6i1.7411>

25. S. L. August and M. J. De Rosa. Evaluation of the Prevalence of Urinary Tract Infection in Rural Panamanian Women. *PLoS One*. Oct. 2012; 7(10) p. e47752.

<https://doi.org/10.1371/journal.pone.0047752>

PMid:23094080 PMCID:PMC3477127

26. (PDF) Antibigram of Gram Negative Uropathogens in Hospitalized Patients. Accessed: Feb. 14, 2024. [Online]. Available: https://www.researchgate.net/publication/263672584_Antibiogram_of_Gram_Negative_Uropathogens_in_Hospitalized_Patients

27. Microbial sensitivity pattern in urinary tract infections in children: a single center experience of 1,177 urine cultures - PubMed. Accessed: Feb. 14, 2024. [Online]. Available: <https://pubmed.ncbi.nlm.nih.gov/17186957/>

28. A. Muhammad, S. N. Khan, N. Ali, M. U. Rehman, and I. Ali. Prevalence and antibiotic susceptibility pattern of uropathogens in outpatients at a tertiary care hospital. *New Microbes New Infect*. Jul. 2020; vol. 36.

<https://doi.org/10.1016/j.nmni.2020.100716>

PMid:32637123 PMCID:PMC7330609

29. H. Z. Hamdan, E. Kubbara, A. M. Adam, O. S. Hassan, S. O. Suliman, and I. Adam. Urinary tract infections and antimicrobial sensitivity among diabetic patients at Khartoum, Sudan. *Ann Clin Microbiol Antimicrob*. Apr.

2015; 14(1); 1-6.

<https://doi.org/10.1186/s12941-015-0082-4>

PMid:25896611 PMCID:PMC4406170

30. "(PDF) Patterns of antibiotic sensitivity of bacterial pathogens among urinary tract infections (UTI) patients in a Pakistani population." Accessed: Feb. 14, 2024. [Online]. Available: https://www.researchgate.net/publication/228520002_Patterns_of_antibiotic_sensitivity_of_bacterial_pathogens_among_urinary_tract_infections_UTI_patients_in_a_Pakistani_population

31. K. Bano, et al. Patterns of antibiotic sensitivity of bacterial pathogens among urinary tract infections (UTI) patients in a Pakistani population. *Afr J Microbiol Res.* Jan. 2012; 6(2).

<https://doi.org/10.5897/AJMR11.1171>

32. T. Khawcharoenporn, S. Vasoo, E. Ward, and K. Singh. High rates of quinolone resistance among urinary tract infections in the ED. *Am J Emerg Med.* Jan. 2012; 30(1): 68-74.

<https://doi.org/10.1016/j.ajem.2010.09.030>

PMid:21075586

33. Z. N. Tano, et al. Susceptibility to first choice antimicrobial treatment for urinary tract infections to *Escherichia coli* isolates from women urine samples in community South Brazil. *The Brazilian Journal of Infectious Diseases.* May 2022; 26(3):102366.

<https://doi.org/10.1016/j.bjid.2022.102366>

PMid:35594950 PMCID:PMC9217753

34. R. Das, E. Perrelli, V. Towle, P. H. Van Ness, and M.

Juthani-Mehta. Antimicrobial Susceptibility of Bacteria Isolated from Urine Samples Obtained from Nursing Home Residents. *Infection control and hospital epidemiology: the official journal of the Society of Hospital Epidemiologists of America.* 2009;30(11):1116.

<https://doi.org/10.1086/647981>

PMid:19785518 PMCID:PMC2866029

35. H. Y. Liu, H. C. Lin, Y. C. Lin, S. hua Yu, W. H. Wu, and Y. J. Lee. Antimicrobial susceptibilities of urinary extended-spectrum beta-lactamase-producing *Escherichia coli* and *Klebsiella pneumoniae* to fosfomycin and nitrofurantoin in a teaching hospital in Taiwan. *J Microbiol Immunol Infect.* Oct. 2011; 44(5): 364-368.

<https://doi.org/10.1016/j.jmii.2010.08.012>

PMid:21524974

36. Y. C. Lin, M. Kuroda, S. Suzuki, and J. J. Mu. Emergence of an *Escherichia coli* strain co-harboring *mcr-1* and *bla*NDM-9 from a urinary tract infection in Taiwan. *J Glob Antimicrob Resist.* Mar. 2019;16: pp. 286-290.

<https://doi.org/10.1016/j.jgar.2018.10.003>

PMid:30312830

37. A. O. Olaitan, S. Morand, and J. M. Rolain. Mechanisms of polymyxin resistance: Acquired and intrinsic resistance in bacteria. *Front Microbiol.* Nov. 2014;5:116005.

<https://doi.org/10.3389/fmicb.2014.00643>

PMid:25505462 PMCID:PMC4244539

Challenges and Remedies in the age of antimicrobial Resistance Landscape: Ventilator-Associated Pneumonia

Md. Farhan Azad Badhon^{*1}, Nadia Natasha Ahmed Chowdhury², Farjan Azad³,
Abhijit Mondol⁴, Gaitri Kashyapi⁵, Abul Kalam Azad⁶

Abstract

Introduction: Ventilator-associated pneumonia (VAP) is a potentially fatal illness that arises in people who are on mechanical ventilation, generally in an intensive care unit (ICU) or a similar hospital setting. When bacteria or other pathogens infiltrate the lungs of a ventilated patient, VAP develops. This illness has the potential to cause serious complications, such as respiratory distress and lengthy hospitalization. **Objective:** This study aims to find and fix ICU ventilator-associated pneumonia management problems and possible solutions. **Materials and Methods:** This study was conducted in a medical college hospital for one year (January 2022-January 2023). 100 patients were included in this study based on the inclusion criteria. **Result:** 32 patients aged 60-69 years, mostly male (57), had common comorbidities: DM (70), hypertension (66), and heart failure (38). Major risk factors for VAP were age over 60 years, tracheostomy, Ng tube reintubation, enteral nutrition, witnessed aspiration, COPD, and coma. Patients diagnosed with cough were tested for C/S, blood was tested for C/S, and pleural fluid was tested for C/S. The major pathogens found were *Pseudomonas*, *S. Aureus* (including MRSA), *Enterobacteriaceae*, and *Streptococcus*. The antibiotics used in our study were carbapenem and linezolid. We used piperacillin-tazobactam and tigecycline. **Conclusion:** VAP may result in higher rates of morbidity, mortality, and medical expenses. Improving patient outcomes requires an early diagnosis and suitable therapy.

Keyword: Mechanical ventilation, Ventilation associated pneumonia, Intensive care unit, Blood for C/S, Cough for C/S, Pleural fluid for C/S, *Pseudomonas*, Tracheostomy, Enteral nutrition, Acute respiratory distress syndrome.

Number of Tables; 04; Number of Figures; 02; Number of References; 15; Number of Correspondences; 04.

*1. Corresponding Author:

Dr. Md. Farhan Azad Badhon
Assistant Professor & Head
Department of Analgesia and Intensive Care Medicine
City Medical College and Hospital
Dhaka, Bangladesh.
email: badhon.bmc@gmail.com

2. Dr. Nadia Natasha Ahmed Chowdhury

Sonologist
Department of Radiology and Imaging
Dhaka General and Orthopaedic Hospital
Dhaka, Bangladesh.

3. Dr. Farjan Azad

Medical Officer
Dhaka General and Orthopaedic Hospital
Dhaka, Bangladesh.

4. Dr. Abhijit Mondol

Assistant Professor
Department of Anesthesiology
Gazi Medical College, Khulna, Bangladesh.

5. Dr. Gaitri Kashyapi

Assistant Professor
Department of Anesthesiology
Gazi Medical College
Khulna, Bangladesh.

6. Dr. Abul Kalam Azad

Professor & Unit Head
Department of Orthopaedic
Shaheed Monsur Ali Medical College
Ex Unit Head (Red 2)
Nitor-Ex Pongu Hospital, Dhaka, Bangladesh.

Introduction:

Ventilator-associated pneumonia (VAP) is a pulmonary parenchyma infection that occurs in patients who have been on invasive mechanical ventilation for a minimum of 48 hours. This is a form of pneumonia that is acquired in the intensive care unit (ICU)¹. Several risk factors contribute to the development of ventilator-associated pneumonia (VAP). Factors that increase the risk for patients include age, pre-existing illness, weakened immune system, hunger, and changes in mental state. Factors related to medical devices include the use of a breathing tube, length of time on a ventilator, type of ventilation, use of sedatives, and patient positioning (patients lying flat on their back are more likely to inhale foreign material compared to those in a partially upright position). Several healthcare-related risk factors exist: VAP is caused by factors such as inadequate hand hygiene, inadequate infection control measures, cross-contamination, and excessive use of antibiotics. The incidence of ventilator-associated pneumonia (VAP) ranges between 5-40% in patients who have invasive mechanical

ventilation for more than 2 days. However, the specific percentage varies depending on factors such as the nation, the type of intensive care unit (ICU), and the criteria used to diagnose VAP²⁻⁴. The EU-VAP/CAP study found that there were 18.3 incidents of ventilator-associated pneumonia (VAP) per 1000 ventilator days⁵. Early identification of VAP is crucial due to the higher risk of mortality associated with delayed antimicrobial therapy⁶⁻⁸. Clinicians use clinical, radiographic, and laboratory indicators to diagnose VAP and start antibiotics. Symptoms may include fever, purulent secretions, hypoxemia, new or progressive chest radiographic infiltrate, elevated white blood cell count, and positive cultures of endotracheal aspirates or bronchoscopic sampling techniques⁹. Alcohol-based hand washing policy, early device discontinuation, and decreased reintubation rates. usage of oropharyngeal instead of nasopharyngeal feeding tubes, subglottic secretions aspiration (HI-LO ETT), and Semi-recumbent patient position (30–45°). Endotracheal tube cuff pressure is about 20 cm H₂O. Usage of small bowel feeding instead of gastric feeding can reduce the risk of VAP. Promotion of NIPPV as an alternative to invasive ventilation to reduce VAP risk. Polyurethane-cuffed and silver/antibiotic-coated tubes may reduce infection risk. Practice good oral hygiene to reduce infection risk. Early weaning and extubation reduce VAP risk. Reducing sedation speeds up recovery and promotes early extubation. Heat-moisture exchangers are preferred over heater humidifiers because they maintain proper humidity levels in the respiratory tract and may reduce infection risk. Probiotics can help maintain a healthy gut microbiome and reduce infection risk. Using a mucus shaver can remove biofilm in endotracheal tubes and lower VAP risk¹⁰⁻¹².

Objective: The objective of this study is to identify and address the challenges and solutions associated with the treatment of ventilator-associated pneumonia in the intensive care unit (ICU).

Materials and Methods:

This cross-sectional observational study took place in a tertiary medical college hospital over one year (January 2022-January 2023). According to the inclusion criteria, 100 patients were included in this study. The study was conducted with the participation of tonsillitis patients and their records (as determined by WHO/AHA criteria).

Inclusion criteria were Patient with critical illness and Patient with pneumonia. **Data analysis:** The checklist is categorized into four sections. The initial section presented socio-demographic data, including age, gender, marital status, and occupation. The second section discussed the commodities and risk factors related to ventilator-associated pneumonia (VAP). The third section discussed common investigations, including the identification and susceptibility testing of microorganisms obtained from cultured specimens. The fourth section discusses the antibiotics employed for the treatment of ventilator-associated pneumonia (VAP). The information was entered into SPSS 23. The significance

threshold was set at 0.05.

Results:

Table I presents a range of socio-demographic factors. The majority of cases (32) fell within the age range of 70-79 years, followed by 27 cases in the age range of 60-69 years. There were 21 cases in the age range of 50-59 years, 12 cases in the age range of 80-89 years, and only 8 cases in the age range of 40-49 years. Out of the total cases, 57 were male and 43 were female. Out of the total number of cases studied, 87 patients were married while 13 were unmarried. Out of the total number of cases, 47 cases were businessmen, 23 were service holders, 17 were housewives, and the remaining 13 cases were engaged in other occupations.

Table I: Socio-demographic factors in our study cases(n=100)

Socio-demographic factors	Frequency	Percentage
Age		
40-49	8	8
50-59	21	21
60-69	27	27
70-79	32	32
80-89	12	12
Sex		
Male	57	57
Female	43	43
Marital status		
Married	87	87
Unmarried	13	13
Occupation		
Businessman	47	47
Service-holder	23	23
Housewives	17	17
Others	13	13

Figure 1 shows that 67% of the cases had hypertension, 30% had COVID-19, a maximum of 70% had diabetes mellitus, 15% had CKD, and 73.33% were on dialysis. Additionally, 21% had stroke, 38% had heart failure, 7 cases had lung cancer, and 15% had sepsis during presentation.

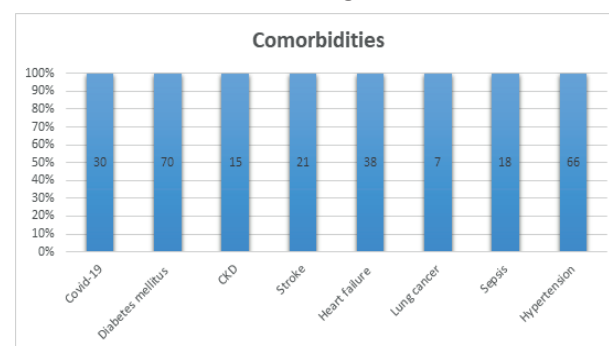


Figure 1: Various comorbidities in our study cases(n=100)

Table II presents several risk factors associated with ventilator-associated pneumonia (VAP). These risk factors include aspiration (37 cases), chronic obstructive pulmonary disease (COPD) (27 cases), improper posture (21 cases), coma (32 cases), enteral nutrition for feeding (51 cases), nasogastric tube reintubation (44 cases), tracheostomy (49

cases), acute respiratory distress syndrome (ARDS) (46 cases), and age over 60 years (71 cases).

Table II: Various risk factors in our study cases(n=100)

Risk Factors	Frequency	Percentage
Witnessed aspiration	37	37
Chronic obstructive pulmonary disease	27	27
Positioning	21	21
Coma	32	32
Enteral nutrition	51	51
Nasogastric tube reintubation	44	44
Tracheostomy	49	49
Acute respiratory distress syndrome	46	46
Age more than 60 years	71	71

Table III lists several common investigations. All 100 cases underwent a complete blood count, chest X-ray with a posterior-anterior view, and blood tests for culture and sensitivity, as well as cough samples for culture and sensitivity. A total of 92 cases underwent arterial blood gas analysis, 57 cases underwent pleural fluid culture and sensitivity testing, only 7 cases underwent high-resolution computed tomography (HRCT) of the chest, and electrocardiography (ECG) and echocardiography were performed in 69 cases. Additionally, infective markers such as S Procalcitonin and LDH were assessed in 25 cases. A total of 53 cases underwent renal function testing.

Table III: Common investigations done in our study cases.

Investigations	Frequency	Percentage
Complete blood count	100	100
Chest X-ray P/A view	100	100
Blood for C/S	100	100
Pleural fluid C/S	57	57
HRCT Chest	7	7
Cough for C/S	100	100
ABG	92	92
Renal functions test	53	53
ECG and Echocardiography	69	69
S procalcitonin and LDH	25	25

Table IV lists common microorganisms found in our study cases. In our study, the majority of cases (37%) were infected by *Pseudomonas*, followed by 22 cases infected by *S. aureus* (including MRSA), 13 cases infected by *Enterobacteriaceae*, 10 cases infected by *Streptococcus* species, 7 cases infected by *Hemophilus* species, 2 cases infected by *Acinetobacter* species, and 9 cases (9%) had no growth in their culture and sensitivity.

Table IV: Microorganism found in culture and sensitivity of specimen(n=100)

Microorganism	Frequency	Percentage
<i>Pseudomonas</i>	37	37
<i>S. aureus</i> including MRSA	22	22
<i>Enterobacteriaceae</i>	13	13
<i>Streptococcus</i> species	10	10
<i>Hemophilus</i> species	7	7
<i>Acinetobacter</i> species	2	2
No growth	9	9

Figure 2 provides a list of the antibiotics utilized in our study group. Carbapenem was administered in 32% of cases,

followed by the usage of linezolid in another 32% of cases. Piperacillin-tazobactam was used in 18% of cases, while tigecycline was only used in 15% of cases.

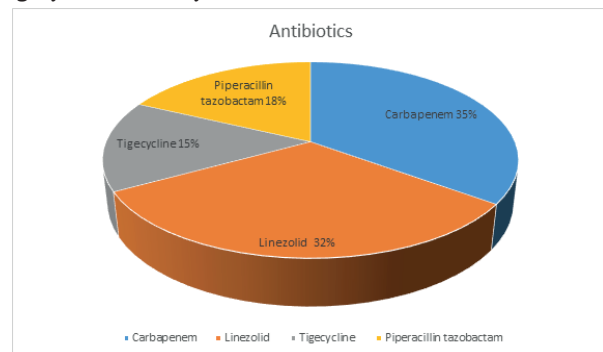


Figure 2: Antibiotics used in VAP in our study cases (n=100)

Discussion:

In our study, the largest proportion of cases (32) occurred among individuals aged 70-79 years, with the second largest proportion being 27 cases among those aged 60-69 years. There were 21 cases among individuals aged 50-59, 12 cases among those aged 80-89, and 8 cases among those aged 40-49. Of the total number of cases, 57 were male and 43 were female. In a separate study, the gender distribution of the 76 participants consisted of 56 men (73.7%) and 20 women (26.3%), which aligns with the findings of our study¹³. Among the cases studied, 87 patients were married and 13 patients were unmarried. Among the cases, 47 were businessmen, 23 were service holders, 17 were housewives, and the remaining 13 were involved in various other occupations. Our study revealed several risk factors associated with ventilator-associated pneumonia (VAP). These risk factors include aspiration (37 cases), chronic obstructive pulmonary disease (COPD) (27 cases), improper posture (21 cases), coma (32 cases), enteral nutrition for feeding (51 cases), nasogastric tube reintubation (44 cases), tracheostomy (49 cases), acute respiratory distress syndrome (ARDS) (46 cases), and age over 60 years (71 cases). Our study includes several commonly conducted investigations. All 100 cases underwent a comprehensive diagnostic evaluation, including a complete blood count, chest X-ray (posterior-anterior view), blood tests for culture and sensitivity, and collection of cough samples for culture and sensitivity analysis. Ninety-two cases underwent arterial blood gas analysis, while pleural fluid culture and sensitivity testing were conducted in 57 cases. High-resolution computed tomography (HRCT) of the chest was performed in only 7 cases, and electrocardiography (ECG) and echocardiography were conducted in 69 cases. In addition, 25 cases were evaluated for infective markers, including S Procalcitonin and LDH. A total of 53 cases were subjected to renal function testing. In our study, the most prevalent pathogen was *Pseudomonas*, accounting for 37% of the cases. *S. aureus* (including MRSA) was responsible for infection in 22 cases, followed by *Enterobacteriaceae* in 13 cases, *Streptococcus*

species in 10 cases, *Hemophilus* species in 7 cases, *Acinetobacter* species in 2 cases, and 9 cases (9%) showed no growth in culture and sensitivity tests. Multiple antibiotics were utilized in our study cases. Carbapenem was administered in 32% of cases, while linezolid was used in another 32% of cases. Piperacillin-tazobactam was administered in 18% of cases, whereas tigecycline was administered in only 15% of cases. In a separate study, it was found that non-immunocompromised patients with early-onset ventilator-associated pneumonia (VAP) and no risk factors for multidrug-resistant (MDR) pathogens can be treated with monotherapy using a narrow-spectrum antibiotic, specifically a non-pseudomonal third-generation cephalosporin^{13,14}. In separate studies, the initial empiric treatment involves the use of a broad-spectrum β -lactam antibiotic that targets *Pseudomonas aeruginosa* and/or ESBL-producing Enterobacteriaceae. Examples of these antibiotics include ceftazidime, cefepime, piperacillin-tazobactam, or a carbapenem. Additionally, a non- β -lactam antipseudomonal agent such as aminoglycosides (amikacin or tobramycin) or fluoroquinolones (ciprofloxacin or levofloxacin) is also used^{14,15}.

Conclusion:

VAP is a global challenge in ICUs and healthcare institutions. This lung infection is a serious threat to patients on mechanical ventilation, leading to longer hospital stays, higher healthcare costs, and in severe cases, significant morbidity and mortality. ICU and institution measures prevent VAP. The measures focus on infection control, device management, surveillance, and antibiotic use. Healthcare providers can reduce VAP by following guidelines and using evidence-based strategies. Medical technology advancements offer new possibilities for VAP prevention and management. Improving understanding and preventive measures can reduce the burden of VAP on patients and healthcare systems. Preventing VAP is important for patient outcomes and healthcare quality. It emphasizes healthcare professionals' dedication to safe and effective care for vulnerable patients. Healthcare collaboration reduces VAP and improves quality for critically ill individuals.

References:

1. Papazian L, Klompas M, Luyt CE. Ventilator-associated pneumonia in adults: a narrative review. *Intensive care medicine*. 2020 May;46(5):888-906.
<https://doi.org/10.1007/s00134-020-05980-0>
PMid:32157357 PMCID:PMC7095206
2. American Thoracic Society, Infectious Diseases Society of America. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. *American journal of respiratory and critical care medicine*. 2005 Feb 15;171(4):388.
<https://doi.org/10.1164/rccm.200405-644ST>
3. Reignier J, Mercier E, Le Gouge A, Boulain T, Desachy A, Bellec F, et al. Effect of not monitoring residual gastric

volume on risk of ventilator-associated pneumonia in adults receiving mechanical ventilation and early enteral feeding: a randomized controlled trial. *Jama*. 2013 Jan 16;309(3):249-56.

<https://doi.org/10.1001/jama.2012.196377>

PMid:23321763

4. Seguin P, Laviolle B, Dahyot-Fizelier C, Dumont R, Veber B, Gergaud S, et al. Effect of oropharyngeal povidone-iodine preventive oral care on ventilator-associated pneumonia in severely brain-injured or cerebral hemorrhage patients: a multicenter, randomized controlled trial. *Critical care medicine*. 2014 Jan 1;42(1):1-8.

<https://doi.org/10.1097/CCM.0b013e3182a2770f>

PMid:24105456

5. Koulenti D, Tsigou E, Rello J. Nosocomial pneumonia in 27 ICUs in Europe: perspectives from the EU-VAP/CAP study. *European journal of clinical microbiology & infectious diseases*. 2017 Nov;36:1999-2006.

<https://doi.org/10.1007/s10096-016-2703-z>

PMid:27287765

6. Celis R, Torres A, Gatell JM, Almela M, Rodríguez-Roisin R, Agustí-Vidal A. Nosocomial pneumonia: a multivariate analysis of risk and prognosis. *Chest*. 1988 Feb 1;93(2):318-24.

<https://doi.org/10.1378/chest.93.2.318>

PMid:3338299

7. Alvarez-Lerma F, ICU-acquired Pneumonia Study Group. Modification of empiric antibiotic treatment in patients with pneumonia acquired in the intensive care unit. *Intensive care medicine*. 1996 May;22:387-94.

<https://doi.org/10.1007/BF01712153>

PMid:8796388

8. Kuti EL, Patel AA, Coleman CI. Impact of inappropriate antibiotic therapy on mortality in patients with ventilator-associated pneumonia and blood stream infection: a meta-analysis. *Journal of critical care*. 2008 Mar 1;23(1):91-100.

<https://doi.org/10.1016/j.jcrc.2007.08.007>

PMid:18359426

9. Fernando SM, Tran A, Cheng W, Klompas M, Kyeremanteng K, Mehta S, et al. Diagnosis of ventilator-associated pneumonia in critically ill adult patients-a systematic review and meta-analysis. *Intensive care medicine*. 2020 Jun;46:1170-9.

<https://doi.org/10.1007/s00134-020-06036-z>

PMid:32306086 PMCID:PMC7223448

10. Dimopoulos G, Poulakou G, Pneumatikos IA, Armaganidis A, Kollef MH, Matthaiou DK. Short-vs long-duration antibiotic regimens for ventilator-associated pneumonia: a systematic review and meta-analysis. *Chest*. 2013 Dec 1;144(6):1759-67.

<https://doi.org/10.1378/chest.13-0076>

PMid:23788274

11. Swoboda SM, Dixon T, Lipsett PA. Can the clinical pulmonary infection score impact ICU antibiotic days?. *Surgical infections*. 2006 Aug 1;7(4):331-9.

<https://doi.org/10.1089/sur.2006.7.331>

PMid:16978076

12. Vallés J, Peredo R, Burgueño MJ, De Freitas AP, Millán S, Espasa M, et al. Efficacy of single-dose antibiotic against early-onset pneumonia in comatose patients who are ventilated. *Chest*. 2013 May 1;143(5):1219-25.

<https://doi.org/10.1378/chest.12-1361>

PMid:23715136

13. Charles MP, Easow JM, Joseph NM, Ravishankar M, Kumar S, Umadevi S. Incidence and risk factors of ventilator associated pneumonia in a tertiary care hospital. *The Australasian medical journal*. 2013;6(4):178.

<https://doi.org/10.4066/AMJ.2013.1627>

<https://doi.org/10.21767/AMJ.2013.1627>

PMid:23671462 PMCID:PMC3650308

14. Torres A, Niederman MS, Chastre J, Ewig S, Fernandez-Vandellos P, Hanberger H, et al. International ERS/ESICM/ESCMID/ALAT guidelines for the management of hospital-acquired pneumonia and ventilator-associated pneumonia: Guidelines for the management of hospital-acquired pneumonia (HAP)/ventilator-associated pneumonia (VAP) of the European Respiratory Society (ERS), European Society of Intensive Care Medicine (ESICM), European Society of Clinical Microbiology and Infectious Diseases (ESCMID) and Asociación Latinoamericana del Tórax (ALAT). *European Respiratory Journal*. 2017 Sep 1;50(3).

<https://doi.org/10.1183/13993003.00582-2017>

PMid:28890434

15. Papazian L, Klompas M, Luyt CE. Ventilator-associated pneumonia in adults: a narrative review. *Intensive care medicine*. 2020 May;46(5):888-906.

<https://doi.org/10.1007/s00134-020-05980-0>

PMid:32157357 PMCID:PMC7095206

Generalized Anxiety in Uninvestigated Dyspepsia Patients: A Single Centre Cross-Sectional Study

Imteaz Mahbub^{*1}, Md. Enamul Karim², Md. Altaf Hossain³, Md. Moshfiquir Rahman Chowdhury⁴, Al Mahmood Appolo⁵, Sayeda Rahim⁶

Abstract

Introduction: Generalized anxiety is the most common mental disorder worldwide. Psychological stress like anxiety may cause gastrointestinal distress and lead to dyspeptic symptoms. Moreover, dyspepsia especially uninvestigated dyspepsia in turn may cause anxiety among the patients by creating uncertainty about the disease and its future.

Objective: To measure anxiety among patients suffering from uninvestigated dyspepsia. **Materials and Methods:** This study was conducted at the outpatient department of Medical Gastroenterology, Sheikh Russel National Gastroenterology Institute and Hospital from December 2023 to May 2024 over six months. A total of 164 patients of uninvestigated dyspepsia patients were enrolled and by dint of GAD-7 validated Bengali questionnaire their generalized anxiety level was measured and categorized. Demographic variables were analyzed by chi square test and correlation with anxiety and number of symptoms was done by Pearson correlation. P value < 0.05 was regarded as statistically significant.

Results: One hundred and sixty-four patients with uninvestigated dyspepsia attending the outpatient department of Sheikh Russel National Gastroenterology Institute and Hospital from December 2023 to May 2024 were enrolled. Among the patients, 92 patients were female and 72 were male without any significant difference ($P = 0.06$). The common age group with dyspepsia and anxiety was 18-40 years. The difference with higher age groups was significant ($P = 0.02$). Most participants were service holders or businessman professions without significant differences ($P = 0.97$). There was a significant positive correlation between anxiety and an increasing number of symptoms of dyspepsia ($P = 0.007$, $r = +.9929$). **Conclusion:** Anxiety and dyspepsia have a positive relationship. Younger age, female sex and stressed professions like service may contribute to dyspepsia.

Keywords: Generalized Anxiety, Uninvestigated Dyspepsia, GAD-7 Questionnaire.

Number of Tables: 02; Number of References: 20; Number of Correspondence: 03.

*1. Corresponding Author:

Dr. Imteaz Mahbub

Registrar

Medical Gastroenterology

Sheikh Russel National Gastroenterology Institute and Hospital
Mohakhali, Dhaka, Bangladesh.

Email: imteaz121@gmail.com

Mobile- +8801715792435

2. Dr. Md. Enamul Karim

FCPS (Medicine), MD (Gastroenterology)

Associate Professor

Medical Gastroenterology

Sheikh Russel National Gastroenterology Institute and Hospital
Mohakhali, Dhaka, Bangladesh.

3. Dr. Md. Altaf Hossain

MD (Gastroenterology)

Assistant Registrar

Medical Gastroenterology

Sheikh Russel National Gastroenterology Institute and Hospital
Mohakhali, Dhaka, Bangladesh.

4. Dr. Md. Moshfiquir Rahman Chowdhury

FCPS (Medicine), MD (Gastroenterology)

Registrar

Medical Gastroenterology

Sheikh Russel National Gastroenterology Institute and Hospital
Mohakhali, Dhaka, Bangladesh.

5. Dr. Al Mahmood Appolo

MD (Gastroenterology)

Resident Physician

Medical Gastroenterology

Sheikh Russel National Gastroenterology Institute and Hospital
Mohakhali, Dhaka, Bangladesh.

6. Dr. Sayeda Rahim

MD (Gastroenterology), FRCP (USA)

Professor

Medical Gastroenterology

Sheikh Russel National Gastroenterology Institute and Hospital
Mohakhali, Dhaka, Bangladesh.

Introduction:

Generalized Anxiety Disorder (GAD) belongs to a group of mental health conditions including panic disorder, phobias, social anxiety disorder, Obsessive-Compulsive Disorder (OCD), and Post-Traumatic Stress Disorder (PTSD)¹. In the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), GAD has been stated to include both psychological symptoms such as persistent worrying and overthinking, difficulty handling uncertainty, restlessness, indecisiveness, etc. as well as physiological symptoms such as fatigue, sleeplessness, muscle tension, nervousness, nausea, irritability, etc.^{2,3}. About 4% population of the world is suffering from generalized anxiety disorder. In the year 2019, 301 million people in the world suffered from anxiety disorder⁴. So, it is the most common mental disorder worldwide. A study estimated the prevalence of GAD to be around 37.3% among individuals in Bangladesh aged between 13 to 63 years⁵. Dyspepsia is one of the most common medical conditions observed throughout the whole world. It affects 20–45% of the general adult population^{6,7}. The term ‘dyspepsia’ was derived from the Greek term ‘dyspeptos’ which means ‘difficult to digest’. ‘Indigestion’ is the non-medical term for dyspepsia. Dyspepsia is used to describe a constellation of symptoms arising from the upper abdomen, such as upper abdominal ‘discomfort’, ‘pain’, bloating, upper abdominal fullness, burning, flatulence, satiation, nausea, vomiting, heartburn, regurgitation, frequent burping (belching) and anorexia⁸. Dyspepsia may be divided into two types- Organic and functional⁹. Uninvestigated dyspepsia indicates patients with new or recurrent dyspeptic symptoms in whom no investigations have been previously undertaken¹⁰. Globally, the prevalence of uninvestigated dyspepsia (UD) varies between 7% - 45%, depending on the definition used and geographical location, whilst the prevalence of FD has been noted to vary between 11% - 29.2%¹¹. The prevalence of dyspepsia in the adult population of Bangladesh is 61.9% which is very high compared to other countries and also much higher than the prevalence found in our country thirty years back¹². In an Australian population-based study, it was found that psychological distress was linked to having persistent functional gastrointestinal symptoms and frequently seeking health care for them. However, these subjects were not investigated for structural disease¹³. In a Finnish study, the risk of having mental distress was nearly 4-fold higher among patients with dyspepsia and functional dyspepsia than among controls¹⁴. This study aims to measure the generalized anxiety level in uninvestigated dyspepsia patients.

Materials and Methods:

This was a cross-sectional study conducted at the outpatient department of Medical Gastroenterology, Sheikh Russel National Gastroenterology Institute and Hospital from December 2023 to May 2024 over six months. A total of 164 consecutive willing adult patients suffering from uninvestigated dyspepsia were enrolled in the study. Patients

suffering from prior anxiety disorders and any neuropsychiatric disorders were excluded from the study. The GAD-7 questionnaire was used to measure generalized anxiety symptoms¹⁵. It was validated in Bengali and that questionnaire was used here¹⁶. As per definition common upper abdominal symptoms like epigastric pain, epigastric burning, postprandial fullness, early satiety, bloating, and anorexia were regarded as dyspeptic symptoms. Ethical clearance was taken from ethical review committee of the institute. Demographic data including sex, age, and profession were noted and analyzed by chi-square test. Correlation between the number of patients with one/ two symptoms or three or more than three symptoms with different levels of anxiety was done by Pearson Correlation. All analyses were performed using the statistical software package SPSS version 26.0. P value < 0.05 was considered as statistically significant.

Results:

A total of 164 patients suffering from uninvestigated dyspepsia were enrolled in the study. This study was done in the outpatient department of Sheikh Russel National Gastroenterology Institute from December 2023 to May 2024.

Table I shows common demographic features of the patients of uninvestigated dyspepsia participating in the study. Among the participants 92 (56.09%) were female and 72 (43.91%) were male. The difference between the two groups with different levels of anxiety was not statistically significant (P = 0.06). Anxiety was found to be more in the 18-40 years age group. The difference between the 18-40 years age group, 41-60 years age group, and >60 years age group was statistically significant (P = 0.02). Among the participants business and service were the predominant profession. The difference between the participants' professions was not statistically significant (P = 0.97).

Table-I: Demographic Profile of Uninvestigated Dyspepsia Patient

Parameter	No Anxiety	Mild Anxiety	Moderate Anxiety	Severe Anxiety	P Value
Gender					
Male	12	28	30	2	0.06
Female	16	38	26	10	
Age					
18-40 years	12	38	22	6	0.02*
41-60 years	8	20	12	2	
≥ 60 years	8	8	22	6	
Profession					
Business	5	12	13	2	0.97
Farming	5	10	9	3	
Service	13	36	25	6	
Studentship	5	8	9	3	

Table II shows the correlation between different levels of anxiety and patients with only one/two symptoms or patients with three or more symptoms. It was positively correlated and statistically significant ($r = +0.9929$, $P = 0.007$).

Table II: Correlation between Different Levels of Anxiety with Dyspeptic Symptoms

Parameter	Patients with One/Two symptoms	Patients with Three or more symptoms	Correlation coefficient	P Value
No Anxiety	12	16	+0.9929	0.007*
Mild Anxiety	24	42		
Moderate Anxiety	20	36		
Severe Anxiety	6	8		

Discussion:

This cross-sectional study was conducted in the outpatient department of Sheikh Russel National Gastroenterology Institute and Hospital from December 2023 to May 2024. A total of 164 patients with uninvestigated dyspepsia were enrolled in the study. Females are more prone to anxiety among dyspepsia patients¹⁷. Our study showed the same. Females 92(56.09%) were more in number than males 72 (43.91%). But the difference was statistically insignificant ($P = 0.06$). The age group with the most predominant dyspeptic symptoms in this study was the 18-40 years age group with a total of 78 (47.56%) patients. In a previous study conducted by Huang et al, among the study participants, 52.04% of patients with dyspepsia were found in the 18-29- and 30-39-years age groups. The difference between 18-40 years, 41-60 years, and > 60 years age group were found to be statistically significant ($P=0.02$). Among the participants service and business are the most predominant profession. Dyspepsia may be related to the professions with high mental stress. Huang et al showed dyspepsia is more common in manual workers (45.98%)¹⁸. However, there was no statistically significant difference ($P = 0.97$). A significant positive relationship was found between anxiety and dyspepsia with p value of 0.007 and a correlation coefficient of 0.9929. One Swedish study showed a significant relationship between uninvestigated dyspepsia and functional dyspepsia with anxiety¹⁹. Another study by Tshabalala, et al in a hospital in South Africa found that among the 201 participants, 149 had dyspepsia along with anxiety²⁰. However, this study had some limitations. Other factors that may contribute to dyspepsia like alcohol consumption, smoking, NSAID intake, and genetic factors were not analyzed or taken into account in this study. So, future research based on those factors along with both anxiety and depression may help to identify all the factors related to dyspepsia.

Conclusion:

According to the result of this study, Anxiety and dyspepsia have a significant positive relationship. Moreover, younger age patients are found to be more prone to suffer from anxiety and dyspepsia. Further large-scale population-based study is wanted to find out all the factors leading to dyspepsia in Bangladesh.

Conflict of Interest: None.

Acknowledgement:

We are grateful to the Director and doctors and staffs of Outpatient department of Sheikh Russel National Gastroenterology Institute, Dhaka. We are also grateful to all the patients who willingly participated in our research work with their consent and kind cooperations.

Reference:

1. Bystritsky A, Khalsa SS, Cameron ME, Schiffman J. Current diagnosis and treatment of anxiety disorders. 2013 Jan; 38(1):30-57.

2. Widiger TA, Costa PT. American Psychological Association, editors. Personality disorders and the five-factor model of personality. Washington, DC: American Psychological Association; 2013.

<https://doi.org/10.1037/13939-000>

3. Dugas MJ, Anderson KG, Deschenes SS, Donegan E. Generalized anxiety disorder publications: Where do we stand a decade later? Journal of Anxiety Disorders. 2010 Oct 1;24(7):780-4.

<https://doi.org/10.1016/j.janxdis.2010.05.012>

4. GBD Results Tool. In: Global Health Data Exchange [website]. Seattle: Institute for Health Metrics and Evaluation; 2019.

5. Islam MS, Ferdous MZ, Potenza MN. Panic and generalized anxiety during the COVID-19 pandemic among Bangladeshi people: An online pilot survey early in the outbreak. Journal of affective disorders. 2020 Nov 1;276:30-7.

<https://doi.org/10.1016/j.jad.2020.06.049>

6. Tougas, G., Chen, Y., Pieway, H.P.D., et al. Prevalence and impact of upper gastrointestinal symptoms in the Canadian population: findings from the DIGEST study. Official journal of the American College of Gastroenterology| ACG. 1999;94(10):2845-2854.

<https://doi.org/10.1111/j.1572-0241.1999.01427.x>

7. Veldhuyzen van Zanten, S.J., Flook, N., Chiba, N., et al. An evidence-based approach to the management of uninvestigated dyspepsia in the era of Helicobacter pylori. Canadian Dyspepsia Working Group. CMAJ: Canadian Medical Association Journal- Journal de L'association Medicale Canadienne. 2000;162(12 Suppl): pp.S3-23.

8. MD, D.E.K. Evaluation and management of nonulcer dyspepsia. American Family Physician. 2004;70(1):107-114.

9. Oustamanolakis P, Tack J. Dyspepsia: organic versus functional. J Clin Gastroenterol. 2012 Mar;46(3):175-90.

<https://doi.org/10.1097/MCG.0b013e318241b335>

10. Basandra S, Bajaj D. Epidemiology of Dyspepsia and Irritable Bowel Syndrome (IBS) in Medical Students of Northern India. J Clin Diagn Res. 2014 Dec;8(12):JC13-6.

<https://doi.org/10.7860/JCDR/2014/10710.5318>

11. Mahadeva S, Goh KL. Epidemiology of functional dyspepsia: a global perspective. World J Gastroenterol. 2006 May 7;12(17):2661-6.

<https://doi.org/10.3748/wjg.v12.i17.2661>

12. Chowdhury J, Islam MS, Miah AR, Saha A, Pal P, Siddique AA, et al. Study of the Prevalence of Dyspepsia in the Adult Population in a Rural Community of Bangladesh. Mymensingh Med J. 2019 Jan;28(1):163-174.

13. Koloski NA, Talley NJ, Boyce PM. Does psychological distress modulate functional gastrointestinal symptoms and health care seeking? A prospective, community cohort study. Am J Gastroenterol 2003;98:789-797.

<https://doi.org/10.1111/j.1572-0241.2003.07388.x>

14. Pajala M, Heikkinen M, Hintikka J. Mental distress in patients with functional or organic dyspepsia: a comparative study with a sample of the general population. *Aliment Pharmacol Ther.* 2005; 21:277-281.
<https://doi.org/10.1111/j.1365-2036.2005.02296.x>
15. Sapra A, Bhandari P, Sharma S, Chanpura T, Lopp L. Using Generalized Anxiety Disorder-2 (GAD-2) and GAD-7 in a Primary Care Setting. *Cureus.* 2020 May 21;12(5):e8224.
<https://doi.org/10.7759/cureus.8224>
16. Dhira TA, Rahman MA, Sarker AR, Mehareen J. Validity and reliability of the Generalized Anxiety Disorder-7 (GAD-7) among university students of Bangladesh. *PloS one.* 2021 Dec 16;16(12):e0261590.
<https://doi.org/10.1371/journal.pone.0261590>
17. Adibi P, Keshteli AH, Daghighzadeh H, Roohafza H, Pournaghshband N, Afshar H. Association of anxiety, depression, and psychological distress in people with and without functional dyspepsia. *Adv Biomed Res.* 2016 Dec 27;5:195.
<https://doi.org/10.4103/2277-9175.190936>
18. Huang ZP, Yang XF, Lan LS, Liu T, Liu CL, Li JL, Liang ZH. Correlation between social factors and anxiety-depression in function dyspepsia: do relationships exist?. *Gastroenterology Review/Przegląd Gastroenterologiczny.* 2014 Jan 1;9(6):348-53.
<https://doi.org/10.5114/pg.2014.47897>
19. Aro P, Talley NJ, Johansson SE, Agréus L, Ronkainen J. Anxiety Is Linked to New Onset Dyspepsia in the Swedish Population: A 10-Year Follow-up Study. *Gastroenterology.* 2015 May 1;148(5):928-37.
<https://doi.org/10.1053/j.gastro.2015.01.039>
20. Tshabalala SJ, Tomita A, Ramlall S. Depression, anxiety and stress symptoms in patients presenting with dyspepsia at a regional hospital in KwaZulu-Natal province. *S Afr J Psychiatr.* 2019 Oct 21;25:1382.
<https://doi.org/10.4102/sajpspsychiatry.v25i0.1382>

Socio-demographic and Clinical profile of Children with Typhoid Fever in a Tertiary Care Hospital

Syeda Farzana Rahat¹, Kartick Chanda Shaha^{*2}, Humayra Sultana³,
MD. Shafiqur Rahman⁴, Sheikh Hasibur Rahman⁵

Introduction with Objective: The aim of this study was to assess the socio-demographic and clinical profile of children with typhoid fever in Dhaka. **Materials and Methods:** This observational study was carried out among 120 patients presenting with symptoms, signs and laboratory investigations diagnostic of typhoid fever in IPD and OPD of Paediatric department, Dhaka National Medical College Hospital, Dhaka, from April 2013 to October 2013. Widal test positive was included for the study. Statistical analyses of the results were obtained by using window based computer software devised with Statistical Packages for Social Sciences (SPSS-20.1). **Results:** Majority of the patients (55%) belonged to 6-8 years. Male patients (n=72, 60%) were more than the female patients (n=48, 40%). Parents education of the study patients was observed that majority parents (n=42, 35%) were HSC level and 41 parents (34.16%) were primary level. Parents occupational status of the study patients was observed that majority (n=42, 35.0%) of the parents were skilled worker. Almost half (46.67%) of the patients drink boiled water. 40% patients used to take food from outside. Good sanitation was found in 61 patients (50.83%). 115 patients (95.83%) had fever 5-10 days. Thirty four percents patients had anemia. 85% patients had coated tongue. 59 patients had abdominal tenderness. Palpable liver was found in 85% patients. Palpable spleen was found in 53.33% patients. 72 (60.0%) patients had To 1:160. 103 patients (85.84%) had TH 1:320. **Conclusion:** Safe water, sanitation and hygiene are critical for preventing the spread of typhoid.

Keywords: Socio-demographic and clinical profile, Typhoid fever.

Number of Tables: 02; Number of Figure: 01; Number of References: 10; Number of Correspondences: 03.

1. Dr. Syeda Farzana Rahat

Associate Professor (c.c)
Department of Paediatrics
Dhaka National Medical College
Dhaka, Bangladesh.

*2. Corresponding Author:

Dr. Kartick Chanda Shaha

Associate Professor (c.c)
Department of Pharmacology
Dhaka National Medical College
Dhaka, Bangladesh.
Phone: 01711313742
Email: kartick_shaha@yahoo.com

3. Dr. Humayra Sultana

Associate Professor (c.c)
Department of Paediatrics
Dhaka National Medical College
Dhaka, Bangladesh.

4. Prof. Dr. MD. Shafiqur Rahman

Professor (c.c)
Department of Paediatrics
Dhaka National Medical College
Dhaka, Bangladesh.

5. Dr. Sheikh Hasibur Rahman

Assistant Registrar
MAG Osmani Medical College Hospital
Sylhet, Bangladesh.

Introduction:

Typhoid fever (typhoid or paratyphoid fever) caused by *Salmonella* serotype Typhi (S Typhi) or *Salmonella* serotype Paratyphi (S Paratyphi) remains endemic in many areas of the developing world, causing over 26 million infections and over 200,000 deaths annually¹. The incidence is highest in south-central Asia and South East Asia over 100/100,000 cases/year, with the highest burden of disease in children aged 2-15 years^{2,3}. Typhoid fever remains a major public health problem in developing countries. In the developed countries, the incidence is much lower, and most cases are usually from travelers returning from endemic areas⁴. In the succeeding five years, outbreaks occurred in Vietnam, Indonesia, Korea, Chile and Bangladesh. S Typhi represents the commonest cause of bacteraemia in this age group^{5,6}. On a global scale, it has been appraised that *Salmonella* is responsible for an estimated 3 billion human infections each year. The World Health Organization (WHO) has estimated that annually typhoid fever accounts for 21.7 million illnesses (217,000 deaths) and paratyphoid fever accounts for 5.4 million of these cases. Infants, children, and adolescents in south-central and South-eastern Asia experience the greatest burden of illness. In cases of typhoid fever, including infections with S. Typhi and S. Paratyphi A and B, it is often necessary to commence treatment before the results of laboratory sensitivity tests are available (WHO).

Materials & Methods:

This Observational study was carried out on children age belonged

to 1 – 12 years presenting with symptoms, signs and laboratory investigations diagnostic of typhoid fever in IPD and OPD of Paediatric, Dhaka National Medical College Hospital, Dhaka, Bangladesh during the period from April 2013 to October 2013. The diagnosis of typhoid fever was based on fever for more than 7 days; positive Widal test and exclusion of other febrile illnesses were enrolled in this study. Typhoid fever associated with other diseases were excluded from the study. The collected data were entered into the computer and analyzed by using SPSS (version 20.1) to assess the socio-demographic and clinical profile of children with typhoid fever. The study was approved by the institutional ethical committee.

Results:

Table I shows socio demographic variables of the patients. It was observed that majority of the patients (55%) belonged to 6-8 years. Parents education of the study patients was observed that majority parents (n=42, 35%) were HSC level and 41 parents (34.16%) were primary level. Other results are depicted in the table. Occupational status of the study patients was observed that majority (n=42, 35.0%) of the parents were skilled worker. Almost half (46.67%) of the patients drink boiled water. 40% patients used to take food from outside. Good sanitation was found in 61 patients (50.83%).

Table I: Distribution of the study patients by socio demographic variables (n=120)

Parameter	Number	percentage
Age (in year) Range (2-13 years)		
≤5 years	19	15.84%
6-8 years	66	55%
9-11 years	29	24.17%
>11 years	06	5%
Parents education		
Graduate and above	19	15.83%
HSC	42	35%
SSC	18	15%
Primary	41	34.16%
Occupational status		
Service	13	10.83%
Business	31	25.83%
Skilled worker	42	35%
Unskilled worker	28	23.33%
Unemployed	06	5%
Drink		
Boiled water	56	46.67%
Unboiled water	53	44.16%
Tubewell water	11	9.17%
Used to take food from outside	48	40%
Sanitation Good	61	50.83%

Total numbers of patients both male and female were 120. Male patients (n=72, 60%) were more than the female patients (n=48, 40%) (Figure 1).

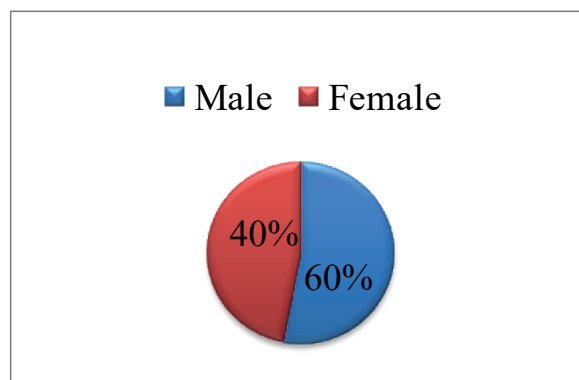


Figure 1: Pie Chart Showing Sex of the Patients (n=120)

Table II shows that, 115 patients (95.83%) had fever 5-10 days. Thirty four percents patients had anemia. 85% patients had coated tongue. 59 patients had abdominal tenderness. Palpable liver was found in 85% patients. Palpable spleen was found in 53.33% patients. 72 (60.0%) patients had To 1:160. 103 patients (85.84%) had TH 1:320.

Table II: Distribution of the study patients by Clinical profile (n=120)

Parameter	Number	percentage
Fever duration		
5-10 days	115	95.83%
11-15 days	05	4.16%
Examination findings		
Anaemia	41	34.16%
Coated tongue	102	85%
Abdominal tenderness	59	49.16%
Liver palpable	102	85%
spleen palpable	64	53.33%
Widal test: TO		
1:160	72	60%
1:320	48	40%
Widal test: TH		
1:160	17	14.17%
1:320	103	85.84%

Discussion:

Typhoid fever may occur at any age, but it is reportedly rate in infancy (Cleary, 2004). In this study majority of the patients (55%) belonged to 6-8 years. This result similar to the findings by the Sinha et al. (1999) and Saha et al. study^{7,5}. In this study it was observed that typhoid fever predominant in male subjects. Rokonzaman et al. (2011) showed significant number of the patients was male 67.0%, and the rest 33.0% of them were female, which is consistent with the current study⁸. In this present series it was observed that majority of patient brought to the hospital during the 5 – 10 days of illness which is also similar to another study carried out in Bangladesh (Islam, 2003)⁹. In this current study it was observed that 85% patients had coated tongue. This finding is similar to the findings of Lakhota et al. (2003) study. Abdominal tenderness was found in 49.16% patients, which is

contrast to the findings of Lakhotia et al. (2003) study¹⁰.

Conclusion:

Public health interventions to minimize human carrier contact, improved personal hygienic measures including health care behavior strategies and typhoid vaccination will help to reduce the morbidity and mortality of this global health problem.

Conflict of Interest: None.

Acknowledgements:

The authors are grateful to the entire staff of Pediatric department of the Dhaka National Medical College and Hospital for their cooperation and support during the study period.

Reference:

1. Crump, J.A., Luby, S.P., Mintz, E.D. The global burden of typhoid fever. *Bull World Health Organ.* 2004; 82(4):346-353.
2. Siddiqui, F.J., Rabbani, F., Hasan, R., et al. Typhoid fever in children: some epidemiological considerations from Karachi, Pakistan. *Int J Infect Dis.* 2006; 10(1): 215-222.
<https://doi.org/10.1016/j.ijid.2005.03.010>
PMid:16431148
3. Ochiai, R.L., Acosta, C.J., Danovaro-Holliday, M.C., et al. A study of typhoid fever in five Asian countries: disease burden and implications for controls. *Bull World Health Organ.* 2008;86(2):260-268.
<https://doi.org/10.2471/BLT.06.039818>

PMid:18438514 PMCID:PMC2647431

4. Capoor M.R., Nair D., Hasan A.S., Aggarwal P., Gupta B., et al. Typhoid fever: Narrowing therapeutic options in India. *Southeast Asian J Trop Med Public Health.* 2006; 37(3): 1170-1174.
5. Saha, S.K., Baqui, A.H., Hanif, M., et al. Typhoid fever in Bangladesh: implications for vaccination policy. *Pediatr Infect Dis J.* 2001; 20 (1):521-524.
<https://doi.org/10.1097/00006454-200105000-00010>
PMid:11368111
6. Brooks, W.A., Hossain, A., Goswami, D., et al. Bacteremic typhoid fever in children in an urban slum, Bangladesh. *Emerg Infect Dis.* 2005;11(3):326-329.
<https://doi.org/10.3201/eid1102.040422>
PMid:15752457 PMCID:PMC3320465
7. Sinha, A., Sazawal, S., Kumar, R., et al. Typhoid fever in children aged less than 5 years. *Lancet.* 1999; 354(2):734-737.
[https://doi.org/10.1016/S0140-6736\(98\)09001-1](https://doi.org/10.1016/S0140-6736(98)09001-1)
PMid:10475185
8. Rokonzaman, S.M., Ahmed, M.A., Uddin, MN., et al. Effectiveness of levofloxacin in enteric fever. *Mymensingh Med J.* 2011; 20(3):441-445.
9. Islam, M.N. Efficacy & Safety of Azithromycin in the Treatment of Childhood Typhoid Fever. FCPS dissertation; 2003.
10. Lakhotia, M., Gehlot, R.S., Jain, P., et al. Neurological Manifestation of Enteric Fever-Original Article. *JIACM.* 2003; 4(3):196-199.

Bedside Prediction of Neonatal Pulmonary Maturity by Single Step Gastric Aspirate Shake Test

Mohammad Khairul Alam^{*1}, Nadira Sultana², Mohammad Zahirul Islam³,
Faruk Ahmed⁴, Md. Abul Hashem⁵

Abstract

Introduction: Respiratory distress syndrome occurs primarily in preterm neonates. Such a baby may need advanced support like NICU admission for ventilation. Preterm LBW is a common problem in our country. Available few centers cannot accommodate all preterm LBW babies. So early prediction of RDS by a simple tool may help to decide whether a baby needs NICU admission for ventilation or not and early referral from a low-facility hospital would be possible.

Aims: To assess the reliability of gastric aspirate shake test in predicting respiratory distress syndrome in newborns immediately after birth. **Materials and Methods:** This prospective study was conducted in the Department of Gastroenterology, Bangabandhu Sheikh Mujib Medical University (BSMMU) and Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh, from September 2009 to May 2010. We included 60 inborn neonates who were admitted to BSMMU and DMCH. Of all the newborns, 30 were pre-term and 30 were term. **Results:** In this study, we found that 75% of preterm neonates with a negative shake test (9 out of 12) developed RDS, and 50% of preterm neonates with an intermediate result (2 out of 4) developed RDS. None of the 14 preterm neonates with a positive shake test developed RDS. None of the term neonates developed RDS. **Conclusion:** It can be concluded that the gastric aspirate shake test is a simple, inexpensive, non-invasive, and reliable test. It can be an excellent bedside tool for predicting respiratory distress syndrome in newborns immediately after birth.

Keywords: Single Step Gastric Aspirate Shake Test, Neonates, Bedside Prediction, Pulmonary Maturity.

Number of Tables: 05; Number of References: 27; Number of Correspondences: 05.

*1. Corresponding Author:

Dr. Mohammad Khairul Alam

Assistant Professor
Department of Paediatrics
Noakhali Medical College
Noakhali, Bangladesh.
Contact: 01712547117
Email: khairulalam6504@gmail.com

2. Dr. Nadira Sultana

Professor
Department of Obs and Gynae
Universal Medical College
Dhaka, Bangladesh.

3. Dr. Mohammad Zahirul Islam

Assistant Professor
Department of Paediatrics
Noakhali Medical College
Noakhali, Bangladesh.

4. Dr. Faruk Ahmed

Assistant Professor
Department of Paediatric
Noakhali Medical College
Noakhali, Bangladesh.

5. Dr. Md. Abul Hashem

Assistant Professor
Department of Paediatric
Noakhali Medical College
Noakhali, Bangladesh.

Introduction:

Premature infants are most affected by respiratory distress syndrome (RDS), which has a negative correlation with both birth weight and gestational age. It affects 60–80% of newborns born before 28 weeks, 15–30% of those born between 32 and 36 weeks, about 5% of those born beyond 37 weeks, and very rarely at term¹. RDS is primarily caused by a lack of surfactant, which is frequently made worse by an excessively compliant chest wall². The search for tests for fetal lung maturity began with an estimation of the lecithin/sphingomyelin (L/S) ratio in amniotic fluid³⁻⁵. However, estimation of the L/S ratio has to be done by thin-layer chromatography which is an expensive and slow technique and needs trained personnel⁶. Biochemical tests for measuring phosphatidylglycerol (PG) levels or immunoassays for surfactant-associated proteins and other proteins require technical skill and are expensive^{7,8,9}. Foam stability test or ‘shake test’ with amniotic fluid is simple, and economical with high sensitivity and specificity but could only be performed in centers where amniocentesis is available^{10,11}. The gastric aspirate shake test was the 1st clinical postnatal test to identify immaturity of the lungs¹². The foam stability test on gastric

aspirate is a valid indicator of prenatal lung maturity in newborns whose amniotic fluid is not available¹³. Other studies also established that the shake test used with aspirate may be used as a predictor of idiopathic respiratory distress syndrome¹⁴⁻¹⁶. Studies of gastric aspirate shake test (GST) in India resulted in the simplification of the test to a single tube dilution method. They demonstrated the overall usefulness of GST for predicting respiratory distress syndrome^{6,17-19}. A rapid bedside test to identify neonates who are surfactant deficient would have clinical and economic benefits. The importance of identifying infants with surfactant deficiency as soon as possible after delivery, to facilitate their early transfer to a neonatal intensive care unit for ventilator support and early surfactant therapy^{20,21}. Surfactant administration prophylactically also has benefits compared with rescue surfactants given to infants with established RDS²²⁻²⁴.

A simple and reliable test of pulmonary maturity in the newborn infant at risk would therefore be of great value. One recent Iranian study concluded that the gastric aspirate shake test is a rapid and simple procedure to rule out RDS and surfactant requirements²⁵. Data on the single-step shake test on gastric aspirate in the rapid evaluation of pulmonary surfactant maturity at birth in Bangladesh is not available. Therefore, the present study was undertaken on newborns to assess the reliability of the single-step shake test.

Materials and Methods:

This prospective study was conducted in the Department of Gastroenterology, Bangabandhu Sheikh Mujib Medical University (BSMMU) and Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh, from September 2009 to May 2010. We included 60 inborn neonates who were admitted to BSMMU and DMCH. Of all the newborns, 30 were pre-term and 30 were term. These are the following criteria to be eligible for enrollment as our study participants:

Inclusion criteria were -All inborn neonates both admitted and non-admitted in BSMMU and DMCH within the study period and -Parents who were willing to participate were included in the study. **Exclusion criteria were** - Outborn babies, Failure to collect gastric aspirate within 30 min of birth, Any oral feeding is given before the collection of the sample, Infants with meconium or blood-stained gastric aspirate and Infants with any history of acute illness (e.g., renal or pancreatic diseases, ischemic heart disease, asthma, COPD etc.) were excluded from our study.

Data Collection: This study was done by the researcher himself. After obtaining informed written consent from parents or legal guardians a detailed history and careful physical examination were done. Within 30 min of birth 0.5 ml gastric aspirate was collected through a 6 gauge nasogastric tube into a test tube then after mixing of equal quantity of normal saline the solution was shaken vigorously for 10 sec. Then 1 ml of 95% ethanol was added and again shaken for 15 sec. Then the test tube was kept in a vertical position for 15 min and the air-liquid interface was examined for the presence of small bubbles⁶. The test was taken as (a)

Positive (Surface when bubbles covered more than 2/3rd of the liquid surface); (b) Intermediate (when bubbles covered 1/3rd to 2/3rd of the liquid surface); (c) Negative (when bubbles covered less than 1/3rd of the liquid surface)⁶. The babies were closely monitored for their respiratory status during 1st 24 hours after birth. The infants were diagnosed as RDS when she/he had met 5 of the 6 following criteria^{6,18} –

1. Preterm infant (< 37 weeks)
2. Respiratory rate 260/min within 4 hours of birth.
3. Intercostal recession and substernal retraction.
4. Grunting
5. Cyanosis in room air and
6. X-ray chest compatible with RDS.

For all infants suspected to have RDS, complete blood count, blood film, IT ratio, and blood culture were done to exclude early-onset neonatal sepsis. Gestational age was assessed from a menstrual history of the mother, USG of pregnancy profile report (optional), and was confirmed by an expanded New Ballard Scoring system.

Statistical Analysis: All data were recorded systematically in preformed data collection form. Quantitative data was expressed as mean and standard deviation and qualitative data was expressed as frequency distribution and percentage. The differences between groups were analyzed by the chi-square (X²) test and Fisher's exact test. A p-value <0.05 was considered as significant. Statistical analysis was performed by using SPSS 16 (Statistical Package for Social Sciences) for Windows version 10. The study was approved by the Ethical Review Committee of Bangabandhu Sheikh Mujib Medical University & Dhaka Medical College Hospital.

Results:

Table I: Characteristics of our study neonates (n= 60)

Characteristics	Mean±SD	Range (Min-Max)
Gestational age (weeks)	34.2±3.2	(27-42)
Birth weight (gm)	1890.2±710.6	(800-4090)
APGAR Score at birth	8.2±1.4	(1-9)
Number (Percentage)		
Male	38(63.3%)	
Preterm	30(50%)	
Caesarean Section	33(55%)	
SGA	15(25%)	
H/O maternal DM	10(16.6%)	
H/O leaking membrane	9(15%)	
H/O preeclampsia of mother	32(53.3%)	
H/O antenatal corticosteroids	13(21.6%)	

Table I shows the mean gestational age was 34.2±3.2 weeks, birth weight was 1890.2±710.6 gm, and APGAR score was 8.2±1.4 at birth. Among all neonates, males were 63.3%, preterm (50%), delivered by LUCS (55%), SGA (25%), had H/O maternal DM (16.6%), H/O leaking membrane (15%), H/O preeclampsia of mother (53.3%) and H/O receiving antenatal corticosteroids (21.6%).

Table II: Characteristics of Preterm neonate with and without RDS (n=30)

Characteristics	RDS (n=11)	Non-RDS (n=19)	P-value
Gestational age (weeks)	30.1±1.3	32.8±2.6	*0.0015 ^S
Birth weight (gm)	1489.3±352.1	1780.2±433.7	*0.0495 ^S
APGAR Score at birth	6.2±2.2	7.9±1.98	*0.036 ^S
Male	8(72.7%)	9(47.3%)	*0.166 ^{NS}
Caesarean Section	7(63.6%)	9(47.3%)	*0.389 ^{NS}
SGA	3(27.2%)	8(42.1%)	*0.341 ^{NS}
H/O maternal DM	4(36.3%)	2(10.5%)	*0.110 ^{NS}
H/O leaking membrane	1(9%)	3(15.7%)	*0.530 ^{NS}
H/O preeclampsia of mother	3(27.2%)	15(78.9%)	*0.001 ^S
H/O antenatal corticosteroids	2(18.1%)	6(31.5%)	*0.362 ^{NS}

Table II shows gestational age and birthweight were significantly different between RDS and non-RDS groups. However other parameters were not significantly different except the APGAR score at birth and H/O preeclampsia of the mother.

Table III: Results of single-step gastric aspirate shake test and development of RDS in neonate according to gestational age

	Term(n=30)		Preterm (n=30)		P-value
	n	%	n	%	
Shake test					
Positive	25	83.3	14	46.6	0.01s
Intermediate	2	6.6	4	13.3	
Negative	3	10	12	40.0	
RDS					
Positive	0	0.0	11	36.6	0.001s
Negative	30	100.0	19	63.3	

Table III shows that shake test results and development of RDS were significantly different in the Term and Preterm groups. The shake test shows positive results in 83.3% & 46.6% of neonates in term & preterm groups respectively.

Table IV: Result of shake test (n=60)

	RDS		Other respiratory distress		No respiratory distress		Total	
	n	%	n	%	n	%	n	%
All neonates (n=60)								
Negative	9	60.0	4	26.6	2	13.3	15	100
Intermediate	2	33.3	2	33.3	2	33.3	6	100
Positive	0	0.0	6	15.3	33	84.6	39	100
Preterm (n=30)								
Negative	9	75.0	3	25.0	0	0.0	12	100
Intermediate	2	50.0	2	50.0	0	0.0	4	100
Positive	0	0.0	5	35.7	9	64.3	14	100
Term (n=30)								
Negative	0	0.0	1	33.3	2	66.7	3	100
Intermediate	0	0.0	0	0.0	2	100.0	2	100
Positive	0	0.0	1	4.0	24	96.0	25	100

The table shows that among all neonates, shake test positive resultants had 0% RDS, among the intermediate resultants, 33.3% developed RDS, and among negative resultants, 60% developed RDS. But in the case of preterm neonates, it was 0%, 50%, and 75%, respectively. No term neonates developed RDS.

Table V: Relation between gastric aspirate shake test and RDS in predicting lung maturity in studied neonates (n=60)

Gastric aspirate shake test	RDS		Total
	Disease positive	Disease negative	
Positive	0	39	39
Others (Intermediate +Negative)	11	10	21
Total	11	49	60

Table V shows that none of the 39 shake test-positive neonates developed RDS in our study. Other

(Intermediate and negative) neonates developed 11 cases of RDS out of 21.

Discussion:

This study confirms the usefulness of a single-step gastric aspirate shake test for assessing pulmonary maturity at birth. This study reveals no term neonate-developed RDS. A similar observation has been made by other studies^{6,18}. Among term neonates, 83.3% of them were shake test positive in contrast to 46.6% in preterm neonates which is statistically significant (p-value 0.01). On the contrary preterm babies were 40.0% shake test negative in contrast to 10.0% in term neonates which is also statistically significant (p-value 0.01). Among term neonates only 3 presented with a shake test negative but they did not develop RDS. Only 2 neonates in the term group developed respiratory distress (one transient tachypnoea of a newborn and another neonate in the term group showed meconium aspiration syndrome). Only intermediate result in gastric aspirate shake test none of them developed RDS or other respiratory distress. Parekh et al, and Teeratakulpisarn et al also showed similar observations^{6,26}. On the other hand, 40.0% in the preterm group showed shake test negative, 13.3% intermediate, and 46.6% positive. No neonates with positive shake test developed RDS (mentioned earlier) but 2 patients developed early onset neonatal sepsis and 3 patients developed TTN. Among neonates with intermediate results, all 4 developed respiratory distress (2 developed RDS and another 2 early onset neonatal sepsis). Out of 12 negative shake tests, baby 9 developed RDS, 1 developed transient tachypnea of the newborn, and 2 developed early onset neonatal sepsis. In contrast, 75% of shake test-negative neonates developed RDS, and 25% did not develop RDS in the preterm group. A similar observation was also found by Arya, Skelton, and Transwell^{14,18,27}. This false negative gastric aspirate shake test in neonates (shake test negative but did not develop RDS) may be due to over-dilution of surfactant by excessive gastric juice in the stomach¹⁸. Serial gastric aspirate shake test may reduce such false negative results¹⁴. This same explanation is also applicable for term neonates with false negative gastric aspirate shake tests. In the preterm neonate group, it was difficult to predict the outcome from intermediate results as 50% of intermediate resultants (2 out of 4) developed RDS, and 50% did not develop. This observation is similarly found in Parekh and Chaudhari studies^{6,19}. Repeat gastric aspirate shake test may resolve this difficulty both in term and preterm groups. To predict RDS, it might be best to regard an intermediate test result as negative in the preterm group¹⁹.

Conclusion and recommendations:

In our study, we found that no term neonates developed RDS. Gastric aspirate shake test-positive neonates also had not developed RDS in both term and preterm groups. Respiratory distress syndrome was correctly predicted in 9(75%) out of 12 preterm babies with a negative shake test and 2 (50%) babies out of 4 preterm babies with an intermediate result developed RD. Our findings also found

that this extremely simple, inexpensive, quick, reproducible, and non-invasive but useful test can help to decide whether the neonate needs NICU admission for ventilation or not, and early referral from a low-facility hospital would be possible. So further study with a prospective and longitudinal study design including a larger sample size needs to be done to validate the findings of our study.

Conflict of Interest: None.

Ethical approval: The study was approved by the Institutional Ethics Committee.

References:

1. Stoll BJ, Adams-Chapman I. The high risk infants. In: Kliegman RM, Behrman RE, Jenson HB, Stanton BF, editors. Nelson textbook of pediatrics. 18th ed. Philadelphia: Saunders; 2007:701-40.
2. Gomella TL, editor. NEONATOLOGY Management, Procedures, On-call Problems, Diseases and Drugs. 5th ed. USA: The McGraw- Hill companies; 2004:539-43.
3. Gluck L, Kulovich MV, Borer RC, Brenner PH, Anderson CG, Spellacy WM. Diagnosis of respiratory distress syndrome by amniocentesis. *Am J Obstet Gynaecol*. 1971;109:440.
[https://doi.org/10.1016/0002-9378\(71\)90342-5](https://doi.org/10.1016/0002-9378(71)90342-5)
PMid:5107880
4. Jain SC, Singh SD, Parekh P, Vijayvargiya R. sphingomyelin ratio in amniotic fluid and its relation to gestational age, maternal factors and neonatal factors. *Indian Pediatr*. 1978;15:195.
5. Lemons JA, Jaffe RB. Amniotic fluid lecithin/sphingomyelin ratio in the diagnosis of hyaline membrane disease. *Am J Obstet Gynecol*. 1973;11:233-7.
[https://doi.org/10.1016/0002-9378\(73\)90291-3](https://doi.org/10.1016/0002-9378(73)90291-3)
PMid:4691840
6. Parekh P, Thakur S, Singh SD. Bedside prediction of neonatal pulmonary maturity by single step gastric aspirate shake test. *Indian J Pediatr* 1983;50:391-3.
<https://doi.org/10.1007/BF02753379>
PMid:6689488
7. Hallman M, Kulovich M, Kirkpatrick E, Sugarman R, Gluck L. Phosphatidylinositol and phosphatidylglycerol in amniotic fluid: Indices of lung maturity. *Am J Obstet Gynecol*. 1976;125:613-7.
[https://doi.org/10.1016/0002-9378\(76\)90782-1](https://doi.org/10.1016/0002-9378(76)90782-1)
PMid:180804
8. Stevens PA, Schadow B, Bartholain S, Segerer H, Obladen M. Surfactant protein A in the course of respiratory distress syndrome. *Eur J Pediatr*. 1992;151:596-600.
<https://doi.org/10.1007/BF01957730>
PMid:1505580
9. Van den Berg W, Breederveld C, ten Cate JW, Peter M, Borm JJJ. Low antithrombin w: Accurate predictor of idiopathic respiratory distress in premature neonates. *Eur J Pediatr* 1989;148:455-8.
<https://doi.org/10.1007/BF00595913>
PMid:2920753
10. Clements JA, Platzker ACG, Tierney DF, et al. Assessment of the risk of the respiratory distress syndrome by a rapid test for the surfactant in amniotic fluid. *N Engl J Med*. 1972;286:1077-81.
<https://doi.org/10.1056/NEJM197205182862004>
PMid:5067186
11. Amoa AB, Paiva M, Klufio CA. Antepartum prediction of respiratory distress syndrome: a comparison of the shake test, the tap test and the turbidity test. *PNG Med J*. 2003;46(1-2):32-40.
12. Evans JJ. Prediction of respiratory distress syndrome by shake test on newborn gastric aspirate. *N Engl J Med*. 1975;292:1113-5.
<https://doi.org/10.1056/NEJM197505222922108>
PMid:1173279
13. Cowett RM, Unsworth EJ, Hakanson DO, Williams JR, Oh W. Foam stability test on gastric aspirate and the diagnosis of respiratory distress syndrome. *N Engl J Med*. 1975;293:413-6.
<https://doi.org/10.1056/NEJM197508282930901>
PMid:239347
14. Transwell AK, Smith BT. Single-step gastric aspirate shake test; bedside predictor of neonatal pulmonary morbidity. *Arch Dis Child*. 1977;52:541-4.
<https://doi.org/10.1136/adc.52.7.541>
PMid:577669 PMCID:PMC1544769
15. Pena-Camarena H, Caballero-Zavaleta E. Prediction of idiopathic respiratory insufficiency using the gastric aspirate shake test. *Bol Med Hosp Infant Mex*. 1989;46(9):615-8.
16. Vermeulen JH, Fenemore B, Rush RW, Woods DL, Segall ML. The gastric aspirate foam test in the prediction of hyaline membrane disease. *SA Med J*. 1979;55:342.
17. Gupta JM, Morris HM, Fisk GC. Gastric shake test and pharyngeal lecithin/sphingomyelin ratios in newborn infants. *Med J Aust*. 1978;2:7-8.
<https://doi.org/10.5694/j.1326-5377.1978.tb131301.x>
PMid:581089
18. Arya LS, Singh M. Gastric aspirate shake test as a predictor of hyaline membrane disease. *Indian J Med Res*. 1979;70:444-8.
19. Chaudhari R, Deodhar J, Kadam S, Bavdekar A, Pandit A. Gastric aspirate shake test for diagnosis of surfactant deficiency in neonates with respiratory distress. *Annals of Trop Paed*. 2005;25:205-9.
<https://doi.org/10.1179/146532805X58148>
PMid:16156986
20. Rodriguez RJ, Martin RJ, Fanaroff AA. Respiratory distress syndrome and its management. In: Fanaroff AA,

martin RJ, Walsh MC, Editors. Neonatal-perinatal medicine-disease of the fetus and infant. 2nd ed. Philadelphia: Mosby; 2006:1097-107.

21. Suresh GK, Soll RF. Pharmacologic adjuncts II: exogenous surfactants. In: goldsmith JP, Karotkin E, Editors. Assisted ventilation of the neonate. Philadelphia:WB. Saunders; 2003:330-44.

<https://doi.org/10.1016/B978-0-7216-9296-8.50025-8>

22. Soll RF, Morley CJ. Prophylactic versus selective use of surfactant in preventing morbidity and mortality in preterm infants. Cochrane Database Syst Rev. 2001;(2):CD 000510.

<https://doi.org/10.1002/14651858.CD000510>

23. Reininger A, Khalak R, Kendig JW, Ryan RM, Stevens TP, Reubens L, et al. Surfactant administration by transient intubation in infants 29 to 35 weeks gestation with respiratory distress syndrome decreases the likelihood of later mechanical ventilation: a randomized controlled trial. J Perinatol. 2005;25 (11):703-8.

<https://doi.org/10.1038/sj.jp.7211381>

PMid:16163369

24. Karthik N. Surfactant replacement therapy in neonates. J of Neonatology. 2003;17(4): 285.

25. Mohammadi M, Iranpour R, Mohammadizadeh M, Soleymani B, Hajiheydari M. Gastric aspirate shake test for predicting of surfactant therapy in premature neonates with hyaline membrane disease. J Isfa Med Schl. 2009;27:96.

26. Teeratakulpisarn J, Taksaphan S, Pengsaa K, Wiangnon S, Kosuwon W. Prediction of idiopathic respiratory distress syndrome by the stable microbubble test on gastric aspirate. Pediatr Pulmonol. 1998;25:383-9.

[https://doi.org/10.1002/\(SICI\)1099-0496\(199806\)25:6<383::AID-PPUL5>3.0.CO;2-I](https://doi.org/10.1002/(SICI)1099-0496(199806)25:6<383::AID-PPUL5>3.0.CO;2-I)

27. Skelton R, Jeffery H. Click test: Rapid diagnosis of the respiratory distress syndrome. Pediatr Pulmonol. 1994;17:383-9.

<https://doi.org/10.1002/ppul.1950170608>

PMid:809060

Surgical Scar Endometriosis: A Painful Scar

Syeda Ummay Kulsum^{*1}, Fowzia Yasmin², Mehriban Amatullah³,
Umme Kulsum⁴, Fatima Wahid⁵

Abstract

Introduction: A variant of extrapelvic endometriosis known as "surgical scar endometriosis" is defined by the development of functional endometrial glands and stroma close to the site of incision in individuals who have had prior surgery. As Cesarean sections have grown more popular in recent years, surgical scar endometriosis has been on the rise. The purpose of this study is to characterize surgical scar endometriosis's clinical features and management. **Materials and Methods:** This cross-sectional, observational study was carried out in a tertiary care center within the Obstetrics and Gynecology department of Bangabandhu Sheikh Mujib Medical University for two years, from July 2022 to June 2024. This study was designed for six women who underwent surgery for scar endometriosis. The study's objectives were to examine the general features as well as the lesions of the patients. The general features consist of mode of delivery, symptoms, ultrasound images, age and parity. The patient's lesion features, such as the size and location of the scar endometriosis (SE), the layers involved, and the surgical procedure, have been documented from the surgical notes included in the case sheet. **Result:** We found 6 cases of scar endometriosis in two years. The mean age of the patient was 30.7 years (range 27-36). All patients were parous women and majority (83.3%) had delivered through cesarean section, with just one had developed scar endometriosis after total abdominal hysterectomy. Here, cyclical pain and swelling at the scar site are the most typical first symptoms. In 66.7% of patients, the time between the diagnosis of surgical scar endometriosis and surgery exceeded two years. Subcutaneous tissue (100%) was the most often affected layer in surgical scar endometriosis, followed by the rectus sheath (66.7%). The preferred treatment strategy for this problem is wide local excision with or without reconstruction. **Conclusions:** Cesarean section is a clear risk factor for surgical scar endometriosis. Clinicians should be cautious about surgical scar endometriosis in patients who come with cyclic pain at the scar site. Scar endometriosis may be accurately diagnosed with ultrasound. The preferred therapy is surgical management with extensive local excision with a clear margin, with or without mesh repair. Precautions during obstetrical surgery to minimize wound infection can help lower the prevalence of scar endometriosis.

Key Words: Cross-sectional study, clinical features, surgical scar endometriosis, Excision, Painful scar.

Number of Tables: 02; Number of References: 14; Number of Correspondences: 05.

*1. Corresponding Author:

Dr. Syeda Ummay Kulsum

Assistant Professor

Department of Obstetrics & Gynecology

Bangabandhu Sheikh Mujib Medical University (BSMMU)

Dhaka, Bangladesh.

Email: sukulsum68@gmail.com

Orcid Id: <https://orcid.org/0009-0006-4991-6249>

Contact: +8801748781538

2. Dr. Fowzia Yasmin

Associate Professor

Department of Obstetrics & Gynecology

Dhaka Medical College Hospital

Dhaka, Bangladesh.

3. Dr. Mehriban Amatullah

Assistant Professor

Department of Obstetrics & Gynecology

Bangabandhu Sheikh Mujib Medical University (BSMMU)

Dhaka, Bangladesh.

4. Dr. Umme Kulsum

Assistant Professor

Fetomaternal Medicine Department

Bangabandhu Sheikh Mujib Medical University (BSMMU)

Dhaka, Bangladesh.

5. Dr. Fatima Wahid

Assistant Professor

Fetomaternal Medicine Department

Bangabandhu Sheikh Mujib Medical University (BSMMU)

Dhaka, Bangladesh.

Introduction:

Endometriosis is known as a functional endometrial glands with stroma external to the uterus and outside the uterine cavity, which is estimated to affect almost 5-10% of all women. Pelvic endometriosis is increasingly a prevalent disorder seen by gynecologists and infertility experts. Endometriosis can cause both extreme pain and infertility. Endometriosis is expected to affect 89 million women of reproductive age worldwide¹. Endometriosis is an estrogen-based chronic inflammatory illness that affects in two ways in a woman's body

through the pelvic or extra-pelvic regions. Pelvic endometriosis is increasingly a prevalent disorder seen by gynecologists and infertility experts. However, extra pelvic endometriosis in distant areas such as the urinary bladder, umbilicus, gastrointestinal system, and thoracic cavity is an uncommon occurrence. Scar endometriosis (SE) is caused by iatrogenic endometrial tissue implantation following uterine surgeries, although it can also arise after nonuterine treatments in rare cases. Scar endometriosis after cesarean section has been reported to be 0.03–0.4%². Surgical scar endometriosis is a variant of extra-pelvic endometriosis distinguished by the presence of endometrial glands and stroma at the incision site in women with previous record of surgery. The researchers found just a few cases of surgical scar endometriosis in the medical literature, making it an uncommon clinical disorder. Scar endometriosis has been reported to develop following obstetric and gynecological surgeries, including Cesarean sections, vaginal deliveries in episiotomy sites, laparotomies or laparoscopic port sites for hernial repair sites, tubectomy, hysterectomy, ovarian cystectomies, ectopic pregnancies, and even needle tracking after amniocentesis^{3,4}. This iatrogenic consequence remains a mystery, and the specific cause of surgical scar endometriosis is still unclear; numerous theories have been proposed to explain its development. The incidence of surgical scar endometriosis varies greatly, ranging between 0.03% and 1.08%^{5,6}. Because of their atypical appearance, these patients may first see general doctors, general surgeons, or plastic surgeons. Raising awareness about this ailment can aid in early detection and treatment. The incidence of surgical scar endometriosis has grown in recent years, as Cesarean sections have become more common. The purpose of this study is to characterize the clinical features and treatment options for surgical scar endometriosis.

Material and Methods:

We performed a prospective, cross-sectional observational investigation in a tertiary care facility at Bangabandhu Sheikh Mujib Medical University (BSMMU) in Dhaka, Bangladesh, for two years (July 2022 to June 2024). During the course of this investigation, six women had scar endometriosis removed. We examined the data for both general and lesional features of the patients. General features include age, parity, method of birth, symptoms, the time between index surgery and symptom start, and ultrasound imaging (diagnostic). We collected the patient's lesion characteristics, such as the location and size of the scar endometriosis, as well as the surgical procedure, from the surgical notes on the case sheet. Histopathological investigation verified the final diagnosis in all cases where surgical excision occurred. The data were analyzed with SPSS version 21. We reported quantitative factors as mean and standard deviation, and qualitative variables as frequency and percentage.

Results:

We included six individuals with pathologically confirmed

surgical scar endometriosis in our study and examined their outcomes. Here, table 1 describes the general features of surgical scar endometriosis. The research patients had a mean age of 30.7 years (range 27–36 years). In our study, the average BMI was 27.15, and more than half of the participants were obese. According to the classification of obesity in Asia Pacific region, Obesity Class I: when BMI is 25–29.9 and Obesity Class II: when BMI is ≥ 30 . In our study all patients (6) were multipara (100%). Among 6 patients, majority (83.3%) had delivered by Cesarean section.

Table I: General Characteristics of the study of patients

General Characteristics	Frequency	Percent
Age (in years)	Mean 30.7 Standard deviation $\pm$ 3.2 year	
BMI (kg/m ²)	Mean 27.15 Standard deviation 3.49	
Obesity Class I (25-29.9)	4	66.7%
Obesity Class II (≥ 30)	1	16.7%
Parity		
Multipara	6	100%
Mode of Delivery		
1 Lower segment cesarean section	3	50%
2 Lower segment cesarean section	2	33.3%

Here, table II describes the lesion features associated with surgical scar endometriosis. The surgical operations preceding the scar endometriosis were primarily cesarean sections (5 patients, 83.3%). Hysterectomy was one of the procedures performed prior to scar endometriosis diagnosis. The average time from index surgery and clinical diagnosis of surgical scar endometriosis was 4.75 years. In our investigation, the most prevalent signs of scar endometriosis were cyclical pain and swelling at the scar site (100%). One woman had bleeding from lesion with umbilical involvement. Preoperative imaging includes ultrasonography for all patients, which is correct in 83.3% of instances. All of the patients (100%) had undergone medical treatment for scar endometriosis before undergoing definitive surgery with tablet Dinogest orally. They stay asymptomatic while receiving therapy, but when treatment is discontinued, symptoms recur, necessitating surgery.

Following surgery, all patients were administered hormonal suppression by oral Dinogest pill for six months. Our investigation found no recurrence after 11 months (± 3 months) of follow-up. In a research, Zhang and Liu⁷ showed that the postoperative medication group had considerably lower recurrence.

In 66.7% of patients, the time between the diagnosis of scar endometriosis and surgical treatment was more than two years. The average size of the surgical scar endometriosis lesion was 4.7 $\times$ 5.1cm. In surgical scar endometriosis, the most typically affected layer was subcutaneous tissue (100%), followed by the rectus sheath (66.7%). All patients, with or without defect correction, underwent a wide local excision of the lesion with a margin of at least 1 cm.

Table II: Lesion Characteristics and Symptoms of the Study Patients.

Lesion Characteristics	Frequency	Percentage
Index Surgery		
Lower segment cesarean section	5	83.3%
Hysterectomy	1	16.7%
Duration Between Index Surgery and Onset Symptoms (in years)	Mean 4.75 Standard Deviation 0.76	
Cyclical pain at scar	6	100%
Swelling or lump	6	100%
Cyclic bleeding	1	16.7%
Dysmenorrhea	2	33.3%
Pelvic Endometriosis	1	16.7%
Ultrasound diagnosis of scar endometriosis		
Correct	5	83.3%
Wrong	1	16.7%
Preoperative medical management	6	100%
Postoperative medical management	6	100%
Duration between symptoms and surgery		
With 2 year	2	33.3%
More than 2 year	4	66.7%
Location of Scar Endometriosis		
Supra Pubic Transverse Scar		
Left Lateral	5	83.3%
Umbilical	1	16.7%
Layer involved in scar endometriosis		
Skin involvement	3	50%
Subcutaneous involvement	6	100%
Rectus sheath	4	66.7%
Wide Local excision	6	100%

Discussion:

Surgical scar endometriosis still remains as a mystery. Endometriosis's actual origin and natural course remains unknown. Surgeons transplant active endometrial cells directly into the layers of a surgically incised lesion, and these types of cells resist immune-mediated apoptosis, causing the ectopic endometrial cell to persist⁸. The estrogen-dependent inflammatory response theory describes endometriosis's natural course and symptoms. In this investigation, we looked at an iatrogenic consequence. The average age of women with surgical scar endometriosis in our investigation was 30.7 years. Yildirim et al.⁹ and Zhang et al.¹⁰ found a mean age of 31 and 34, respectively. We attributed the high frequency among women of reproductive age to an increase in surgical scar endometriosis patients after a Cesarean delivery. The mean body mass index (BMI) in our investigation was 27.15, with more than half of the participants being obese, indicating that scar endometriosis is more common among obese people. This result was consistent with the findings of Sumathy et al.¹¹ and Ding et al.¹². Obesity can provide a large surgical surface for the trapping of active endometrial cells, perhaps initiating the process⁸. The index surgery is clearly a risk factor for surgical scar endometriosis. In our analysis, the index procedures initiating the scar endometriosis were primarily obstetric (83.3%) after Cesarean delivery. Scar endometriosis is thought to grow with parity due to increased adhesions and non-closure of peritoneal layers, which expose endometrial cells to the abdominal cavity. In our study, just one patient

developed scar endometriosis after abdominal hysterectomy. This might be due to endometrial cells being inoculated onto the incision site during the specimen removal process. Cyclical pain and a painful mass at the scar site, either with or without bleeding from the scar location, are the defining characteristics of surgical scar endometriosis. Dysmenorrhea was prevalent in 33.3% of patients, however pelvic endometriosis was found in only 13.3% of them. In a research by Yan Ding et al.¹², concurrent pelvic endometriosis was found in 5.3% of cases, despite the fact that the incidence is claimed to be 14.2-26%. The mean size of the surgical scar endometriosis lesion was 4.7×5.1cm. Subcutaneous tissue involvement (100%) followed by rectus sheath involved (66.7%) was the most common form of surgical scar endometriosis. This result was consistent with the findings of Sumathy et al.¹¹. For the diagnosis of surgical scar endometriosis, we only employed ultrasonography in conjunction with a high level of clinical suspicion. Our study found that ultrasonography was accurate in 83.3% of individuals with scar endometriosis. This observation is similar to those reported by Yuan et al.¹³ and Zhang et al.¹⁰. The USG characteristics of scar endometriosis are generally hypoechoic and heterogeneous, with dispersed internal echoes at the surgical site and minimal vascularity. Surgical scar endometriosis can be treated with medication and surgery. Dinogest 2mg is an oral tablet used in medical treatment. Scar endometriosis is best treated surgically by completely excising the lesion with a wide margin of about 1 cm and reconstructing the abdominal wall if necessary with mesh with a 1 cm clear margin, as well as minimizing contamination during handling to avoid recurrence after surgery. Following surgery, all women were given Dinogest 2mg tablets orally for 6 months. This diagnosis is confirmed by the histopathological examination of the excised tissue by the presence of endometriosis and stroma. Recurrence and malignant transformation are complications of scar endometriosis. Ding and Zhu's investigation found a 1.5 recurrence rate¹². The key to preventing recurrence following surgery is complete excision with a 1 cm clear margin along with minimizing endometriotic cell contamination of the area during handling. Scar endometriosis transforms in several ways, incorporating genetic, immunological, and environmental variables. Clear cell carcinoma is the single most prevalent histological subtype, succeeded by endometrial cancer. The prophylaxis of scar endometriosis is essential. To achieve this prevention, we must minimize the contamination of surgical incision layers with decidual or endometrial cells. They can avoid cesarean scar endometriosis by conducting an introflexed suture of the uterine incision and sealing the visceral and parietal peritoneums¹⁴. Vigorous abdominopelvic cavity irrigation, avoiding the use of a mop to clean the uterine cavity, approaching the visceral and parietal peritoneum, and suturing the uterine and abdominal walls with separate needles⁸. However, no evidence suggests that these measures can prevent the development of scar endometriosis.

Conclusions:

We found a clear link between surgical scar endometriosis with obstetrics and gynecology operations. A cesarean delivery is a clear risk factor for scar endometriosis. Scar endometriosis may become more common as the number of lower segment cesarean sections increases. Clinicians should have a high level of suspicion for scar endometriosis in women who approach with cyclic pain and swelling at the scar site. Scar endometriosis may be diagnosed accurately using ultrasound imaging. Medical care provides only short relief; a later excision with a clear margin, with or without mesh restoration, is the recommended treatment. We can avoid these iatrogenic consequences by following aforementioned surgical precaution. Furthermore, more prospective studies are needed on post-operative medical management in order to reduce recurrences.

Conflict of Interest: None.

Acknowledgement:

I would like to thank all of my patients who despite their grief and suffering assisted me in gathering all of my clinical information. This research was supported through resources and services provided by Department of Obstetrics & Gynecology at Bangabandhu Sheikh Mujib Medical University.

References:

1. Danielpour PJ, Layke JC, Durie N, Glickman LT. Scar endometriosis-a rare cause for a painful scar: A case report and review of the literature. *Canadian Journal of Plastic Surgery*. 2010 Mar;18(1):19-20.
<https://doi.org/10.1177/229255031001800110>
2. Oh EM, Lee WS, Kang JM, Choi ST, Kim KK, Lee WK. A surgeon's perspective of abdominal wall endometriosis at a cesarean section incision: nine cases in a single institution. *Surgery Research and Practice*. 2014;2014(1):765372.
<https://doi.org/10.1155/2014/765372>
3. Paşalega M, Mirea C, Vilcea ID, Vasile I, Pleşea IE, Calota F, et al. Parietal abdominal endometriosis following Cesarean section. *Rom J Morphol Embryol*. 2011 Jan 1;52(1 Suppl):503-8.
4. Khachani I, Filali Adib A, Bezad R. Cesarean scar endometriosis: An uncommon surgical complication on the rise? Case report and literature review. *Case Reports in Obstetrics and Gynecology*. 2017;2017(1):8062924.
<https://doi.org/10.1155/2017/8062924>
5. Chatterjee SK. Scar endometriosis: a clinicopathologic study of 17 cases. *Obstetrics & Gynecology*. 1980 Jul 1;56(1):81-4.
6. Teng CC, Yang HM, Chen KF, Yang CJ, Chen LS, Kuo CL. Abdominal wall endometriosis: an overlooked but possibly preventable complication. *Taiwanese Journal of Obstetrics and Gynecology*. 2008 Mar 1;47(1):42-8.
[https://doi.org/10.1016/S1028-4559\(08\)60053-4](https://doi.org/10.1016/S1028-4559(08)60053-4)
7. Zhang J, Liu X. Clinicopathological features of endometriosis in abdominal wall-clinical analysis of 151 cases. *Clin Exp Obstet Gynecol*. 2016 Jan 1;43(3):379-83.
<https://doi.org/10.12891/ceog2126.2016>
8. Ucar MG, Şanlıkan F, Göçmen A. Surgical treatment of scar endometriosis following cesarean section, a series of 12 cases. *Indian Journal of Surgery*. 2015 Dec;77:682-6.
<https://doi.org/10.1007/s12262-013-0978-1>
9. Yildirim D, Tatar C, Dogan O, Hut A, Donmez T, Akinci M, et al. Post- cesarean scar endometriosis. 2018 Mar; 15(1):33-38.
<https://doi.org/10.4274/tjod.90922>
10. Zhang P, Sun Y, Zhang C, Yang Y, Zhang L, Wang N, et al. Cesarean scar endometriosis: presentation of 198 cases and literature review. *BMC women's health*. 2019 Dec;19:1-6.
<https://doi.org/10.1186/s12905-019-0711-8>
11. Sumathy S, Mangalakanthi J, Purushothaman K, Sharma D, Remadevi C, Sreedhar S. Symptomatology and surgical perspective of scar endometriosis: a case series of 16 women. *The Journal of Obstetrics and Gynecology of India*. 2017 Jun;67:218-23.
<https://doi.org/10.1007/s13224-016-0945-4>
12. Ding Y, Zhu J. A retrospective review of abdominal wall endometriosis in Shanghai, China. *International Journal of Gynecology & Obstetrics*. 2013 Apr 1;121(1):41-4.
<https://doi.org/10.1016/j.ijgo.2012.11.011>
13. Yuan L, Zhang JH, Liu XS. Clinicopathological features of 151 cases with abdominal wall endometriosis. *Zhonghua fu Chan ke za zhi*. 2013 Feb 1;48(2):113-7.
14. Plotski A. Endometriosis of Postoperative Scar. *Scars*. IntechOpen; 2019.
<http://dx.doi.org/10.5772/intechopen.88246>

Outcome of Continuous versus Interrupted Sutures for Circumcision

M M Masud Pervez^{*1}, Tamanna Narmeen², Amrita Lal Halder³, Mahjib Shahnaz⁴,
Saniath Ahmad Salehin⁵

Abstract

Introduction: Circumcision is the most common pediatric surgical procedure all over the world. Suturing techniques are of two ways and complications are minimum in both these procedure. But bleeding and infection are the major complications associated with interrupted sutured circumcision. Continuous sutures had better outcome and showed less wound dehiscence than interrupted sutures. Hence, continuous suturing techniques were explored to replace the interrupted absorbable sutures. This study was conducted to compare the outcome of continuous and interrupted absorbable suturing techniques. **Materials and Methods:** This prospective study was conducted at the department of pediatric surgery BIRDEM General Hospital and Khidma Hospital, Dhaka, Bangladesh, among 250 children undergoing circumcision between January 2023 and December 2023. Among them, 125 patients underwent circumcision with continuous absorbable suturing techniques (group I) and 125 patients with interrupted absorbable suturing technique (group II). Comparative outcome analysis of both the groups was done based upon the following parameters- bleeding, infection, surgical wound dehiscence, swelling in the penis, Visual Analog Score (VAS) for pain assessment and cosmesis. The comparison of quantitative variables between the groups was done using chi-square test. **Results:** The age was 6.4 ± 1.3 years in group I and 5.8 ± 1.4 years in group II. Religious region was the commonest indication for circumcision (72%). The average healing period was six days in group I and 8 days in group II. No major surgical complications were observed in both the groups. But fewer postoperative complications were encountered in group I with respect to group II. As wound infection (p -value=0.05) is more common in group II. Circumcision done in group I (very good: 90.4%) was cosmetically superior to the patients in group II (very good: 40.8%) in which sutured marks were usually observed ($p < 0.0001$). **Conclusion:** The present study demonstrated better postoperative outcomes, reduced surgical time, reduced suture material requirement and better cosmesis in circumcision using continuous absorbable suturing technique compared to the interrupted technique. Higher satisfaction levels were observed in the continuous suture technique.

Keywords: Circumcision; Continuous absorbable suture; complications; cosmesis.

Number of Tables: 04; Number of Figures: 02; Number of References: 25; Number of Correspondences: 03.

*1. Corresponding Author:

Dr. M M Masud Pervez

Associate Professor
Department of Pediatric Surgery
BIRDEM General Hospital & IMC
Dhaka, Bangladesh.
Email: shaheensb25@gmail.com
Mobile no: 01716-582294

2. Dr. Tamanna Narmeen

Associate Professor
Department of Surgery
BIRDEM General Hospital & IMC
Dhaka, Bangladesh.

3. Dr. Amrita Lal Halder

Associate Professor
Department of Pediatrics and Neonatology
BIRDEM General Hospital & IMC
Dhaka, Bangladesh.

4. Dr. Mahjib Shahnaz

Medical Officer
National Burn and Plastic Surgery Institute
Dhaka, Bangladesh.

5. Dr. Saniath Ahmad Salehin

Senior Medical Officer
Department of Pediatric Surgery
BIRDEM General Hospital & IMC
Dhaka, Bangladesh.

Introduction:

Circumcision is a surgical procedure mostly performed for religious and medical reasons. It involves the excision of the foreskin that covers the distal end of the penis¹ and around 1/6th of the world's male population is reported to have been circumcised². Although circumcision is not accepted by many people worldwide, there are several health benefits of it, such as reduction in the risk of acquiring HIV, urinary tract infections, herpes simplex, balanitis, phimosis, and penile cancer^{3,4}. Bleeding and infection are the major complications associated with circumcision. Hence, alternatively tissue adhesives and different suturing techniques are being explored to reduce the complications associated with traditional circumcision⁵. Interrupted absorbable sutures are commonly performed all over

the world to approximate the skin and the inner prepuce in circumcision⁶. Continuous sutures had better outcome and showed less wound dehiscence than interrupted sutures⁷. There is limited data available on outcome analysis of continuous versus interrupted suturing techniques for circumcision⁸. Therefore, there is a need to compare the outcomes of the continuous suturing technique with the traditional suturing technique for widespread adoption. Hence, the present prospective study was conducted with the aim to assess the outcomes and complications with continuous and interrupted absorbable suturing techniques in circumcision.

Materials and Methods:

This prospective study was conducted at the department of pediatric surgery BIRDEM General Hospital and Khidma Hospital, Dhaka, Bangladesh. Data were collected from January 2023 to December 2023. The written informed consent was obtained from every patient's guardian before enrollment in the study. Total 250 patients, aged between 3-12 years were enrolled in the study. Main reason for circumcision was religious issue. And other indications were phimosis, balanoposthitis, paraphimosis and urinary tract infection. Patients aged <3 years and >12 years, with bleeding diathesis, previous penile surgery were excluded from this study. Based on the suturing techniques, patients were divided into two groups; group I (n=125, patients who underwent circumcision followed by continuous absorbable suture technique by 6-0 vicryl) and group II (n=125, patients who underwent circumcision followed by interrupted absorbable suture technique by 6-0 vicryl). All the cases were operated by a single pediatric surgeon between January 2023 to December 2023 by sleeve method. The preoperative antibiotic regimen used was third generation cephalosporin (Ceftriaxone 50 mg/kg). All aseptic preparation and under general anesthesia caudal block was given. The skin was prepared using 10% povidone solution and draped sterile. Congenital preputial adhesions are divided and the glans is cleaned with antiseptic solution. The line of circumferential incision marked just proximal to the coronal sulcus, leaving a cuff of inner preputial skin below the glans. The incision is then made with a scalpel knife to sufficient depth to allow the penile skin to be retracted proximally. The foreskin is elevated by placing one artery forceps ventrally and one dorsally. A circumferential line of incision on the penile shaft skin is marked, allowing sufficient skin to cover the full length of penis without tension. The skin is incised along the line with a scalpel knife. The excess foreskin is removed by dividing the subcutaneous layer between the inner and outer skin layers with bipolar diathermy. The outer skin is retracted and any bleeding points are coagulated with bipolar diathermy. The wound is closed with continuous technique using 6-0 absorbable suture (vicryl) in group I and interrupted technique using 6-0 absorbable suture (vicryl) in group II. Postoperatively, a local antiseptic ointment Mupirocin 2% was applied over the surgical site thrice daily for 21 days. All the patients received a course of antibiotics

cefixime (8-10 mg/kg/day) for 7 days and analgesics for 3 days. Patients were allowed to bathe after the third postoperative day. All the patients were admitted for day care surgery and followed-up in the outpatient department in regular interval for three months. By comparing the two groups, outcomes were analyzed in view of postoperative pain, bleeding, infection, swelling, surgical wound dehiscence and cosmesis. Operative and recovery time were noted. Postoperative pain was evaluated by Visual Analogue Scale (VAS) at 4 hrs, 12 hrs, and 48 hrs, and graded as mild, moderate and severe according to the score^{9,10}. The postoperative pain was divided into mild (1-3), moderate (4-7) and severe (8-10). The wound was assessed for cosmesis using modified Hollander cosmesis scale^{11, 12} and assigned 0 or 1 (0 for yes, 1 for no) point each for the step off the borders, contour irregularities puckering, wound margin separation, wound edge inversion and excess inflammation. Overall appearance was graded as very good, good, acceptable and bad. Another assessment of cosmesis was carried out after two months by another surgeon, who had not performed the circumcision in this study. Data were processed manually and analyzed with the help of Statistical Package for Social Sciences (SPSS) software version 20.0. The collected data was analyzed using descriptive statistical tool. Continuous variables were expressed as mean and Standard Deviation (SD) whereas categorical variables were given as numbers (percentage). Quantitative data were analyzed by t-test and qualitative data was analyzed by chi-square test. The level of statistical significance was taken as p-value <0.05.

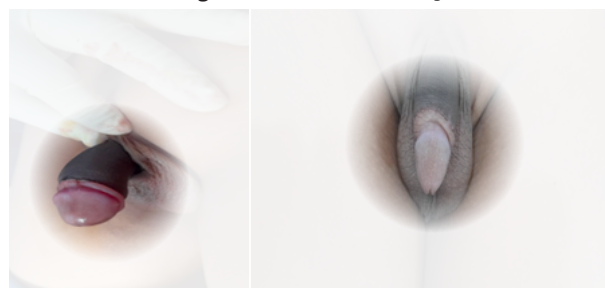


Fig-1: Images of continuous suture

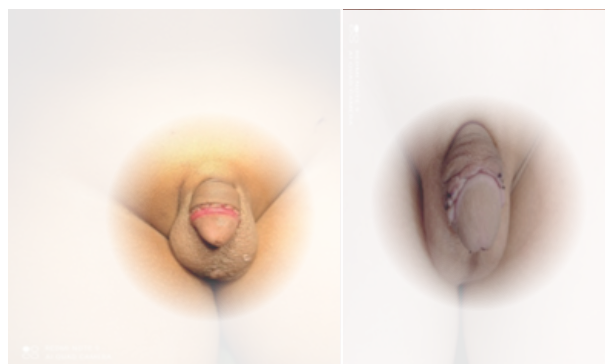


Fig-2: Images of interrupted suture

Results:

Among the 250 patients mean age was 6.4 ± 1.3 years in group I and 5.8 ± 1.4 years in group II. The average time

taken for the procedure was less in group I (14 minutes) than group II (20 minutes) and healing time was also less in group I (6 days) than group II (8 days). The most common indication for circumcision was religious region (72%) and others were phimosis, balanoposthitis, Urinary Tract Infections (UTIs), paraphimosis [Table I]. No major surgical complications were observed in both the groups.

Table I: Indication for circumcision.

Indication for circumcision	n (%)
Religious	180(72)
Phimosis	40(16)
Paraphimosis	3(1.2)
Balanoposthitis	15(6)
Urinary tract infections	12(4.8)

Incidence of bleeding was comparatively lower among patients from group I (2.4%) than group II (4 %). Wound infections were lesser among group I compared to group II. However, surgical site oedema was found to be higher in patients from group I (25.6%) compared to group II (14.4%). Minimal swelling was observed in group II in early postoperative period but later it was retroceded with oral analgesic and topical antiseptic cream. All patients with mild and moderate infections were treated with antiseptic cream and oral antibiotics and recovered well within 10-16 days.

Table II: Comparison of complications in continuous versus interrupted suture for children circumcision.

Postoperative complication	Group I (n=125), n (%)	Group II (n=125), n (%)	p-value
Bleeding	3(2.4)	5(4)	0.0876
Surgical site oedema	32(25.6)	18 (14.4)	0.01
Wound infection	1(0.8)	4(3.2)	0.05
Wound dehiscence	-	1(0.8)	-

Postoperative pain assessment was done using a visual analog pain scoring system. The visual analog score was mild pain in majority of the patients in group I than group II [Table III].

Table III: Visual analogue score of postoperative pain.

Postoperative pain	Mild (1-3) n (%)	Moderate (4-7) n (%)	Severe (8-10) n (%)
VAS after 4 hours			
Group I	104 (83.2)	19 (15.2)	2 (1.6)
Group II	95 (76)	24 (19.2)	6 (4.8)
p-value	0.2192	0.5062	0.1976
VAS after 12 hours			
Group I	113 (90.4)	12 (9.6)	-
Group II	105 (84)	18 (14.4)	2 (1.6)
p-value	0.1024	0.1916	-
VAS after 48 hours			
Group I	119 (95.2)	6 (4.8)	-
Group II	115 (92)	10 (8)	-
p-value	0.2541	0.3412	-

Circumcision done in group I (very good: 90.4%) was cosmetically superior to the patients in group II (very good: 40.8%) in which sutured marks were usually observed ($p < 0.0001$). Higher satisfaction levels were observed in the continuous suture technique [Table IV].

Table IV: Cosmesis score in continuous and interrupted absorbable sutures after circumcision.

Cosmesis score	Group I (n=125), n (%)	Group II (n=125), n (%)	p-value
Very good	113 (90.4)	51(40.8)	<0.0001
Good	8 (6.4)	63 (50.4)	<0.0001
Acceptable	4 (3.2)	10 (8)	0.0504
Bad	-	1 (0.8)	-

Discussion:

The present study implies a shorter operative time with less postoperative pain, less healing period and better cosmesis in continuous absorbable suturing technique as compared to interrupted absorbable suturing technique. Religious region is the most common indication for circumcision followed by phimosis, balanoposthitis, UTIs, and paraphimosis. A study reported by Weiss HA et al., the most common indications for circumcision are phimosis, balanoposthitis, recurrent balanoposthitis, Balanitis Xerotica Obliterans, recurrent UTIs and religious¹³. Extensive literature showed that data comparing the continuous and interrupted technique using absorbable suture in terms of clinical outcomes, complications and cosmesis are scarce^{8,14}. Studies have reported the use of these techniques in circumcision and also in other conditions such as obstetrics, surgery of abdomen or groin and mass closure of transverse incisions in paediatrics^{15,16,17}. Dorsal slit and sleeve method are the two common techniques in circumcision. Guillotine method was performed in pediatric populations with surgical equipments including Gomco, Mogen, Plastic Bell, Tara Ring and Shang clamps used for better results¹⁹. The sleeve method was used in the present study groups with the only difference between the two groups being the use of continuous absorbable suturing technique vs. interrupted absorbable suture technique. In the present study, the average healing period was faster in patients with continuous technique than in sutured group patients (6 vs. 8 days). Literature reports that the frequency of complications associated with circumcision increases with the age of the patient²⁰. Early complications of circumcision include bleeding, haematoma, infection, lacerations of the penis, injury to the glans penis, meatal stenosis, urinary retention, and buried penis¹³. A delayed complication includes suture granuloma, foreign body reaction, and disfiguration. The common surgical complications of circumcision observed in the present study were oedema, bleeding, and wound infection. These complications were greater in group II than in group I. Ravindraanandan M et al., did not report any major postoperative complications with continuous suturing circumcision¹⁸. However, a clinical trial in paediatrics,

reported less wound dehiscence rate with interrupted absorbable suture than the mass closure of transverse incision in children¹⁷. Thermocautery-assisted circumcision has become a practical and rapid method for circumcision in regions where circumcision is a common procedure with minimal complications²². The cosmetic result of a classic circumcision is not easily acceptable in a community. Minimal excision of the prepuceal skin which includes the fibrous tissue in order to achieve a redundant outer layer of the skin and reapproximation of the traumatic edges with 5-0 absorbable interrupted sutures give more cosmetic than the classic circumcision²³. The use of interrupted sutures with octyl cyanoacrylate offers several advantages of faster skin closure and the application of octyl cyanoacrylate is less painful and less invasive than standard suturing techniques. Moreover, it yielded comparable cosmetic results to standard suturing techniques²⁷. Patients who underwent circumcision without sutures had better cosmesis postoperatively and during follow-up periods⁸. Similarly, in the present study, higher satisfaction levels were observed in continuous suture technique. Researchers have been suggesting that continuous repair technique is better than interrupted suture methods in terms of perineal pain²⁴. Previous comparative study comparing the postoperative pain scores between continuous and interrupted circumcision technique. The results showed that mild pain was more common in interrupted suture technique as compared to continuous suture technique with no need for analgesics in any of this patients⁸. Similarly, in the present study majority of patients from continuous suture technique group had less pain as compared to interrupted suturing technique group. The stitch marks were more in patients with continuous suture technique groups as compared to interrupted absorbable sutures. This method helps to get rid of the use of traditional dressings which are incorporated within sutures, and hence cause pain during their removal. Absence of interrupted sutures gives better cosmetic results. Limitation of this study was the small sample size in both groups, therefore further studies with larger sample sizes are required to support these findings.

Conclusions:

It is obvious that continuous absorbable suturing technique was the better option than interrupted technique for circumcision as this procedure demonstrated better postoperative outcomes, reduced surgical time, reduced suture material requirement and better cosmesis. However, multicenter studies are needed to conclude which suturing technique is better.

Conflict of Interest: None.

Acknowledgement:

The authors are grateful to all doctors and staffs of the Department of Pediatric surgery, BIRDEM General Hospital, Dhaka for their cooperation during study period.

References:

1. Ince B, Dadaci M, Altuntas Z, Bilgen F. Rarely seen complications of circumcision, and their management. *Turk J Urol*. 2016;42:12-15.
<https://doi.org/10.5152/tud.2016.78972>
2. Waszak SJ. The historic significance of circumcision. *ObstetGynaecol*. 1978; 51:499-501.
<https://doi.org/10.1097/00006250-197804000-00023>
3. Reed JB, Njeuhmeli E, Thomas AG, Bacon MC, Bailey R, Cherutich P, et al. Voluntary medical male circumcision: an HIV prevention priority for PEPFAR. *J Acquir Immune Defic Syndr*. 2012;60Suppl 3:S88-95.
<https://doi.org/10.1097/QAI.0b013e31825cac4e>
4. Eisenberg ML, Galusha D, Kennedy WA, Cullen MR. The Relationship between Neonatal Circumcision, Urinary Tract Infection, and Health. *World J Mens Health*. 2018;36:176-182.
<https://doi.org/10.5534/wjmh.180006>
5. Tiwari P, Tiwari A, Kumar S, Patil R, Goel A, Sharma P, et al. Sutureless [4] circumcision-An Indian experience. *Indian J Urol*. 2011;27(4):475-78.
<https://doi.org/10.4103/0970-1591.91435>
6. Kettle C, Hills RK, Ismail KM. Continuous versus interrupted sutures for [6] repair of episiotomy or second degree tears. *Cochrane Database Syst Rev*. 2007;4:CD000947.
<https://doi.org/10.1002/14651858.CD000947.pub2>
7. Gurusamy KS, Toon CD, Allen VB, Davidson BR. Continuous versus interrupted [11] skin sutures for non-obstetric surgery. *Cochrane Database Syst Rev*. 2014;14(2):CD010365.
<https://doi.org/10.1002/14651858.CD010365.pub2>
8. Raut A. Sutureless versus sutured circumcision: A comparative study. *Urol Ann*. [12] 2019;11(1):87-90.
https://doi.org/10.4103/UA.UA_12_18
9. Haefeli M, Elfering A. Pain assessment. *Eur Spine J*. 2006;15(1):S17-S24.[14]
<https://doi.org/10.1007/s00586-005-1044-x>
10. Aitken RC. Measurement of feelings using visual analogue scales. *Proc R Soc [15] Med*. 1969;62(10):989-93.
<https://doi.org/10.1177/003591576906201005>
11. Hollander JE, Singer AJ, Valentine S, Henry MC. Wound registry: Development [16] and validation. *Ann Emerg Med*. 1995;25(5):675-85.
[https://doi.org/10.1016/S0196-0644\(95\)70183-4](https://doi.org/10.1016/S0196-0644(95)70183-4)
12. Quinn JV, Drzewiecki AE, Stiell IG, Elmslie TJ. Appearance scales to [17] measure cosmetic outcomes of healed lacerations. *Am J Emerg Med*. 1995;13(2):229-31.
[https://doi.org/10.1016/0735-6757\(95\)90100-0](https://doi.org/10.1016/0735-6757(95)90100-0)

13. Weiss HA, Larke N, Halperin D, Schenker I. Complications of circumcision [18] in male neonates, infants and children: A systematic review. *BMC Urol.* 2010;10:02.
<https://doi.org/10.1186/1471-2490-10-2>
14. Bawazir OA, BanajaAM. Sutureless versus interrupted sutures techniques for [19] neonatal circumcision; a randomized clinical trial. *J Pediatr Urol.* 2020;16(4):493.e1-493.e6.
<https://doi.org/10.1016/j.jpuro.2020.06.025>
15. Maged AM, Moheesen MN, Elhalwagy A, Abdelaal H, Almohamady M, Abdellatif [20] AA, et al. Subcuticular interrupted versus continuous skin suturing in elective cesarean section in obese women: A randomized controlled trial. *J Matern Fetal Neonatal Med.* 2019;32(24):4114-19.
<https://doi.org/10.1080/14767058.2018.1481950>
16. Gurusamy KS, Toon CD, Allen VB, Davidson BR. Continuous versus interrupted [21] skin sutures for non-obstetric surgery. *Cochrane Database Syst Rev.* 2014;2:CD010365.
<https://doi.org/10.1002/14651858.CD010365.pub2>
17. Khan S, Saleem M, Talat N. Wound dehiscence with continuous [22] versus interrupted mass closure of transverse incisions in children with absorbable suture: A randomized controlled trial. *World JnlPed Surgery.* 2019;2(2):e000016.
<https://doi.org/10.1136/wjps-2018-000016>
18. Ravindraanandan M, Fernando H, Aslam S. Continuous suturing as a wound closure technique for circumcisions. *J Clin Urol.* 2019;12(6):470-73.
<https://doi.org/10.1177/2051415819849319>
19. Abdulwahab-Ahmed A, Mungadi IA. Techniques of male circumcision. *J Surg [24] Tech Case Rep.* 2013;5(1):01-07.
<https://doi.org/10.4103/2006-8808.118588>
20. Krill AJ, Palmer LS, Palmer JS. Complications of circumcision. *Sci World J.* [25] 2011;11:2458-68.
<https://doi.org/10.1100/2011/373829>
21. Lane V, Vajda P, Subramaniam R. Paediatricsutureless circumcision: A systematic [26] literature review. *PediatrSurg Int.* 2010;26(2):141-44.
<https://doi.org/10.1007/s00383-009-2475-y>
22. Ölçücü MT, Teke K. Evaluation of short-term postoperative complications [27] according to the Clavien-Dindo classification system in Thermocautery-assisted Circumcision Cases. *J Urol Surg.* 2020;7(3):218-26.
<https://doi.org/10.4274/jus.galenos.2020.3266>
23. Tsikopoulos G, Asimakidou M, Smaropoulos E, Farmakis K, Klokkaris A. [28] Circumcision-A new approach for a different cosmetic result. *Hippokratia.* 2014;18(2):116-19.
24. Van Haute C, Tailly T, Klockaerts K, Ringoir Y. Sutureless circumcision using [31] 2-Octyl cyanoacrylate results in more rapid and less painful procedures with excellent cosmetic satisfaction. *Journal of Pediatric Urology.* 2015;11(3):147.e1-e5.
<https://doi.org/10.1016/j.jpuro.2015.02.013>
25. Morano S, Mistrangelo E, Pastorino D, Lijoi D, Costantini S, Ragni N, et al. A [32] randomized comparison of suturing techniques for episiotomy and laceration repair after spontaneous vaginal birth. *J Minim Invasive Gynaecol.* 2006;(5):457-62.
<https://doi.org/10.1016/j.jmig.2006.06.006>

Prevalence and Causes of Low Vision in Urban vs. Rural Populations

Md. Miftahul Hossain Chowdhury^{*1}, Md. Golam Faruk Hossain², Shamima Siddiqui³

Abstract

Introduction: Low vision is a significant global public health issue, affecting millions and leading to reduced quality of life. In developing countries like Bangladesh, low vision is often due to uncorrected refractive errors, cataracts, and other preventable conditions. There are disparities in the prevalence and causes of low vision between urban and rural populations, driven by differences in healthcare access, socio-economic status, and awareness. **Objective:** To assess the prevalence, causes, and socio-economic impact of low vision in urban and rural populations in Bangladesh. **Materials and Methods:** This cross-sectional comparative study was conducted at the Ophthalmology Department, Shaheed Tajuddin Ahmed Medical College, Gazipur, over two years (January 2021–December 2022). A total of 124 participants were included using stratified random sampling. Comprehensive eye exams and demographic data were collected. The study used descriptive statistics and chi-square tests for analysis, with a p-value of <0.05 considered significant. **Result:** The study included 124 participants, with the majority aged 30–49 (33.9%) and 56.5% being male. Half of the participants (50%) had moderate low vision, while 37.1% had severe low vision. Cataracts were the leading cause of low vision (38.7%), especially in rural areas (46.7%). Urban participants had more frequent eye check-ups (81.3%) and cataract surgeries (21.9%) compared to rural participants (46.7% and 13.3%, respectively). **Conclusion:** The study reveals disparities in low vision prevalence, causes, and access to care across populations.

Keywords: Low vision, prevalence, urban populations, socio-economic factors.

Number of Tables: 08; Number of References: 27; Number of Correspondences: 03.

*1. Corresponding Author:

Dr. Md. Miftahul Hossain Chowdhury
Associate Professor
Department of Ophthalmology
National Institute of Ophthalmology (NIO)
Dhaka, Bangladesh.
Mobile: 01763519961
Email: miftahulchowdhury75@gmail.com

2. Dr. Md. Golam Faruk Hossain

Assistant Professor
Department of Community Ophthalmology
Bangabandhu Sheikh Mujib Medical University (BSMMU)
Dhaka, Bangladesh.

3. Dr. Shamima Siddiqui

Medical Officer
National Institute of Cancer Research & Hospital (NICRH)
Dhaka, Bangladesh.

Introduction:

Low vision is a significant public health issue that affects millions of people worldwide, leading to diminished quality of life and social functioning. According to the World Health Organization (WHO), low vision is defined as a visual acuity worse than 6/18 but equal to or better than 3/60 in the better eye with the best possible correction¹. It is estimated that globally, 2.2 billion people live with some form of vision impairment, of which at

least 1 billion have a preventable or treatable cause of low vision². The causes of low vision vary based on geographic location, socio-economic conditions, and access to healthcare services. In developing countries like Bangladesh, the prevalence of low vision is significant due to factors such as uncorrected refractive errors, cataracts, and other eye diseases³. A study in South Asia reported that refractive errors and cataracts are the leading causes of low vision, particularly in rural populations where access to specialized eye care is limited⁴. However, there are variations in the prevalence and causes of low vision between urban and rural populations, often driven by differences in healthcare infrastructure, awareness, and lifestyle factors⁵. Urban populations may have better access to healthcare services, including early diagnosis and treatment of vision problems, but they also face risks from lifestyle-related diseases such as diabetes, which can lead to diabetic retinopathy, a common cause of low vision⁶. In contrast, rural populations often suffer from preventable causes like cataracts and uncorrected refractive errors due to limited access to healthcare and lower health literacy⁷. The prevalence of low vision in Bangladesh remains under-researched, particularly in terms of comparing urban and rural populations. Previous studies have focused primarily on either urban or rural settings but have not provided a comprehensive comparison between the two⁸. Understanding the differences in prevalence and causes between these populations is crucial for developing targeted interventions⁹. For example, a study conducted in rural India found that the prevalence of uncorrected refractive errors was significantly higher in rural areas compared to urban regions¹⁰. This study aims to investigate the prevalence and causes of low vision in urban versus rural populations in

Bangladesh. By conducting a comparative analysis, this study will provide valuable insights into the different factors contributing to low vision in these two populations and help inform public health strategies for reducing vision impairment¹¹. Given the growing aging population and the increasing burden of non-communicable diseases in Bangladesh, addressing low vision is of paramount importance for improving overall public health outcomes¹². The findings from this study can also guide healthcare policymakers in resource allocation and the development of preventive programs, especially in rural areas where the burden of low vision is expected to be higher¹³. Ultimately, improving access to eye care services and addressing the causes of low vision can contribute to better quality of life for affected individuals and reduce the overall healthcare burden in the country^{14,15}.

Objectives:

General Objective: To determine the prevalence, causes, and socio-economic impact of low vision among urban and rural populations, and to assess the differences in visual impairment and its management between these two groups.

Specific Objectives:

- To determine the prevalence of low vision in both urban and rural populations.
- To identify the leading causes of low vision in urban and rural settings, such as cataracts, refractive errors, glaucoma, and age-related macular degeneration (AMD).
- To compare the socio-economic characteristics of individuals with low vision in urban and rural populations, focusing on income levels, access to healthcare, and eye care services.

Materials and Methods: This is a cross-sectional, comparative study conducted to evaluate the prevalence and causes of low vision in urban versus rural populations. The study was carried out in the Ophthalmology Department of Shaheed Tajuddin Ahmed Medical College, Gazipur, over a period of two years (January 2021 to December 2022). **Sampling Formula:** The sample size was calculated using the following formula for prevalence studies:

Where:

$$n = \frac{(z^2 \times P \times (1-P))}{d^2}$$

n = required sample size

Z = Z value (1.96 for 95% confidence level)

p = estimated prevalence of low vision (assumed as 0.2 based on previous studies)

d = margin of error (set at 0.05)

A total of 124 participants (urban and rural) were included, ensuring equal representation from both populations.

Data Collection Procedure: Participants were selected through stratified random sampling from urban and rural populations attending the Ophthalmology department. Each participant underwent a comprehensive eye examination, including visual acuity testing, refraction,

slit-lamp biomicroscopy, and fundoscopy. Data on demographics (age, gender, occupation, and BMI) and medical history were also collected. The visual acuity was categorized as per World Health Organization (WHO) criteria. The causes of low vision were identified based on clinical diagnosis, including refractive errors, cataracts, glaucoma, and diabetic retinopathy. All data were recorded in pre-structured data collection forms.

Inclusion Criteria:

- Adults aged 18 years and above
- Participants presenting with low vision (visual acuity worse than 6/18 in the better eye with best possible correction)
- Residents of the urban or rural areas around Gazipur
- Individuals willing to provide informed consent

Exclusion Criteria:

- Patients with a history of ocular trauma
- Those who had undergone any previous ocular surgery
- Individuals with systemic conditions affecting vision (e.g., neurological disorders)
- Patients unwilling to participate or provide consent

Statistical Analysis: Data were entered and analyzed using SPSS (Statistical Package for Social Sciences) software, version 25.0. Descriptive statistics were used to calculate frequencies, percentages, mean, and standard deviation for demographic and clinical variables. Chi-square tests were performed to assess associations between categorical variables (such as causes of low vision in urban vs. rural populations), while t-tests were used for continuous variables like age and BMI. A p-value of <0.05 was considered statistically significant.

Ethical Considerations: Ethical approval for the study was obtained from the Ethical Review Board of Shaheed Tajuddin Ahmed Medical College. Informed written consent was taken from all participants after explaining the study objectives and procedures. Confidentiality of all patient data was maintained, and participants had the right to withdraw from the study at any time without any consequence to their treatment. The study adhered to the Declaration of Helsinki principles regarding research involving human subjects.

Result:

Table I: Demographic Characteristics (Age, Gender, Occupation, BMI)

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
18–29	28	22.6
30–49	42	33.9
50–69	38	30.6
≥70	16	12.9
Mean Age (years)	45.8 ± 12.6	
Gender		
Male	70	56.5
Female	54	43.5
Mean BMI (kg/m²)	24.7 ± 3.9	
Underweight (<18.5)	10	8.1
Normal (18.5–24.9)	68	54.8
Overweight (25–29.9)	34	27.4
Obese (≥30)	12	9.7

Table I presents the demographic and clinical characteristics of the study population, which consists of 124 participants. The majority of participants are in the 30–49 age group (33.9%), followed by those aged 50–69 (30.6%). Males make up 56.5% of the population, while females constitute 43.5%. The BMI distribution indicates that 54.8% have a normal BMI, while 27.4% are overweight, and 9.7% are obese. The mean age of the participants is 45.8 years.

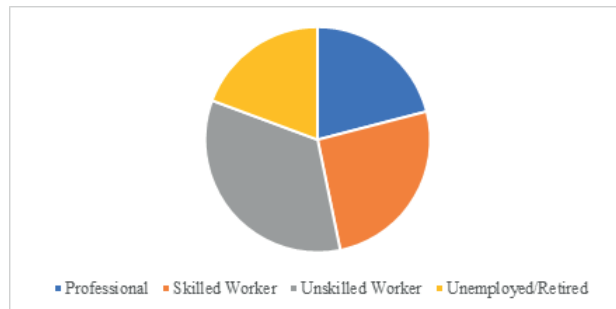


Figure 1: Distribution of occupations

Figure 1 shows the occupation, most participants are unskilled workers (33.9%), with 25.8% working in skilled jobs and 21.0% holding professional positions.

Table II: Distribution by Residence and Socio-Economic Status.

Variable	Urban (n=64)	Rural (n=60)
Socio-Economic Status		
Low	18 (28.1%)	28 (46.7%)
Middle	30 (46.9%)	22 (36.7%)
High	16 (25.0%)	10 (16.6%)

Table II differentiates between the urban and rural populations in terms of socio-economic status. Urban residents have a higher average income (34,500 BDT/month) compared to their rural counterparts (18,200 BDT/month). Additionally, 46.7% of rural participants fall within the low socio-economic bracket, compared to 28.1% in urban areas. This distinction is crucial, as socio-economic factors often influence access to healthcare and treatments, potentially affecting the prevalence and management of low vision in these populations.

Table III: Vision Impairment Categories. (n=124)

Vision Category	Urban (n=64)	Rural (n=60)
Moderate Low Vision (BCVA <6/18)	34 (53.1%)	28 (46.7%)
Severe Low Vision (BCVA <6/60)	20 (31.3%)	26 (43.3%)
Blindness (BCVA <3/60)	10 (15.6%)	6 (10.0%)

This table categorizes the degree of vision impairment in the study population, showing that half of the participants (50%) suffer from moderate low vision, while 37.1% have severe low vision. A smaller percentage (12.9%) are classified as blind.

Table IV: Causes of Low Vision. (n=124)

Cause of Low Vision	Urban (n=64)	Rural (n=60)
Cataract	20 (31.3%)	28 (46.7%)
Refractive Error	26 (40.6%)	18 (30.0%)
Glaucoma	8 (12.5%)	6 (10.0%)
Age-Related Macular Degeneration (AMD)	6 (9.4%)	4 (6.7%)
Diabetic Retinopathy	4 (6.2%)	4 (6.6%)

Table IV shows the most common causes of low vision in both urban and rural populations are cataracts (38.7%) and refractive errors (35.5%). Cataracts are more prevalent in rural areas (46.7%) than in urban areas (31.3%), possibly due to delayed access to surgical interventions. Glaucoma and

age-related macular degeneration (AMD) are less common, while diabetic retinopathy accounts for 6.5% of cases.

Table V: Visual Acuity at First Presentation.

Visual Acuity (BCVA)	Urban (n=64)	Rural (n=60)
6/9 – 6/12	14 (21.9%)	12 (20.0%)
6/18 – 6/24	18 (28.1%)	14 (23.3%)
6/36 – 6/60	22 (34.4%)	24 (40.0%)
<3/60 (Blind)	10 (15.6%)	10 (16.7%)

Table V shows the visual acuity levels of participants when they first presented for examination. A significant portion of the population (37.1%) falls into the 6/36 – 6/60 range, indicating severe visual impairment. Another 25.8% have moderate impairment (6/18 – 6/24), while 16.2% of participants are considered blind (visual acuity <3/60).

Table VI: History of Eye Treatment and Access to Eye Care.

Access to Eye Care	Urban (n=64)	Rural (n=60)
History of Eye Check-Up	52 (81.3%)	28 (46.7%)
Ever Used Glasses/Contacts	40 (62.5%)	24 (40.0%)
Eye Surgery (e.g., cataract)	14 (21.9%)	8 (13.3%)

Table 6 focuses on the history of eye care and treatment in both urban and rural populations. Urban participants are more likely to have had eye check-ups (81.3% vs. 46.7%) and to have used glasses or contact lenses (62.5% vs. 40.0%). Surgical interventions, such as cataract surgery, are more common in urban areas (21.9% vs. 13.3%).

Table VII: Comorbid Conditions Associated with Low Vision

Condition	Urban (n=64)	Rural (n=60)
Hypertension	18 (28.1%)	22 (36.7%)
Diabetes Mellitus	10 (15.6%)	14 (23.3%)
Chronic Respiratory Disease	8 (12.5%)	10 (16.7%)
Heart Disease	6 (9.4%)	8 (13.3%)

Table VII outlines the comorbid conditions that are associated with low vision in the study population. Hypertension is the most common comorbidity (32.3%), followed by diabetes mellitus (19.4%) and chronic respiratory disease (14.5%).

Table VIII: Impact of Low Vision on Daily Activities.

Daily Activity Affected	Urban (n=64)	Rural (n=60)
Reading and Writing	36 (56.3%)	28 (46.7%)
Mobility (walking outside)	30 (46.9%)	38 (63.3%)
Household Tasks	24 (37.5%)	30 (50.0%)
Employment/Work	20 (31.3%)	24 (40.0%)

Table VIII shows the impact of low vision on daily life activities. More than half of the participants (54.8%) report difficulties with mobility, particularly in rural areas where outdoor navigation can be more challenging. Reading and writing are affected in 51.6% of cases, while 43.5% of participants struggle with household tasks. Low vision also impacts employment, with 35.5% of participants reporting difficulties in their work life.

Discussion:

The study population demonstrates a significant variation in age distribution, with the majority falling into the 30–49 (33.9%) and 50–69 (30.6%) age groups. This reflects that low vision is prevalent in both middle-aged and older individuals, which aligns with previous studies indicating that age is a major risk factor for visual impairment, especially due to conditions like cataracts, refractive errors, and age-related macular degeneration (AMD)¹⁶. The mean age of the participants, 45.8 years, is indicative of an aging population at

risk for such ocular conditions¹⁷. The gender distribution, with males accounting for 56.5% and females 43.5%, also suggests a higher prevalence of low vision among males in the population studied. Similar trends have been observed in other studies, where men are more likely to report visual impairments, possibly due to a higher exposure to occupational hazards and reduced use of protective eyewear¹⁸. In terms of BMI, 54.8% of the population had a normal BMI, while 27.4% were overweight and 9.7% were obese. This indicates that being overweight or obese may contribute to the risk of developing low vision, particularly through the development of conditions like diabetes, which can lead to diabetic retinopathy, a known cause of vision impairment¹⁹. Studies have shown a strong association between obesity, diabetes, and visual impairment²⁰. The occupational status of the participants further sheds light on socio-economic factors influencing low vision. Most of the participants were unskilled workers (33.9%), followed by skilled workers (25.8%) and professionals (21.0%). The high prevalence of low vision among unskilled workers may be due to increased exposure to environmental and occupational risks without adequate protection or preventive measures²¹. Moreover, individuals in lower socio-economic brackets tend to have reduced access to healthcare services, contributing to untreated or poorly managed eye conditions²². A key finding of this study is the disparity between urban and rural populations regarding socio-economic status and access to healthcare services. Rural participants had a lower average monthly income (18,200 BDT) compared to their urban counterparts (34,500 BDT), and 46.7% of rural participants were classified as low socio-economic status, compared to 28.1% in urban areas. This socio-economic gap is crucial, as it directly affects access to timely eye care, including the use of glasses, contact lenses, and cataract surgeries. Studies have consistently shown that rural populations are more likely to experience delays in seeking medical attention for eye diseases, resulting in more advanced and severe visual impairments²³. Cataracts (38.7%) and refractive errors (35.5%) were the most common causes of low vision in both urban and rural populations. However, cataracts were more prevalent in rural areas (46.7%) than in urban areas (31.3%), likely due to the aforementioned socio-economic and healthcare access disparities. This aligns with research showing that rural populations often have delayed access to cataract surgeries, resulting in a higher prevalence of cataract-induced low vision²⁴. Similarly, refractive errors, though prevalent in both settings, may be more easily managed in urban areas where access to optometric services is greater²⁵. Visual acuity measurements revealed that 37.1% of participants had severe visual impairment, with visual acuity ranging from 6/36 to 6/60. Additionally, 16.2% were considered blind, with visual acuity less than 3/60. These figures are alarming and emphasize the need for improved access to early detection and treatment, particularly in rural areas where blindness due to treatable conditions like cataracts is more common²⁶. In terms of eye care history,

urban participants were more likely to have undergone regular eye check-ups (81.3% vs. 46.7%) and surgical interventions, such as cataract surgery (21.9% vs. 13.3%). This reinforces the need for public health initiatives to improve access to eye care in rural areas and raise awareness about the importance of regular check-ups²⁷.

Conclusion:

This study highlights the significant burden of low vision in both urban and rural populations, with notable differences in the prevalence, causes, and management of visual impairment across these settings. Cataracts and refractive errors were identified as the most common causes of low vision, particularly among rural populations where access to timely surgical interventions is limited. The socio-economic disparity between urban and rural areas also emerged as a critical factor influencing both the prevalence and treatment of low vision, with rural participants having lower incomes and reduced access to healthcare services.

References:

1. World Health Organization. Blindness and vision impairment [Internet]. 2020. Available from: <https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment>
2. Flaxman SR, Bourne RRA, Resnikoff S, Ackland P, Braithwaite T, Cicinelli MV, et al. Global causes of blindness and distance vision impairment 1990-2020: a systematic review and meta-analysis. *Lancet Glob Health*. 2017;5(12):34.
3. Hashemi H, Yekta A, Jafarzadehpour E, Ostadimoghaddam H, Fotouhi A. The prevalence of visual impairment and blindness in underserved rural areas: A review of studies from Iran. *J Curr Ophthalmol*. 2019;31(1):1-10.
4. Khanna RC, Murthy GV, Giridhar P, Krishnaiah S, Pant HB, Pal SS, et al. Cataract, visual impairment, and long-term mortality: The Andhra Pradesh Eye Disease Study. *Invest Ophthalmol Vis Sci*. 2020;61(4):45.
5. Dandona L, Dandona R. Socioeconomic status and blindness. *Br J Ophthalmol*. 2001;85(12):1484-8. <https://doi.org/10.1136/bjo.85.12.1484> PMID:11734525 PMCID:PMC1723805
6. Yau JW, Rogers SL, Kawasaki R, Lamoureux EL, Kowalski JW, Bek T, et al. Global prevalence and major risk factors of diabetic retinopathy. *Diabetes Care*. 2012;35(3):556-64. <https://doi.org/10.2337/dc11-1909> PMID:22301125 PMCID:PMC332721
7. Bourne RRA, Steinmetz JD, Flaxman SR, Briant PS, Taylor HR, Resnikoff S, et al. Causes of vision loss worldwide, 1990-2010: A systematic analysis. *Lancet Glob Health*. 2021;9(2):60.
8. Khandekar R, Mohammed AJ, Negrel AD, Al Riyami

A. The prevalence and causes of blindness in the Sultanate of Oman: the 1996 national survey. *Ophthalmic Epidemiol.* 2022;9(3):73-81.

9. Rahman MM, Islam MS, Al-Amin MM, Iqbal MA. Prevalence and determinants of visual impairment among adults in Bangladesh: A population-based study. *J Epidemiol Glob Health.* 2021;11(2):200-9.

<https://doi.org/10.55002/mr.2.3.23>

10. Reddy PA, Reddy PA. Prevalence of refractive errors in urban and rural settings of South India. *Indian J Ophthalmol.* 2017;65(3):224-8.

11. Foster A, Resnikoff S. The impact of vision 2020 on global blindness. *Eye.* 2005;19(10):1133-5.

<https://doi.org/10.1038/sj.eye.6701973>

PMid:16304595

12. Thylefors B, Negrel AD, Pararajasegaram R, Dadzie KY. Global data on blindness. *Bull World Health Organ.* 1995;73(1):115-21.

13. Murthy GVS, Gupta SK, Bachani D, Jose R, John N. Human resources and infrastructure for eye care in India: current status. *Natl Med J India.* 2004;17(3):128-34.

14. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. *Br J Ophthalmol.* 2012;96(5):614-8.

<https://doi.org/10.1136/bjophthalmol-2011-300539>

PMid:22133988

15. Quigley HA, Broman AT. The number of people with glaucoma worldwide in 2010 and 2020. *Br J Ophthalmol.* 2006;90(3):262-7.

<https://doi.org/10.1136/bjo.2005.081224>

PMid:16488940 PMCID:PMC1856963

16. Riaz Y, de Silva SR, Evans JR, Wormald RP, Peto T, Meads C. Surgical interventions for age-related cataract. *Cochrane Database Syst Rev.* 2006;(4).

<https://doi.org/10.1002/14651858.CD001323.pub2>

PMid:17054134 PMCID:PMC7096771

17. Bourne RRA, Flaxman SR, Braithwaite T, Cicinelli MV, Das A, Jonas JB, et al. Magnitude, temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: A systematic review and meta-analysis. *Lancet Glob Health.* 2017;5(9):97.

18. Van Newkirk MR, Weih L, McCarty CA, Taylor HR. Causes and associations of visual impairment in a population-based sample of older adults in Victoria, Australia. *Arch Ophthalmol.* 2000;118(2):246-52.

19. Ghassemi F, Fard MA, Khataminia G,

Yarmohammadi A. Association of body mass index with eye diseases in adults. *J Ophthalmic Vis Res.* 2014;9(4):471-7.

20. Ghassemi F, Jalali S, Khataminia G, Zareei A. Relationship between body mass index and eye diseases. *Retina.* 2020;40(1):121-8.

21. Resnikoff S, Pascolini D, Mariotti SP, Pokharel GP. Global magnitude of visual impairment caused by uncorrected refractive errors in 2004. *Bull World Health Organ.* 2008;86(1):63-70.

<https://doi.org/10.2471/BLT.07.041210>

PMid:18235892 PMCID:PMC2647357

22. Wong TY, Sabanayagam C. The war on diabetic retinopathy: Where are we now? *Asia Pac J Ophthalmol (Phila).* 2019;8(6):448-56.

<https://doi.org/10.1097/APO.0000000000000267>

PMid:31789647 PMCID:PMC6903323

23. Gilbert CE, Faal H. Blindness in children: Control priorities and research opportunities. *Br J Ophthalmol.* 2002;86(10):1025-7.

<https://doi.org/10.1136/bjo.85.9.1025>

PMid:11520746 PMCID:PMC1724126

24. Congdon N, Vingerling JR, Klein BE, West S, Friedman DS, Kempen J, et al. Prevalence of cataract and pseudophakia/aphakia among adults in the United States. *Arch Ophthalmol.* 2004;122(4):487-94.

<https://doi.org/10.1001/archophth.122.4.487>

PMid:15078665

25. Varma R, Ying-Lai M, Klein R, Azen SP. Prevalence and risk indicators of visual impairment and blindness in Latinos: The Los Angeles Latino Eye Study. *Ophthalmology.* 2004;111(6):1132-40.

<https://doi.org/10.1016/j.ophtha.2004.02.002>

PMid:15177963

26. Gupta P, Ravindran RD, Murthy GVS, Fletcher AE, Sankara Nethralaya Diabetic Retinopathy Epidemiology and Molecular Genetic Study (SNDREAMS II): Research design and methodology. *Ophthalmic Epidemiol.* 2010;17(1):48-56.

27. Murthy GVS, John N, Shamanna BR, Pant HB. Elimination of avoidable blindness due to cataract: Where do we prioritize and how should we monitor this decade? *Indian J Ophthalmol.* 2012;60(5):438-45.

<https://doi.org/10.4103/0301-4738.100545>

PMid:22944756 PMCID:PMC3491272

Evaluation of the Outcome of Primary Repair within 24 Hours of Open Tendo Achilles Injury

Mohammed Abdul Kadir ^{*1}, Liton Kumar Roy², Mahabub Alam³, Apel Chandra Saha⁴,
Md. Khorshedul Alam⁵, Abdullah Al Rafi⁶

Abstract

Introduction: The outcome of open Achilles tendon injury is always challenging, primary repair is considered as gold standard procedure for open Tendo Achilles injury. **Objective:** To assess the outcome of primary repair within 24 hours of open Tendo Achilles injury. **Materials and Methods:** This prospective observational study was carried out among 50 patients attending at the Department of Orthopaedics, Comilla Medical College Hospital, Cumilla within the defined period from January 2022 to December 2022. Ethical clearance was obtained from the Institutional Review Board (IRB) of Comilla Medical College Hospital. Purposive sampling was done according to availability of the patients. Statistical analyses of the results were obtained by using window based computer software devised with Statistical Packages for Social Sciences (SPSS-20.1). Evaluation was done according to Juhana Leppilahti's modified scoring scale. **Results:** The mean age of the patients were 29.48 years with standard deviation of 13.53 years. More than two-thirds of the patients 34(68.0%) were male, whereas 16 (32.0%) were female. The majority of patients 30(60.0%) underwent surgery within 6-12 hours of injury. Moreover, half of the patients 28(56.0%) had been followed up for more than 6 months. According to Juhana Leppilahti's modified scoring scale, mild pain was found in 26 patients 52.0%) and no pain in 24 patients (48.0%). Mild stiffness was found in 46 patients (92.0%), moderate in 1 patient (2.0%) and no stiffness was found in 3 patients (6.0%). Mild calf muscle weakness was found in 11 patients (22.0%). Mild footwear restrictions were found in 3 patients (6.0%). Half of the patients (n=25, 50.0%) had normal ROM (Range of motion) difference between affected and normal ankle after operation, 24 patients (48.0%) had mild ROM difference and 1 patients (2.0%) had moderate ROM difference. Almost half (n=24, 48.0%) of the patients had MRC grade 5, 20 patients (40.0%) had 4 MRC grade and 6 patients (12.0%) had 3 MRC grade. Subjective results very satisfied was found in 36 patients (72.0%), satisfied with minor reservations was in 13 patients (26.0%) and satisfied with major reservations was in 1 patients (2.0%). **Conclusion:** The present study suggests that primary repair within 24 hours of open Tendo Achilles injury is a safe and effective procedure with low complication rates. The majority of patients reported high levels of satisfaction with the procedure, and excellent to good outcomes were achieved in most cases.

Key words: Achilles tendon Injury, Primary repair, Open Achilles tendon injury.

Number of Tables: 04; Number of Figures: 02; Number of References: 10; Number of Correspondences: 03.

*1. Corresponding Author:

Dr. Mohammed Abdul Kadir
Medical Officer
Department of Orthopaedics
Cumilla Medical College and Hospital
Cumilla, Bangladesh.
Phone: 01616304060
Email: mahabubalam.mbbs@gmail.com

2. Dr. Liton Kumar Roy

Associate Professor and HOD
Department of Orthopaedics
Cumilla Medical College and Hospital
Cumilla, Bangladesh.

3. Dr. Mahabub Alam

Assistant Professor
Department of Orthopaedics
Dhaka Medical College and Hospital
Dhaka, Bangladesh.

4. Dr. Apel Chandra Saha

Assistant Professor
Department of Orthopaedics
Cumilla Medical College and Hospital
Cumilla, Bangladesh.

5. Dr. Md. Khorshedul Alam

Assistant Professor
Department of Orthopaedics
Cumilla Medical College and Hospital
Cumilla, Bangladesh.

6. Dr. Abdullah Al Rafi

Assistant Registrar
Department of Casualty
Cumilla Medical College and Hospital
Cumilla, Bangladesh.

Introduction:

The Achilles tendon is one of the most frequent ruptured tendon in the human body¹, and it's the 3rd most frequent major tendon injury behind those of the rotator cuff and knee extensor mechanism². TA injury is a disabling condition, which is difficult to treat if there is a large gap in between two ends of the disrupted tendon, this gap may result from several factors like open laceration followed by infection, allowing retraction and degeneration of the tendon³. This gap occurs very rapidly due to calf muscle contracture, within 3 / 4 days. So that difficulty may be experienced in repositioning of the rupture ends of tendon⁴. About a week after rupture the gap between two ends fills with scar tissue. If left untreated, the tendon will not heal. Running, jumping, going up and down the stairs are severely compromised⁵. It's a generally accepted that surgical repair of fresh ruptures of TA give excellent result. The complication of operative intervention however are not infrequent which include adherence of the scar, wound infection, sloughing of the overlying skin and tendon, keloid formation⁶. The aim of this study is to evaluate the outcome of primary repair of open Tendo Achilles injury

Materials & Methods:

This Prospective observational Study study was carried out among 50 patients attending at the Department of Orthopaedics, Comilla Medical College Hospital, Cumilla within the defined period from January 2022 to December 2022. Ethical clearance was obtained from the Institutional Review Board (IRB) of Comilla Medical College Hospital. Purposive sampling was done according to availability of the patients. The collected data were entered into the computer and analyzed by using SPSS (version 20.1) to assess the outcome of primary repair within 24 hours of open Tendo Achilles injury. Evaluation was done according to Juhana Leppilahti's modified scoring scale. Juhana Leppilahti's modified scoring scale given below

Clinical feature Score	Score
Pain	
None	15
Mild, no limitations on recreational activities	10
Moderate, limitations on recreational, but not daily activities	5
Severe, limitations on recreational and daily activities	0
Stiffness	
None	15
Mild, occasional, no limitations on recreational activities	10
Moderate, limitations on recreational, but not daily activities	5
Severe, limitations on recreational and daily activities	0

Clinical feature Score	Score
Call muscle weakness (Subjective)	
None	15
Mild, no limitations on recreational activities	10
Moderate, limitations on recreational, but not daily activities	5
Severe, limitations on recreational and daily activities	0
Footwear restrictions	
None	10
Mild, most shoes tolerated	5
Moderate, unable to tolerate fashionable shoes, modified shoes tolerated	0
Active range of motion (ROM) difference between ankles	
Normal (<6)	15
Mild (6-10)	10
Moderate (11-15)	5
Severe >15)	0
Subjective result	
Very satisfied	15
Satisfied with minor reservations	10
Satisfied with major reservations	5
Dissatisfied	0
Power of plantar flexion	
MRC -5	15
MRC -4	12
MRC -3	9
MRC -2	6
MRC -1	3
Result (Total score)	100
Rating	
Excellent	90-100
Good	75-89
Fair	60-74
Poor	<60

Results:

Table I shows that majority of the (n=16, 32.0%) patients belonged to age group 21-30 years. The mean age was 29.48 with standard deviation of 13.53 years.

Table I: Distribution of the study patients (n=50)

Age (years)	Number	percentage
≤20	13	26%
21-30	16	32%
31-40	10	20%
41-50	07	14%
>50	04	08%
Mean±	29.48±13.53	

Figure 1 shows that more than two third (68.0%) patients were male and 16(32.0%) were female.

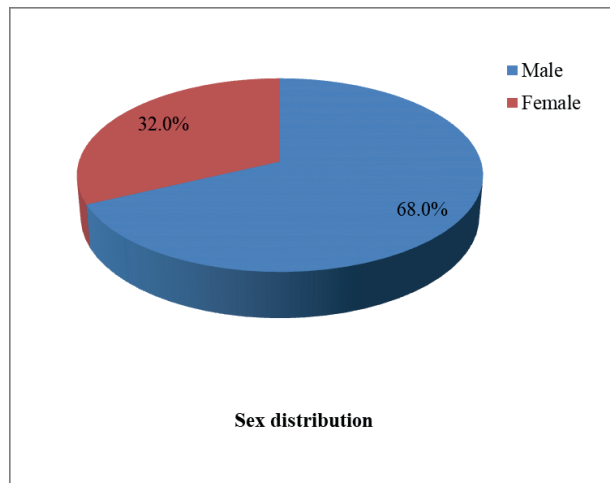


Figure 1: Distribution of the study patients by sex (n=50)

Table II shows that majority (n= 30, 60.0%) patients underwent surgery within 6-12 hours of injury. The mean delay of repair was 9.98 with standard deviation of 4.45 hours.

Table II: Distribution of the study patients by duration of underwent surgery (n=50)

Duration of underwent surgery (hours)	Number	percentage
<6	8	16%
6-12	30	60%
13-18	9	18%
19-24	3	06%

Mean±SD- 9.98±4.45 hours

Table III shows that more than half (56.0%) patients were >6 months follow up. The mean total follow up period was 6.78 with standard deviation of 1.61 months.

Table III: Distribution of the study patients by total follow up period (n=50)

Total follow up period (months)	Number	percentage
<5	5	10%
5-6	17	34%
>6	28	56%

Mean±SD - 6.78±1.61 month

Table IV shows mild pain was found in 26 patients 52.0%) and no pain in 24 patients(48.0%). Mild stiffness was found in 46 patients (92.0%), moderate in 1 patient (2.0%) and no stiffness was found in 3 patients (6.0%). Mild calf muscle weakness was found in 11 patients (22.0%). Mild footwear restrictions were found in 3 patients (6.0%). Half of the patients (n=25, 50.0%) had normal ROM (Range of motion) difference between affected and normal ankle after operation, 24 patients (48.0%) had mild ROM difference and 1 patients (2.0%) had moderate ROM difference. Almost half (n=24, 48.0%) of the patients had MRC grade 5, 20 patients (40.0%) had 4 MRC grade and 6 patients (12.0%) had 3 MRC grade. Table IV shows that subjective results very satisfied was found in 36 patients (72.0%), satisfied with minor reservations was in 13 patients (26.0%) and satisfied with major reservations was in 1 patients (2.0%).

Table IV: Distribution of the study patients by Juhana Leppilahti's modified scoring scale (n=50)

Parameter	Number	percentage
Pain		
mild pain	26	52%
no pain	24	40%
Stiffness		
mild	46	92%
Moderate	01	2%
No stiffness	03	6%
Calf muscle weakness		
mild weakness	11	22%
No	39	78%
Footwear Restrictions		
mild restrictions	3	6%
No	47	94%
Range of motion		
Normal ROM	25	50%
Mild ROM difference	24	48%
Moderate ROM difference	01	2%
power of planter flexion (MRC)		
MRC - 3	6	12%
MRC - 4	20	40%
MRC - 5	24	48%
Subjective Results		
Very satisfied	36	72%
Satisfied with minor reservations	13	26%
Satisfied with major reservations	01	2%

Figure 2 shows that excellent outcome was found in 30 patients (60.0%), good in 16 patients (32.0%), fair in 3 patients (6.0%) and poor in 1 patients (2.0%).

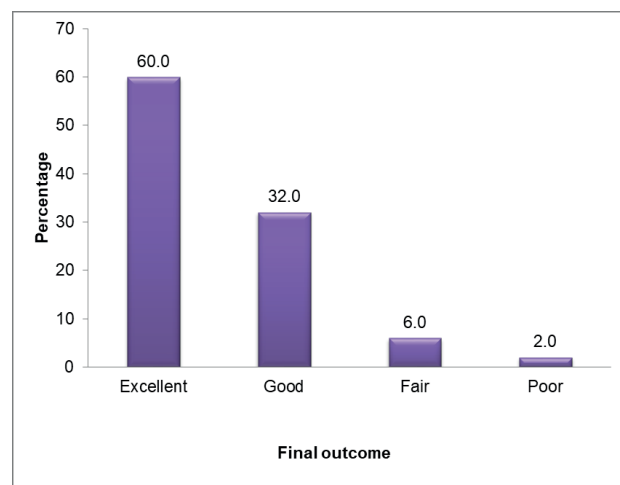


Figure 2: Distribution of the study patients by final outcome (n=50)

Discussion:

The majority of the 16 (32.0%) patients in this study were between the ages of 21 and 30. The mean age was 29.48 years, with a standard deviation of 13.53 years. The peak incidence of Achilles tendon ruptures occurs in the middle age group rather than in the older population. Ahmed et al. reported the mean age was 30.02 years with a standard deviation of 7.71 years⁶. Rayhan et al. reported mean age was 30.5 years⁷. Bishop et al. reported that the mean age was 41.1 years⁸. de Oliveira et al. reported that the mean age of the patients was 32 years⁹. In terms of gender, this study observed that about two-thirds (68%) of patients were male and one-third (32%) were female, which is consistent with other studies that found a higher prevalence of tendo Achilles injuries in males. Bishop et al. reported 314 (85.1%) were male, and 55 (14.9%) were female⁸. Awe et al. reported these comprised 28 (53.8%) males and 24 (46.2%) females with male: female ratio of 1.2: 1¹⁰. Regarding timing of surgery, the majority of patients in the current study underwent surgery within 6-12 hours of injury (60%), with a mean delay of repair of 9.98 hours. This is consistent with Ahmed et al. (mean delay of repair 6 hours 7 minutes) and Rayhan et al. (median delay of repair 5 hours 42 minutes)^{6,7}. In terms of follow-up, more than half of the patients in the current study (56%) had follow-up periods of over 6 months, with a mean total follow-up period of 6.78 months. Other studies such as Ahmed et al. and Rayhan et al. also reported relatively long follow-up periods of 9 months and 7 months respectively^{6,7}. The final assessment of this research shows that 60% of the outcomes were excellent, 32% were good, 6% were fair, and 2% were poor. Another study by Ahmed et al. found that 56% of the

outcomes were excellent, 32% were good, 8% were fair, and 4% were poor. Similarly, Rayhan et al. reported that 50% of the outcomes were excellent, 36.67% were good, 6.67% were fair, and 6.6% were poor^{6,7}.

Conclusion:

Based on the findings of the study, primary repair within 24 hours of open Tendo Achilles injury is a feasible treatment option. The results of the study showed that primary repair resulted in good to excellent outcomes in 92% of patients, with 72% very satisfied with the subjective result. Overall, the study suggests that primary repair within 24 hours of open Tendo Achilles injury is a safe and effective treatment option that can lead to good functional outcomes and lower complication rates. With this encouraging result of the study, the treatment protocol of this study can be followed by the surgeon for better management of an open Tendo Achilles injury.

Conflict of Interest: None.

Acknowledgements:

The authors are grateful to the entire staff of department of Orthopaedic Surgery at Cumilla Medical College Hospital, Cumilla during the study period.

References:

1. Leppilahti J, Puranen J, Orava S. Incidence of Achilles tendon rupture. *Acta orthopaedica Scandinavica*. 1996;67(3):277-9. <https://doi.org/10.3109/17453679608994688> PMID:8686468
2. Lesic A, Bumbasirevic M. Disorders of the Achilles tendon. *Current Orthopaedics*. 2004;18(1):63-75. <https://doi.org/10.1016/j.cuor.2003.10.002>
3. Wagdy-Mahmoud S, Megahed A-H, El-Sheshtawy O. Repair of the calcaneal tendon. An improved technique. *The Journal of bone and joint surgery British volume*. 1992;74(1):114-7. <https://doi.org/10.1302/0301-620X.74B1.1732237> PMID:1732237
4. Bosworth DM. Repair of defects in the tendo achillis. *The Journal of bone and joint surgery American volume*. 1956;38-A 1:111-4. <https://doi.org/10.2106/0004623-195638010-00011>
5. Campbell WC, Canale ST, Beaty JH. *Campbell's Operative Orthopaedics*: Mosby/Elsevier; 2017;chap-48, pp.2422-2423.
6. Ahmed SU, Hasan MH, Haque MA, Haque ME, Imam Z. Evaluation of the Result of Surgical Repair of Open Achilles Tendon Injuries by Pulling Down of The Proximal Tendon. *TAJ: Journal of Teachers Association*. 2021; 34(2):15-23. <https://doi.org/10.3329/taj.v34i2.58551>
7. Rayhan F, Rezwana M, Sarker M. Evaluation of the result of early repair of open tendo achilles injury. *MOJ Orthop Rheumatol*. 2022; 14(1):24-7.

<https://doi.org/10.15406/mojor.2022.14.00572>

8. Bishop ME, Comer CD, Kane JM, Maltenfort MG, Raikin SM. Open repair of acute Achilles tendon ruptures: is the incidence of clinically significant wound complications overestimated? *Foot & Ankle Orthopaedics*. 2017 ;(2):1-6.

<https://doi.org/10.1177/2473011417699834>

9. De Oliveira RL, Martins JS, Silva PH. Minimally invasive repair of acute Achilles tendon injury:

description of technique and evaluation of outcomes. *Journal of the Foot & Ankle*. 2020;14(1):62-7.

<https://doi.org/10.30795/jfootankle.2020.v14.1169>

10. Awe AA, Esezobor EE, Aigbonoga QO. Experience with managing open Achilles tendon injuries in a tertiary hospital in southern Nigeria. *Journal of the West African College of Surgeons*. 2015;5(4):30.

<https://doi.org/10.4103/1597-1112.139455>

Supracondylar Humerus Fracture in Children: A Retrospective Study

Shorif Uz Zaman^{*1}, A.F.M. Julfikar², Md. Nazmul Islam Nissan³

Abstract

Introduction: The most typical kind of distal humeral fracture in children is a supracondylar fracture of the humerus. Depending on the neurovascular injury and Gartland classification, the treatment options are either non-operative or surgical. Which Kirschner pin configuration—crossed pinning or lateral pinning—should be used is still up for debate. **Objective:** The purpose of our research was to compare the therapeutic outcomes of treating children with cross and lateral pinning for supracondylar humeral fractures. **Materials and Methods:** Retrospective analysis was done on 80 individuals under the age of 18, who underwent surgery between January 2021 and January 2023 for a supracondylar humeral fracture. For comparison, two treatment modalities—crossed pinning and lateral pinning—were examined. **Results:** In 66 cases (82.5%) crossed pinning was done, and in 14 patients (17.5%) lateral pinning. During the trauma, the average age was 6.83 years (2–14). When comparing the group treated crosswise to the group treated from the side, there was a substantial increase in the incidence ($p = 0.03$) of current complaints (53% vs. 33% of patients reported problems, respectively). The following parameters were analyzed: the presence of current neurological complications, the degree of satisfaction with the current function of the limb, the Baumann angle of the operated limb, the flexion deficit in the elbow joint of the operated limb, the Flynn criteria, and the Mayo Elbow Score. No significant differences were found between the types of fixation and any of these parameters. **Conclusions:** There is ongoing debate in the literature regarding the advantages of lateral or crossing pinning for children's supracondylar humeral fractures. Excellent clinical and functional outcomes are produced by both approaches.

Key words: Supracondylar fracture, Paediatric orthopaedics, Humerus fracture.

Number of Tables: 04; Number of References: 37; Number of Correspondences: 03.

*1. Corresponding Author:

Dr. Shorif Uz Zaman

Senior Consultant (Orthopaedics)

250 Beded General Hospital

Gopalganj, Bangladesh.

Mobile: 01712153478

Email: dr.shorifuzzaman@gmail.com

2. Dr. A.F.M. Julfikar

Senior Consultant (Orthopaedics)

250 Beded General Hospital

Gopalganj, Bangladesh.

3. Dr. Md. Nazmul Islam Nissan

Resident Surgeon (Orthopaedics)

Sheikh Sayera Khatun Medical College Hospital

Gopalganj, Bangladesh.

Introduction:

The most common distal humerus fracture in children at the moment is the supracondylar fracture. It often happens between the ages of 5 and 7 and accounts for 60% of all elbow fractures and 16% of all pediatric fractures¹. The literature reports that both boys and girls are equally distributed in the left side, where the bulk of cases occur^{2,3}. Flexion and extension fractures can be classified into two categories based on the mechanism of damage. Up to 97% of instances are of the extension type, which is primarily caused by

falling on an outstretched hand with the elbow fully extended^{2,4}. When there is a suspicion of a supracondylar fracture, an AP (anterior-posterior) and lateral view x-ray should be performed. Because it can identify the type of fracture, this imaging modality is regarded as the "gold standard"⁵. Either operational or non-operative treatment is used in terms of management. Depending on Gartland's classification, one can choose. Broadly speaking, conservative care is typically used to treat undisplaced fractures (with a cast). Closed reduction and percutaneous pinning are used to treat displacement; ultimately, an open reduction may be necessary. Failure of closed reduction, limb vascular compromise, an open fracture, and suspicion of brain damage are among criteria for open reduction⁵⁻⁸. Between 5 and 19% of displaced fractures are associated with neurovascular problems. The anterior interosseous nerve, a branch of the median nerve, is the most often reported problem⁸. The brachial artery is the most usually affected vascular damage, and it can be diagnosed angiography or ultrasonography with Doppler mode in addition to a physical examination⁹. One of the rarest but most devastating consequences is compartment syndrome that results in Volkmann's ischemic contracture. A total loss of limb function is the outcome of this contracture⁶. Bone cortical continuity must be restored for appropriate bone union to occur, and this can ultimately result in the restoration of limb function that is physiological¹⁰. However, there is still space for debate over the ideal pin arrangement. These days, two main methods are employed: lateral pinning with two or three pins, and crossed pinning with two pins. Although the first one is thought to offer more mechanical stability, the addition of a medial pin is considered to increase the risk of ulnar nerve injury. Although the second one is thought to be less stable, it is thought to be safer in terms

of the incidence of nerve injury¹¹⁻¹⁴. There is no clear consensus on which of these two procedures is the gold standard despite several research comparing them in terms of surgical results¹⁵⁻¹⁸.

Materials and Methods:

Eighty paediatric patients with supracondylar humerus fractures who had surgery between January 2021 and January 2023 were included in our study. A self-administered questionnaire was completed by caretakers, and patients were examined during a telephone visit after being searched in a hospital patient database. The patient's age of injury must have been under 18 years old, they must have undergone surgery under general anesthesia with closed repositioning and fracture stabilization by percutaneous Kirschner wire insertion, and they must not have had any prior elbow injuries. These were the inclusion criteria. Other diagnoses, the patient's age at the time of the accident, the use of an alternative fracture stabilization technique (such as open repositioning), and prior elbow injuries in the patient were all considered exclusion factors. A self-administered questionnaire about clinical information, fracture circumstances, perioperatively reported symptoms, recovery time, and an evaluation of their level of satisfaction with present limb function was filled out by the parents of the patients on the day of the study. The Visual Analogue Scale (VAS) was used to measure the respondents' present level of pain. Using a goniometer, the doctor examined the limb's mobility (limb axis, elbow joint extension, flexion, forearm supination, and pronation) and determined the operated limb's neurological status on the day of the evaluation. The Mayo Elbow Score, which takes into account the elbow joint's stability, range of motion, and capacity for performing fundamental everyday tasks, was used to evaluate the patients. In addition, patients were assessed using the Flynn evaluation criteria, which considered both mobility limitations and limb axis changes. Using the postoperative radiographs that were available, the Baumann angle was determined. To find relationships between individual characteristics, clinical data, and the insertion method (crosswise, from the side), statistical analysis was conducted. The statistical analysis was carried out using the SPSS 26.0 software version. A p-value of less than 0.05 was deemed statistically significant in the analysis.

Results:

The study comprised eighty patients with a history of supracondylar humerus fracture. When they were injured, the patients' ages ranged from 2 to 14 years old, with a mean of 6.83. In 40% of instances, the right limb was shattered. The dominant limb in 45.0% of the surgical patients was the fractured limb. Indicating a fall from over own height were 62.0% of the responders. The fracture mechanism in the remaining cases was a fall from their own height. In 83% of patients, crossed K-wires were implanted; in 17%, they were put from the side. The most often selected response (< 2 months) to the question about return to function was 35%. In 8.0% of cases, total loss of function was identified (Tab.I).

Table-I: Recovery time after a supracondylar fracture

Recovery time	<2 months	2-3 months	4-6 months	>6 months	Not fully functioning
Number of patients(%)	35	26	20	11	8

At the time of the study, the average VAS pain score was 0.2 (range: 0-10). 84% of the time, the response that was selected was 0.82% of participants expressed satisfaction, 15% moderate satisfaction, and 3% unhappiness with their present level of limb function. 16% of the participants experienced temporary nerve dysfunction as a result of the injury and surgical intervention; this most frequently affected the median nerve (8% of patients).

Table II: Nerve dysfunction in the course of supracondylar fracture and perioperative intervention

Disturbance of innervation originating from the nerve	Median nerve	Ulnar nerve	Radial nerve
Number of patients(%)	8.0	5.0	3.0

After surgery, the disorders associated with selective innervation disappeared in all of the individuals. Volkmann's contracture followed fascial compartment syndrome in one patient as a result of the fracture. Due to the consequences of the fracture, the aforementioned patient had multiple forearm reconstruction procedures. The most frequent result in the Flynn criteria subcategories for axis change and mobility restriction was very good (81.25% and 75% of individuals, respectively) (Tab.III and Tab. IV).

Table III: Following treatment, assessment of elbow joint mobility in both operated and non-operated limbs using Flynn's criteria based on limb axis difference (n = 80).

Result	Very good (0-5)	Good (6-10)	Satisfactory (11-15)	Bad (>15)
Number of patients (%)	65 (81.25%)	13 (16.25%)	1 (1.25%)	1 (1.25%)

Table IV: The assessment of a range of motion (flexion-extension) in the operated and non-operated limb according to Flynn's criteria after the completion of treatment (n = 80).

Result	Very good (0-5)	Good (6-10)	Satisfactory (11-15)	Bad (>15)
Number of patients (%)	60 (75%)	15 (18.75%)	3 (3.75%)	2 (2.5%)

Cubitus varus was observed in 7 (8.75%) patients. The Baumann angle was 72.5 degrees on average. The Mayo Elbow Score turned out to be excellent in 94.7% of the operated patients and good in 4.0%. Patients with a satisfactory score represented only 1.3% of the sample. The kind of fixation was also examined in the patient group, comparing the cross and side approaches with respect to the frequency of current complaints. When comparing the group treated crosswise to the group treated from the side, there was a significant increase in the occurrence of current complaints ($p = 0.03$) (53% vs. 33% of patients reported

current complaints, respectively). A significant correlation was seen between the number of falls and the season. Trauma patients have more falls from over their own height in the summer. On the other hand, patients with trauma experience fractures from falls with a greater frequency during the spring than during other seasons. There were no relevant differences observed between the type of fixation and the following studied parameters: current VAS pain score, Baumann angle of the operated limb, flexion deficit in the elbow joint of the operated limb, presence of current neurological complications, satisfaction with the current function of the limb, Flynn criteria score, and Mayo Elbow Score. Additionally, there was no discernible difference between the patient's age at the time of the injury and the healing period, or between the patient's age at the time of the accident and the flexion deficit relative to the healthy limb. Gender did not significantly affect Baumann's angle, the suggested recovery time, postoperative neurological problems, or the difference in axis between the healthy and operated limbs.

Discussion:

In order to determine whether surgical approach was best, the retrospective study's data were analyzed and correlated. Specifically, the treatment of supracondylar humerus fractures in children was evaluated and compared using cross- and side-K-wire techniques. Regarding future limb function and patient satisfaction, it is unclear from the studies currently available which patient group will gain more from a specific K-wire design^{19,20}. The K-wire cross approach has historically been linked to more neurological side effects, the most common of which is ulnar paresthesia¹¹.

On the other hand, the side K-wire approach is frequently linked to the fracture's instability²¹. Interestingly, some writers contend that it is impossible to prove the superiority of either approach^{22,23}. Due to postoperative patient complaints, statistical analysis of the current study group reveals only one significant association favoring the cross K-wire surgical technique over the side K-wire surgical technique. It should be highlighted that the results may be skewed and that the surgeons' experiences with the two surgical procedures varied significantly because of the small number of study groups and the stark disparity in the two surgical techniques' popularity. According to a meta-analysis by Dekker et al., ulnar nerve injury is the most common type of iatrogenic intra and postoperative neurological consequence seen in humerus fractures, and it usually results in ulnar nerve palsy¹¹. According to some sources, injuries to the median nerve are the most frequent⁸. The risk of injuring the median nerve should constantly be on the surgeon's mind. When palsy is identified early enough, ideally during the procedure, it helps to lessen long-term consequences. Kocher et al. compared the outcomes of the percutaneous cross K-wire approach versus the side K-wire technique in 52 patients, and neither group experienced iatrogenic nerve injury¹⁹. Krusche et al.'s study presents results that are comparable to those of the 36-patient group. The authors document just one instance of iatrogenic

radial nerve damage, which resolved on its own without the need for medical assistance²⁴. Of the 65 patients in the research group, Green et al. discovered one patient had a postoperative ulnar nerve injury, indicating a 1.5% iatrogenic injury rate²⁵. According to our research, just one patient had Volkmann contracture, a serious consequence that was managed with revision procedures that only slightly improved limb function. On the day of the assessment, none of the patients had nerve damage. According to a meta-analysis by Mitchelson et al., contractures are usually regarded as some of the most frequent consequences of pediatric supracondylar fractures and affect 1.1% of patients. Nonetheless, Volkmann ischemic contracture is an uncommon but very challenging to manage side effect of supracondylar humerus fractures^{26,27}. After surgery, all but one of the perioperative symptoms, which included transient nerve palsy, neurological symptoms of paraesthesia, and vascular issues that affected around 20% of patients, had either disappeared completely or significantly lessened. According to the authors, between 5 and 14% of patients manifest with neurological problems, while between 7 and 10% have vascular compromise²⁸⁻³¹. The seasonality of injury following a fall has been observed to differ statistically significantly. There is statistical evidence that falls from one's own height are more common in the spring, while falls from heights above oneself are more common in the summer. Previous research on the seasonality of injury in upper limb fractures, particularly in supracondylar fractures, has shown that summer is the most common season for injuries³²⁻³⁵. Furthermore, associations were noted between the age of patients at the time of injury and the variations in the anatomical limb axis, indicating that younger children are more likely than older children to preserve the limb axis. The aforementioned results need to be carefully considered because the study groups had different proportions, and larger cohort studies ought to be conducted. In comparison to an injury of a similar nature in an older child, Auso-Peres et al.'s study demonstrated that a younger age at fracture allows a quicker and less complicated healing process³⁴.

In a study of 382 pediatric patients, Mitchelson et al. found that older children and those with bigger statures had more severe and complex injuries overall²⁶. The authors point out that older children's rapid growth causes a decrease in bone mineral density, which increases the risk of complex fractures^{36,37}. If the current study were expanded to a larger cohort of patients with statistically equivalent study groups, bias may be eliminated in subsequent research and, if broken down into smaller age-dependent subgroups, more associations might be found. A noteworthy constraint of the research is that the patients were enrolled freely and required to arrange their own transportation to the examination locations, so excluding certain individuals who lacked access to transportation from rural areas. The study's tertiary center focus means that it could not be entirely representative of the general population, which is another drawback.

Conclusion:

When a child's supracondylar humeral fracture is stabilized percutaneously, good results can be achieved. While perioperative disorders affecting the nerves in the limbs are not uncommon, the functional abnormalities are typically transient and resolve on their own in a matter of months. The functional examination of the upper limb is often more than adequate. Our study only showed statistical significance for the patients' current complaints when comparing the therapy outcomes to the K-wire introduction technique. Very good functional results are obtained with both pinning strategies. The study was constrained by the significant variations in group sizes, which might have affected the significance of the results. There should be additional research done with a larger or more representative sample of patients.

References:

1. Carrazzone OL, Barbachan Mansur NS, Matsunaga FT, et al. Crossed versus lateral K-wire fixation of supracondylar fractures of the humerus in children: a meta-analysis of randomized controlled trials. *J Shoulder Elb Surg.* 2021; 30: 439-48.
<https://doi.org/10.1016/j.jse.2020.09.021>
2. Cheng JC, Lam TP, Maffulli N. Epidemiological features of supracondylar fractures of the humerus in Chinese children. *J Pediatr Orthop B.* 2001; 10: 63-7.
<https://doi.org/10.1097/01202412-200101000-00011>
<https://doi.org/10.1097/00009957-200101000-00011>
3. Farnsworth C, Silvia P, Mubarak S. Etiology of Supracondylar Humerus Fractures. *J Pediatr Orthop.* 1998; 18: 38-42.
<https://doi.org/10.1097/00004694-199801000-00008>
<https://doi.org/10.1097/01241398-199801000-00008>
4. Shah M, Agashe MV. Supracondylar Humerus Fractures: Classification Based Treatment Algorithms. *Indian J Orthop.* 2020; 55: 68-80.
<https://doi.org/10.1007/s43465-020-00285-2>
5. Saeed W, Waseem M. Elbow Fractures Overview. StatPearls; [Internet] 2022.
6. Kropelnicki A, Ali AM, Popat R, et al. Paediatric supracondylar humerus fractures. *Br J Hosp Med (Lond).* 2019; 80: 312-6.
<https://doi.org/10.12968/hmed.2019.80.6.312>
7. Janczewski K, Mazurek T. Ulnar nerve stability evaluation of 4 children with iatrogenic ulnar nerve palsy after closed reduction and percutaneous pinning of supracondylar humeral fracture. *Polish Orthop Traumatol.* 2017; 82: 69-71.
8. Pobłocki K, Mazurek T, Dąbrowski F. Peripheral nerve injuries after pediatric supracondylar humerus fracture. *Polish Orthop Traumatol.* 2017; 82: 65-68.
9. Usman R, Jamil M, Hashmi JS. Management of Arterial Injury in Children with Supracondylar Fracture of the Humerus and a Pulseless Hand. *Ann Vasc Dis.* 2017; 10: 402-6.
<https://doi.org/10.3400/avd.oa.17-00050>
10. Sheen JR, Garla V: Fracture Healing Overview. StatPearls [Internet] 2022.
11. Dekker AE, Krijnen P, Schipper IB. Results of crossed versus lateral entry K-wire fixation of displaced pediatric supracondylar humeral fractures: A systematic review and meta-analysis. *Injury.* 2016; 47: 2391-8.
<https://doi.org/10.1016/j.injury.2016.08.022>
12. Slobogean BL, Jackman H, Tennant S, et al. Iatrogenic ulnar nerve injury after the surgical treatment of displaced supracondylar fractures of the humerus: number needed to harm, a systematic review. *J Pediatr Orthop.* 2010; 30: 430-6.
<https://doi.org/10.1097/BPO.0b013e3181e00c0d>
13. Uludağ A, Tosun HB, Aslan TT, et al. Comparison of Three Different Approaches in Pediatric Gartland Type 3 Supracondylar Humerus Fractures Treated With Cross-Pinning. *Cureus.* 2020; 12.
<https://doi.org/10.7759/cureus.8780>
14. Hanim A, Wafiuddin M, Azfar MA, et al. Biomechanical Analysis of Crossed Pinning Construct in Supracondylar Fracture of Humerus: Does the Point of Crossing Matter? *Cureus.* 2021; 13.
<https://doi.org/10.7759/cureus.14043>
15. Zhao JG, Wang J, Zhang P. Is lateral pin fixation for displaced supracondylar fractures of the humerus better than crossed pins in children? *Clin Orthop Relat Res.* 2013; 471: 2942-53.
<https://doi.org/10.1007/s11999-013-3025-4>
16. Loizou CL, Simillis C, Hutchinson JR. A systematic review of early versus delayed treatment for type III supracondylar humeral fractures in children. *Injury.* 2009; 40: 245-8.
<https://doi.org/10.1016/j.injury.2008.07.031>
17. Na Y, Bai R, Zhao Z, et al. Comparison of lateral entry with crossed entry pinning for pediatric supracondylar humeral fractures: a meta-analysis. *J Orthop Surg Res.* 2018; 13.
<https://doi.org/10.1186/s13018-018-0768-3>
18. Woratanarat P, Angsanuntsukh C, Rattanasiri S, et al. Meta-analysis of pinning in supracondylar fracture of the humerus in children. *J Orthop Trauma.* 2012; 26: 48-53.
<https://doi.org/10.1097/BOT.0b013e31812143de0>
19. Kocher MS, Kasser JR, Waters PM, et al. Lateral entry compared with medial and lateral entry pin fixation for completely displaced supracondylar humeral fractures in children. A randomized clinical trial. *J Bone Joint Surg Am.* 2007; 89: 706-12.
<https://doi.org/10.2106/JBJS.F.00379>
<https://doi.org/10.2106/00004623-200704000-00002>
20. Zhao H, Xu S, Liu G, et al. Comparison of lateral entry and crossed entry pinning for pediatric supracondylar humeral fractures: a meta-analysis of randomized controlled trials. *J Orthop Surg Res.* 2021; 16: 1-15.
<https://doi.org/10.1186/s13018-021-02505-3>

21. Sahu R. Percutaneous K-wire fixation in paediatric supracondylar fractures of humerus: A retrospective study. *Niger Med J.* 2013; 54: 329.
<https://doi.org/10.4103/0300-1652.122375>
<https://doi.org/10.4103/0300-1652.122355>
22. Mazda K, Boggione C, Fitoussi F, et al. Systematic pinning of displaced extension-type supracondylar fractures of the humerus in children. A prospective study of 116 consecutive patients. *J Bone Joint Surg Br.* 2001; 83: 888-93.
<https://doi.org/10.1302/0301-620X.83B6.0830888>
23. Topping RE, Blanco JS, Davis TJ. Clinical Evaluation of Crossed-Pin Versus Lateral-Pin Fixation in Displaced Supracondylar Humerus Fractures. *J Pediatr Orthop.* 1995; 15: 435-9.
<https://doi.org/10.1097/01241398-199507000-00004>
24. Krusche-Mandl I, Aldrian S, Köttstorfer J, et al. Crossed pinning in paediatric supracondylar humerus fractures: A retrospective cohort analysis. *Int Orthop.* 2012; 36: 1893-8.
<https://doi.org/10.1007/s00264-012-1582-x>
25. Green DW, Widmann RF, Frank JS, et al. Low incidence of ulnar nerve injury with crossed pin placement for pediatric supracondylar humerus fractures using a mini-open technique. *J Orthop Trauma.* 2005; 19: 158-63.
<https://doi.org/10.1097/00005131-200503000-00000>
26. Mitchelson AJ, Illingworth KD, Robinson BS, et al. Patient demographics and risk factors in pediatric distal humeral supracondylar fractures. *Orthopedics.* 2013; 36: 700-6.
<https://doi.org/10.3928/01477447-20130523-12>
27. Hosseinzadeh P, Hayes CB. Compartment Syndrome in Children. *Orthop Clin North Am.* 2016; 47: 579-87.
<https://doi.org/10.1016/j.ocl.2016.02.004>
28. Babal JC, Mehlman CT, Klein G. Nerve injuries associated with pediatric supracondylar humeral fractures: A meta-analysis. *J Pediatr Orthop.* 2010; 30: 253-63.
<https://doi.org/10.1097/BPO.0b013e3181d213a6>
29. Ramachandran M, Birch R, Eastwood DM. Clinical outcome of nerve injuries associated with supracondylar fractures of the humerus in children. The experience of a specialist referral centre. *J Bone Jt Surg.* 2006; 88: 90-4.
<https://doi.org/10.1302/0301-620X.88B1.16869>
30. Choi PD, Melikian R, Skaggs DL. Risk factors for vascular repair and compartment syndrome in the pulseless supracondylar humerus fracture in children. *J Pediatr Orthop.* 2010; 30: 50-6.
<https://doi.org/10.1097/BPO.0b013e3181c6b3a8>
31. White L, Mehlman CT, Crawford AH. Perfused, pulseless, and puzzling: A systematic review of vascular injuries in pediatric supracondylar humerus fractures and results of a POSNA questionnaire. *J Pediatr Orthop.* 2010; 30: 328-35.
<https://doi.org/10.1097/BPO.0b013e3181da0452>
32. Qiu X, Deng H, Su Q, et al. Epidemiology and management of 10,486 pediatric fractures in Shenzhen: experience and lessons to be learnt. *BMC Pediatr.* 2022; 22: 1-14.
<https://doi.org/10.1186/s12887-022-03199-0>
33. Vergouwen M, Samuel TL, Sayre EC, et al. FROST: Factors Predicting Orthopaedic Trauma Volumes. *Injury.* 2021; 52: 2871-8.
<https://doi.org/10.1016/j.injury.2021.02.076>
34. Ausó JR, Rodríguez GM. Comprehensive Analysis of Pediatric Supracondylar Fractures in the Emergency Department; A Single Center Experience. *Bulletin of emergency and trauma.* 2020; 8: 142-7.
35. Barr L V. Paediatric supracondylar humeral fractures: Epidemiology, mechanisms and incidence during school holidays. *J Child Orthop.* 2014; 8: 167-70.
<https://doi.org/10.1007/s11832-014-0577-0>
36. Kalkwarf HJ, Laor T, Bean JA. Fracture risk in children with a forearm injury is associated with volumetric bone density and cortical area and areal bone density. *Osteoporos Int.* 2011; 22: 607-16.
<https://doi.org/10.1007/s00198-010-1333-z>
37. Zemel BS, Kalkwarf HJ, Gilsanz V, et al. Revised reference curves for bone mineral content and areal bone mineral density according to age and sex for black and non-black children: results of the bone mineral density in childhood study. *J Clin Endocrinol Metab.* 2011; 96: 3160-9.
<https://doi.org/10.1210/jc.2011-1111>

Risk Elements Linked to Oral Candidiasis

Tanzila Rawnuck^{*1}, Md Selim Reza², Nusrat Jahan³, A.B.M. Iftekhar Hossain⁴,
Bushra Fatema⁵, Mohammad Fatteh-Ul- Islam⁶

Abstract

Introduction: Oral candidiasis is also called oral thrush or oropharyngeal candidiasis. In this condition, the fungus named *Candida albicans* (*C. albicans*) accumulates on the lining of the oral cavity. The typical colonization rate of *C. albicans* varies with age. In neonates it is around 45%; in healthy children ranging between 45–65%; in healthy adults about 30–45%. **Objectives:** This study aimed to find out the risk factors, and symptoms and identify the different types of clinical presentations according to the classifications, as well as trace out the drugs which is commonly being used. **Materials and Methods:** This prospective observational study was conducted at the Shishu Hospital, Shaymoly, Dhaka, and Rajshahi Medical College (RMC), Rajshahi with the ethical clearance of the review board, between January 2016 and December 2016. In this study, 386 patients were enrolled out of which 286 patients were from Shishu Hospital, Shamoly, Dhaka and 100 were from RMC who had the positive clinical features of *Candida* infection. **Results:** Out of the 247(64%) patients had dry mouth. About 62(16%) patients had dental prostheses, such as dentures or fillings. Around 42(11%) patients were using steroid drugs. Almost 259(67%) patients gave a history of unhealthy dietary intake. The systemic factor was that more than 235(61%) patients in our study were belonging two adverse age groups. About 239(62%) patients had malnutrition. Around 127(33%) patients had a history of using long-term antibiotics. In our study 142(37%) patients had a history of Diabetes Mellitus. In the case of 335(87%) cases creamy white lesions on the surface of the tongue. Loss of taste sensation had to 127(33%) cases. **Conclusion:** In the last few decades, a huge amount of clinical data has been recorded on oral candidiasis to its advent with various immunocompromised conditions. With the development of antifungal drugs, this disease has been controlled better than the previous decades.

Keywords: *Candida albicans*, Oral thrush, Risk factors.

Number of Tables: 02; Number of Figures: 03; Number of References:20; Number of Correspondence: 05.

*1. Corresponding Author:

Dr. Tanzila Rawnuck

Associate Professor
Dept of Pathology with Microbiology
Dhaka Dental College
Dhaka, Bangladesh.
Email: drrawnuck@gmail.com
Contact:01924-280 980
ORCID ID. 0000-0001-8004-8765

2. Dr. Md Selim Reza

Assistant Professor
National Institute of Traumatology & Orthopedic
Rehabilitation (NITOR)
Dhaka, Bangladesh.

3. Dr. Nusrat Jahan

Medical Officer (BDS)
Bangladesh Dental Health Care
Dhaka, Bangladesh.

4. Dr. A.B.M. Iftekhar Hossain

Assistant Professor
Dept of Pathology with Microbiology
Dhaka Dental College
Dhaka, Bangladesh.

5. Dr. Bushra Fatema

Lecturer
Dept of Pathology with Microbiology
Dhaka Dental College
Dhaka, Bangladesh.

6. Dr. Mohammad Fatteh-Ul- Islam

Junior Consultant
Dept of Transfusion Medicine
Rajshahi Medical College
Rajshahi, Bangladesh.

Introduction:

In the oral cavity, *Candida albicans* is most commonly detected on the dorsum surface of the tongue, followed by the palate and buccal mucosa. While *Candida* is a natural organism in the mouth, it can sometimes overgrow and lead to symptomatic infections¹. Oral thrush, a common manifestation, produces creamy white lesions typically located on the tongue or inner cheeks, but it may also spread to the roof of the mouth, gums, tonsils, or the back of the throat². These lesions often cause discomfort and can interfere with normal oral function, especially in more severe cases. *C. albicans* is responsible for around 80% of infections and can colonize the oral cavity either on its own or in combination with other non-albicans

species. The typical colonization rate of *C. albicans* varies significantly with age: in neonates, it is approximately 45%; in healthy children, it ranges from 45–65%; in healthy adults, about 30–45%; in denture wearers, between 50–65%; in patients residing in acute or long-term care facilities (e.g., nursing or residential homes), it rises to 65–88%; and in immunocompromised patients, such as those with HIV or undergoing chemotherapy for acute leukemia, the rates soar to 95% and 90%, respectively^{1,3}. The reasons for these age-related variations in colonization rates remain unclear, but the differences highlight the complex relationship between host factors and *Candida* overgrowth. This study aimed to identify risk factors, evaluate symptoms, classify clinical presentations, and determine the commonly used treatment regimens. Understanding these factors is crucial for the effective management of *Candida* infections.

Aetiology and Pathogenesis:

Candidiasis is caused by the excessive growth of *Candida* species, which are normal commensals in the body. Among these, *C. albicans* is the most frequently isolated species in both healthy and unhealthy individuals. Less commonly, species such as *C. glabrata*, *C. tropicalis*, *C. guilliermondii*, *C. krusei*, *C. parapsilosis*, *C. kefyr*, and *C. dubliniensis* are identified¹⁻⁵. However, colonization by *Candida* in the oral cavity does not necessarily indicate an infection. A significant proportion of healthy individuals continuously harbor *C. albicans* without symptoms^{1,4}. Reported symptom-free oral *Candida* carriage rates vary from 25% to 75% across different populations²⁻⁶. *Candida* species are typically harmless commensals within the normal microbial flora of the mouth, just as they are in the skin, gastrointestinal tract, and vagina⁷⁻⁹. Whether *Candida* remains a benign commensal or proliferates to cause disease is largely determined by the organism's virulence factors and the host's predisposing conditions¹⁰⁻¹². The development of candidiasis is influenced by *Candida*'s virulence factors, which include its ability to adhere to the host's tissues, form germ tubes, switch between phenotypic states, and produce hydrolytic enzymes and toxins¹³⁻¹⁵. However, the most significant factors in the progression of infection are related to the host. During our study, we observed several important host factors that contributed to the onset of *Candida* infection, which are discussed in detail.

Materials and Methods:

This prospective observational study was conducted at the Shishu Hospital, Shamoly, Dhaka, and Rajshahi Medical College (RMC), Rajshahi with the ethical clearance of the review board, between January and December 2016. In this study, 386 patients were enrolled out of which 286 patients were from Shishu Hospital, Shamoly, Dhaka and 100 patients were from RMC who had the positive clinical features of *Candida* infection. Age of the participants was between five and 72. Structured questionnaires were used for patient interviews.

Results and Discussion:

Risk factors:

-Local and systemic factors in the host can increase susceptibility to infection by *Candida* species. These predisposing factors that we noted during our study period are elaborated below and summarized in Table-I.

Local Factors:

- Dry Mouth (247 patients, 64%): Out of the total number of patients, 247 (64%) experienced dry mouth (Figure 1). The reduction in saliva production is a significant risk factor for oral candidiasis, as saliva plays a crucial role in controlling microbial growth. Salivary components, such as enzymes and antimicrobial proteins, naturally inhibit the overgrowth of *Candida*. Without sufficient saliva, these protective mechanisms are weakened, creating an environment conducive to *Candida* colonization and infection³. Dental Prostheses (62 patients, 16%): Approximately 62 patients (16%) had dental prostheses, including dentures or dental fillings (Figure 1). These prosthetic devices can provide surfaces where *Candida* organisms can adhere and thrive, particularly if oral hygiene is inadequate. Dental prostheses can create small pockets or niches that retain moisture and food particles, which encourage fungal growth, making the oral cavity more susceptible to *Candida* infections³. Steroid Use (42 patients, 11%): Around 42 patients (11%) were using steroid medications (Figure 1). Corticosteroids, commonly prescribed for inflammatory or autoimmune conditions, can temporarily suppress the immune responses in the oral cavity. This immune suppression alters the oral microbiome by reducing the body's ability to control fungal organisms, including *Candida*. The disturbance in the oral flora, combined with a weakened immune response, can lead to an imbalance, allowing *Candida* species to overgrow and cause infection⁴. Unhealthy Dietary Habits (259 patients, 67%): Nearly 259 patients (67%) reported having unhealthy dietary patterns (Figure 1). Diets high in sugars, carbohydrates, sweets, and dairy products are known to lower the pH level in the oral cavity, making it more acidic. This acidic environment promotes the growth of *Candida* by providing ideal conditions for the fungi to thrive. Furthermore, a poor diet lacking essential nutrients can weaken the immune system, further predisposing patients to fungal infections such as candidiasis⁸.

Table I: Local and Systemic factors of oral candidiasis

List of local factors	List of systemic factors
1. Impaired local defense mechanisms	1. Impaired systemic defense mechanisms
2. Decreased saliva production	2. Primary or secondary immunodeficiency
3. Smoking	3. Immunosuppressive medications
4. Atrophic oral mucosa	4. Endocrine disorders- Diabetes
5. Mucosal diseases	5. Malnutrition
6. Topical medications – corticoids	6. Malignancies
7. Decreased blood supply	7. Congenital conditions
8. Radiotherapy	8. Broad-spectrum antibiotic therapy
9. Poor oral hygiene	
10. Dental prostheses	
11. Altered or immature oral flora	

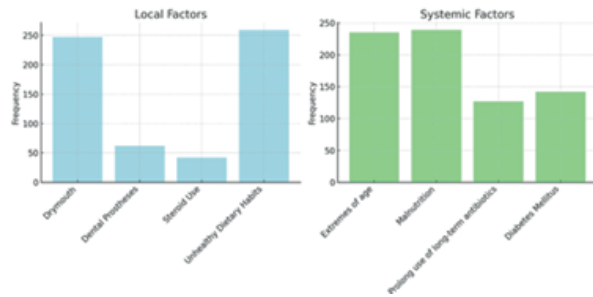


Figure 1: The bar diagrams displaying the frequency of local and systemic factors.

On the left side, the local factors such as "Dry mouth" and "Unhealthy Dietary Habits" with the highest occurrences. On the right-hand side, systemic factors such as "Malnutrition" and "Extremes of age" have similarly high frequencies.

Systemic factors:

- More than 235 (61%) patients in our study were belonging two adverse age groups. Extremes of age may be one of the predisposing factors for individuals to candidiasis owing to immature or weakened immunity, along with variations in the *Candida* carriage rates¹⁶.
- About 239 (62%) patients had malnutrition (Figure 1). Malnutrition, particularly iron but also in other nutrients such as essential fatty acids, folic acid, vitamins A and B6, magnesium, selenium, and zinc, are often associated with the increased risk of oral candidiasis. A deficiency of Iron may cause the fungistatic action of transferrin and other iron-dependent enzymes used in the suppression of fungal overgrowth in the oral cavity¹⁷.
- Around 127 (33%) patients had a history of using long-term antibiotics (Figure 1). Prolonged use of such broad-spectrum antibiotics (e.g. co-amoxiclav), or immunosuppressants (e.g. azathioprine) may alter the local oral flora by killing off the bacteria and suppressing the immune system. This results in a favorable environment for the growth of *Candida*¹⁷.
- In our study 142 (37%) patients had a history of Diabetes Mellitus (Figure 1). Oral and invasive candidiasis is more frequently reported in patients who have endocrine disorders, such as diabetes and Cushing's syndrome. Additionally, in immunodeficiency conditions such as AIDS; and also in patients receiving chemotherapy and radiotherapy for the treatment of carcinoma¹⁸.

Symptoms:

With the informed consent of the patients, we conducted a detailed evaluation of symptoms in both adults and children throughout the study. The findings revealed a range of oral manifestations, varying in severity and impact on daily activities:

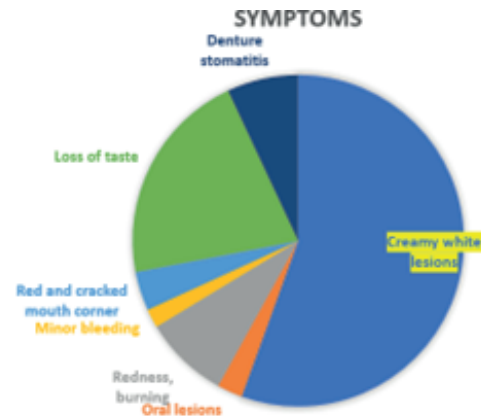


Figure 2: Common symptoms found in oral candidiasis.

- Creamy white lesions were the most common symptom, found in 335 patients (87%) (Figure 2). These lesions appeared on the tonsils, gums, and roof of the mouth, and occasionally extended to the surface of the tongue. The appearance of these lesions often prompted concerns of oral infection or inflammation.
- From Figure 2, approximately 15 patients (4%) exhibited slightly raised oral lesions, which closely resembled the texture and appearance of cottage cheese. These lesions were less common but were still a notable symptom for a subset of the patients.
- Redness, burning, or pain in the oral cavity was reported by 50 patients (13%), with some describing the discomfort as severe enough to interfere with eating and swallowing (Figure 2). This subset experienced significant disruptions to their nutrition intake due to the intensity of their symptoms.
- In 11 patients (3%), attempts to scrape or rub the lesions resulted in minor bleeding, indicating a degree of fragility in the affected areas. This bleeding further complicated the management of their symptoms and increased the risk of secondary infections.
- The corners of the mouth were found to be red and cracked in 23 patients (6%), a condition commonly associated with discomfort while opening the mouth, speaking, or eating (Figure 2). This symptom often exacerbated pain and hindered proper oral hygiene.
- Loss of taste perception was reported by 127 patients (33%) (Figure 2), a significant symptom that impaired their overall eating experience and possibly affected nutritional intake. The loss of taste had both physical and psychological impacts, as it diminished appetite and altered daily eating habits.
- Lastly in Figure 2, denture stomatitis, characterized by redness, irritation, and pain under dentures, was noted in 42 patients (11%). This condition was particularly concerning for patients who relied on dentures for daily function, as it limited their ability to wear them comfortably and maintain proper oral health.

These findings highlight the diversity and severity of oral symptoms observed, emphasizing the need for timely diagnosis and effective management strategies to alleviate patient discomfort and prevent further complications.



Figure 3: Oral thrush

Types of Oral Candidiasis:

We considered Oral candidiasis into three different groups as follows for our work during the study period:

Table II: Types of Oral Candidiasis

Acute candidiasis	Chronic candidiasis	Angular cheilitis (stomatitis)
• Acute pseudomembranous. • Acute atrophic (erythematous).	• Chronic hyperplastic (Candidial leukoplakia). • Denture induced (chronic atrophic (erythematous)). • Median rhomboid glossitis.	• Pseudomembranous.

i. Acute Pseudomembranous Candidiasis: During a visual examination, we observed that the lesions could be wiped away, leaving behind an erythematous mucosal surface that may bleed slightly¹⁸.

ii. Erythematous Candidiasis: Clinically, we identified localized erythematous areas, most commonly on the dorsum of the tongue and palate, and less commonly on the buccal mucosa. These areas were painful. This variant, previously referred to as "antibiotic sore mouth," is frequently associated with prolonged use of broad-spectrum antibiotics. These antibiotics reduce the oral bacterial population, creating an environment that fosters *Candida* overgrowth^{8,10-12}. This form is sometimes termed "atrophic candidiasis," where the term "atrophic" is used to describe the red areas. The redness may result not only from reduced epithelial thickness (atrophy) but also from increased vascularity¹⁹.

iii. Hyperplastic Candidiasis: We found that almost all patients presenting with this variant were smokers. The lesions were well-demarcated, slightly elevated, and consisted of adherent, homogeneous, or nodular white plaques that could not be wiped away. This variant is sometimes referred to as "candidial leukoplakia." The most common site for these lesions was the commissural region of the buccal mucosa, with the dorsum of the tongue being less frequently involved¹⁰⁻¹².

iv. Denture Stomatitis (Denture-associated Erythematous Candidiasis): In this variant, patients primarily reported slight soreness or a burning sensation. Denture stomatitis is often associated with angular cheilitis and median rhomboid

glossitis. It is characterized as a chronic inflammation of the mucosa that bears the denture²⁰.

v. Median Rhomboid Glossitis: This condition was characterized by an erythematous, rhomboid-shaped area located on the midline of the dorsum of the tongue, just anterior to the circumvallate papillae. Although it was once considered a developmental anomaly, current evidence indicates that it may represent an acquired form of chronic oral candidiasis⁵.

vi. Angular Cheilitis: This condition appeared as an erythematous lesion, commonly observed in denture-wearing patients with a reduced vertical occlusal dimension. Additionally, nutritional deficiencies, such as iron or vitamin B12 deficiency, have been implicated in the development of these lesions⁷.

Management of oral candidiasis

We observed that the effective management of oral candidiasis could be achieved by adhering to the following guidelines: (1) Diagnosis should be based on a thorough medical and dental history, alongside clinical manifestations, and confirmed through laboratory tests such as direct wet mount smear, staining, culture, or molecular testing. (2) Addressing and correcting predisposing factors plays a key role in controlling the infection. (3) Maintaining proper oral hygiene can significantly reduce the risk of developing oral candidiasis. (4) The appropriate use of antifungal drugs, as prescribed by a doctor based on the severity of the infection is crucial for effective treatment.

Antifungal Agents: We analyzed the commonly used antifungal agents for treating candidiasis, which are divided into three main categories depending on the nature of the lesion and the patient's immunological status:

Polyenes (nystatin and amphotericin B);

Ergosterol Biosynthesis Inhibitors – including azoles (miconazole, clotrimazole, ketoconazole, itraconazole, and fluconazole), allylamines, thiocarbamates, morpholines, and the DNA analog 5-fluorocytosine; and newer Agents such as Caspofungins^{14,15}. In healthy patients, superficial oral candidiasis can be treated topically, while in immunocompromised patients, both topical and systemic treatments may be required.

Topical Antifungals:

Topical antifungal agents are typically the first choice for treating uncomplicated, localized candidiasis in patients with normal immune function. These drugs achieve high concentrations in the oral epithelium when applied directly were used commonly to the patients. Polyenes function by directly binding to ergosterol in the fungal cell membrane, leading to cytoplasmic leakage and eventual fungal cell death¹⁶. Nystatin or amphotericin B solutions are commonly used for 4 weeks. In cases of recurrence, treatment may be extended to at least 4–6 weeks.

Topically administered miconazole gel is effective in treating uncomplicated infections in generally healthy patients, with treatment continuing for 1 week after the patient's symptoms have resolved.

Systemic antifungals:

We noted that systemic antifungals are typically used for disseminated candidiasis and/or in immunocompromised patients. Fluconazole and itraconazole are the most commonly administered oral antifungal agents. The oral solution of these drugs also has a topical effect. Azoles, a class of antifungal drugs, work by inhibiting the fungal enzyme lanosterol demethylase, which is crucial for ergosterol synthesis. Among the azoles, fluconazole achieves particularly high concentrations in saliva, making it an ideal antifungal agent for treating oral infections¹⁵.

However, one of the significant risks associated with fluconazole and other azoles is the development of resistant *Candida* strains¹⁷. For cases where fluconazole resistance is encountered, itraconazole solution can be administered at a dosage of 200 mg daily or Posaconazole suspension may be used at a dosage of 400 mg twice daily for 3 days, followed by 400 mg daily for up to 28 days, as recommended¹⁸⁻²⁰.

Prognosis:

The prognosis for oral candidiasis is generally good, both in inpatient and outpatient settings, when appropriate and effective treatment is administered. However, relapse is more common in patients who fail to properly remove and clean their dentures or who are unable to resolve the underlying causes or predisposing factors for the infection.

Conclusion:

In recent decades, a large amount of clinical data has been accumulated on oral candidiasis, particularly its association with various immunocompromised conditions. The development of antifungal drugs has significantly improved the control of this disease compared to previous decades. However, the emergence of drug-resistant *Candida* strains underscores the ongoing need for research into newer and more effective antifungal agents. In addition, the development of a vaccine against *Candida* species is becoming increasingly important in addressing this persistent issue.

Conflict of Interest: None.

Acknowledgment:

This study was supported by IBSc, Rajshahi, Bangladesh. We are thankful to all the staff of RMC and IBSc, Rajshahi, Bangladesh for their gratitude, compassion, and cooperation.

References:

1. Akpan A & Morgan R. Oral candidiasis. *Postgrad Med J*. 2002; 78(922): 455-459.
<https://doi.org/10.1136/pmj.78.922.455>
2. Coronado-Castellote L & Jim enez-Soriano Y. Clinical

and microbiological diagnosis of oral candidiasis. *J Clin Exp Dent*. 2013; 5(5): e279-e286.

<https://doi.org/10.4317/jced.51242>

3. Patil S, Rao RS, Majumdar B & Anil S. Clinical appearance of oral candida infection and therapeutic strategies. *Front Microbiol*. 2015; 6: 1391.

<https://doi.org/10.3389/fmicb.2015.01391>

4. Fraser VJ, Jones M, Dunkel J, et al. Candidemia in a tertiary care hospital: epidemiology, risk factors, and predictors of mortality. *Clin Infect Dis*. 1992; 15(3): 414-421.

<https://doi.org/10.1093/clind/15.3.414>

5. Open Prescribing. 2015. Available at: <https://openprescribing.net/> (accessed October 2020)

6. National Institute for Health and Care Excellence. Corticosteroids (inhaled). 2017. Available at: <https://bnf.nice.org.uk/drug-class/corticosteroids-inhaled.html> (accessed October 2020)

7. National Health Service. Oral thrush (mouth thrush). 2020. Available at:

<https://www.nhs.uk/conditions/oral-thrush-mouth-thrush/> (accessed October 2020)

8. Martins N, Ferreira ICFR, Barros L, et al. Candidiasis: predisposing factors, prevention, diagnosis and alternative treatment. *Mycopathologia*. 2014; 177: 223-240.

<https://doi.org/10.1007/s11046-014-9749-1>

9. Budtz-J rgensen E. Etiology, pathogenesis, therapy, and prophylaxis of oral yeast infections. *Acta Odontol Scand*. 1990; 48: 61-69.

<https://doi.org/10.3109/00016359009012735>

10. Sherman RG, Prusinski L, Ravenel MC, Joralmon RA. Oral candidosis. *Quintessence Int*. 2002; 33: 521-532.

<https://doi.org/10.1353/nlh.2002.0031>

11. Webb BC, Thomas CJ, Willcox MD, Harty DW, Knox KW. *Candida*-associated denture stomatitis. Aetiology and management: A review. Part 2. Oral diseases caused by *Candida* species. *Aust Dent J*. 1998; 43:160-166.

12. Zegarelli DJ. Fungal infections of the oral cavity. *Otolaryngol Clin North Am*. 1993; 26: 1069-1089.

[https://doi.org/10.1016/S0030-6665\(20\)30744-1](https://doi.org/10.1016/S0030-6665(20)30744-1)

13. Ghannoum, M. A., and Rice, L. B. Antifungal agents: mode of action, mechanisms of resistance, and correlation of these mechanisms with bacterial resistance. *Clin. Microbiol. Rev*. 1999;12: 501-517.

<https://doi.org/10.1128/CMR.12.4.501>

14. Stecks en-Blicks, C., Granstrom, E., Silfverdal, S. A., et al. Prevalence of oral *Candida* in the first year of life. *Mycoses*. 2015; 58: 550-556.

<https://doi.org/10.1111/myc.12355>

15. Thompson, G. R. III, Patel, P. K., Kirkpatrick, W. R., et

al. Oropharyngeal candidiasis in the era of antiretroviral therapy. *Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod.* 2010; 109, 488-495.

16. Pappas, P. G., Kauffman, C. A., Andes, D., et al. Clinical practice guidelines for the management of candidiasis: 2009 update by the Infectious Diseases Society of America. *Clin. Infect. Dis.* 2009; 48, 503-535.

17. Ghannoum MA, Abu-Elteen KH. Pathogenicity determinants of *Candida*. *Mycoses.* 1990; 33: 265-282.

<https://doi.org/10.1111/myc.1990.33.6.265>

18. Van Burik JA, Magee PT. Aspects of fungal pathogenesis in humans. *Annu Rev Microbiol.* 2001; 55: 743-772.

<https://doi.org/10.1146/annurev.micro.55.1.743>

19. Siikala, E., Rautemaa, R., Richardson, M., Saxen, et al. Persistent *Candida albicans* colonization and molecular mechanisms of azole resistance in autoimmune polyendocrinopathy-candidiasis-ectodermal dystrophy (APECED) patients. *J. Antimicrob. Chemother.* 2010; 65, 2505-2513.

<https://doi.org/10.1093/jac/dkq354>

20. Vazquez, J. A. Invasive oesophageal candidiasis: current and developing treatment options. *Drugs.* 2003; 63, 971-989.

<https://doi.org/10.2165/00003495-200363100-00004>

The Pattern of Clinical Characteristics of Tubercular Meningitis (TBM) Patients in Pediatric Unit of Magura Medical College Hospital

Mohammad Abdul Hye^{*1}, Md. Shamsur Rahman², Md. Iqbal Hossain³, Shuperna Ahmed⁴

Abstract

Introduction with Objectives: In this study our main goal is to evaluate the clinical characteristics of tubercular meningitis (TBM) patients in pediatric unit of Magura Medical College Hospital. **Materials and Methods:** An experimental design was conducted in pediatric unit of Magura Medical College Hospital from January 2021 to June 2024. 26 cases of tubercular meningitis confirmed by CSF study or confirmed by conservative treatment with antiTB were included for study. **Results:** In the present study, among the study subjects 55% had anemia, 96% had neck rigidity, 8% had cranial nerve palsy, 45% had kernig's sign and 22 % had long tract sign. Among them most prevalent symptom was fever (92%). Among others, headache (67%), altered consciousness (46%), vomiting (40%) and neck stiffness (25%) were notable. **Conclusion:** Finally we conclude that tubercular meningitis is a very serious form of tuberculosis that can occur in different forms and can cause mortality and morbidity in endemic developing countries and also in developed countries due to emergences of immune compromised conditions. Further study is needed for better outcome.

Keywords: Tubercular Meningitis (TBM), Pulmonary Infection.

Number of Tables: 04; Number of Figures: 03; Number of References: 08; Number of Correspondences: 03.

*1. Corresponding Author:

Dr. Mohammad Abdul Hye

Associate Professor

Department of Pediatrics

Magura Medical College & Hospital

Magura, Bangladesh.

Email: dr.mahye@yahoo.com

Mobile: 01815245012

2. Dr. Md. Shamsur Rahman

Assistant Professor

Department of Pediatrics

Satkhira Medical College & Hospital

Satkhira, Bangladesh.

3. Dr. Md. Iqbal Hossain

Assistant Professor

Department of Pediatrics

Jashore Medical College & Hospital

Jashore, Bangladesh.

4. Dr. Shuperna Ahmed

Associate Professor

Department of Pharmacology

Magura Medical College, Magura, Bangladesh.

contributing factors to the high mortality and morbidity, especially in resource-limited regions. When diagnosed promptly, TBM can be cured with supervised medication administration and supportive care^{3,4}. Patients with TBM develop typical symptoms and signs of meningitis including headache, fever, and stiff neck, although meningeal signs may be absent in the early stages. The duration of symptoms before presentation ranges from several days to several months. Especially in resource-limited settings, TBM cases may present in advanced clinical stages, with Glasgow Coma Scale scores of 10 or less^{5,6}. Cranial nerve (CN) palsies, hemiparesis, paraparesis, and seizures are common and should raise the possibility of MTB as the etiology of meningitis. Patients often present with multiple CN palsies, most commonly involving CN III, VI, and VII. Chest X-ray is suggestive of active or previous pulmonary TB in approximately 50% of cases^{7,8}. In this study our main goal is to evaluate the clinical characteristics of tubercular meningitis (TBM) patients.

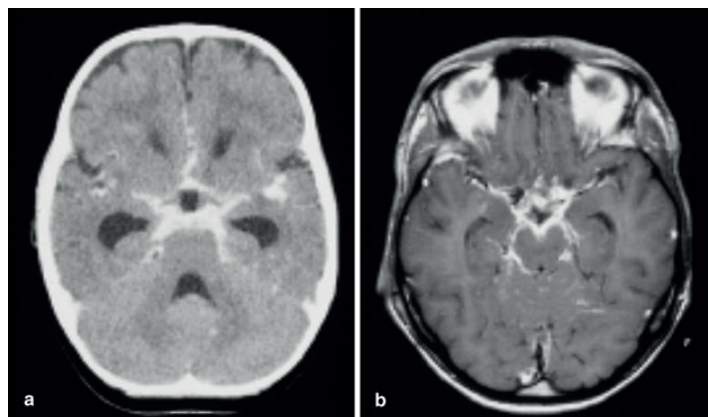


Figure-1a and 1b: CT scan report TM patients

Introduction:

Tubercular meningitis (TBM) can occur as the sole manifestation of TB or concurrent with pulmonary or other extra pulmonary sites of infection. TBM carries a high mortality and morbidity, particularly among patients co-infected with HIV^{1,2}. Delays in seeking medical care, diagnosis, and initiation of treatment are

Objective: General objectives are to evaluate the clinical characteristics of tubercular meningitis (TBM) patients. Specific objectives are to detect laboratory findings and the clinical symptoms and signs of patients.

Materials and Methods:

The experimental study conducted at pediatric unit of magura medical college hospital, magura from January 2021 to June 2024. Study population was a total 26 (twenty six) children aged 02 months to 12 years was selected randomly and sampling technique was purposive. All cases of tubercular meningitis confirmed by CSF study or confirmed by successful conservative treatment with anti-TB drugs. Pyogenic meningitis was excluded from the study. Anti-TB drugs treatment was given for 12 months. Follow up period is average 18 months during anti-TB treatment and after completion of drugs therapy. 5 patients with suspected tubercular meningitis were treated empirically with anti-TB drugs and responded successfully.

Statistical Analysis: First data were edited to the validity and consistency of the data. After proper verification data were coded and entered into computer by using SPSS software programs. Descriptive analysis was done by percentage, mean and standard deviation. Association was observed by appropriate statistical test at 95% confidence interval eg. odds ratio, Chi-square, t-test.

Result:

Table-I shows age distribution of the patients where most of the patients in study subjects belong to 2 months to 1 yr age group, 60%. The following figure is given below in detail:

Table- I: Distribution of baseline characteristics of study population (N=26).

Age group	Study population
2 months to 1 yr	60%
1yr to 5 yrs	25%
5 yrs to 12 yrs	15%

In figure-2 shows gender distribution of the patients (N=26) where male patients were higher than female. The following figure is given below in detail:

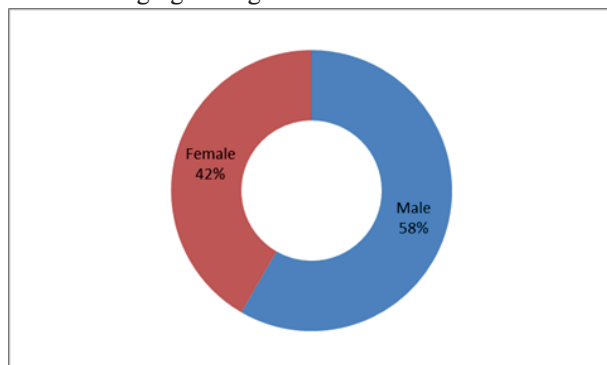


Figure-2: Gender distribution of the patients.

Table-II shows the distribution of the study subjects by physical sign. Among the study subjects 55% had anemia,

96% had neck rigidity, 8% had cranial nerve palsy, 45% had kernig's sign and 22 % had long tract sign. The following table is given below in detail:

Table-II: Shows the distribution of the study subjects by physical sign.

Variable	%
Anemia	55%
Neck rigidity	96%
Cranial nerve palsy	8%
Kernig's sign	45%
Long tract sign	22%

In figure-3 shows distribution of the study subjects by presenting symptoms. Among them most prevalent symptom was fever (92%). Among others, headache (67%), altered consciousness (46%), vomiting (40%) and neck stiffness (25%) were notable. The following figure is given below in detail:

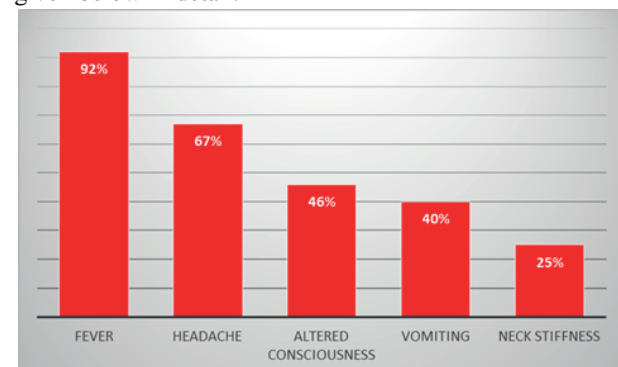


Figure-3: Distribution of the study subjects by presenting symptoms.

Table-III shows the distribution of the study subjects by fundoscopic examination finding, 80 % had normal eye, 9 % had optic atrophy and 11 % had papilloedema. The following table is given below in detail:

Table-III: The distribution of the study subjects by fundoscopic examination

Variable	%
Normal eye	80%
Optic atrophy	9%
Papilloedema	11%

Table-IV shows the distribution of the laboratory finding. Among the study subjects 4% shows positive gram stain, 100% shows high CSF protein and 46% showed MT over 10 mm. The following Table is given below in detail:

Table-IV: The distribution of the laboratory finding.

Variable	%
CSF Gram Staining:	
Positive	4%
Negative	96%
CSF Color:Straw/hazy	90%
WBC: Lymphocyte	70%
Protein:High	100%
MT:	
< 10 mm	54%
> = 10 mm	46%

Discussion:

According to the present study, the incidence in males was 58% and in females 42%. The incidence in both males and females is consistent with the study done by one study. Among the study subjects 55 % had anemia, 96% had neck rigidity, 8% had cranial nerve palsy, 45% had kernig's sign and 22 % had long tract sign. Also noted that 80 % had normal eye, 9 % had optic atrophy and 11 % had papilloedema. This was supported by one study where the incidence of papilloedema was 13.3 % and optic atrophy 3.3 % of cases and all are in TBM group not the NTBM. Other study observed papilloedema in 16.1% of cases 11. TBM is the severe form of extrapulmonary tuberculosis occurring in 7-12 % of TB patients in developing countries with high rate of mortality due to delay in diagnosis and proper treatment. In the absence of an early diagnosis and treatment, tubercular meningitis is characterized by high mortality (20-50%) and morbidity (20-30%). The cytological and biochemical analysis of cerebrospinal fluid is the cornerstone for diagnosis but there are diagnostic difficulties many a times in differentiating tubercular meningitis from nontubercular meningitis.

Conclusion:

From our study we conclude that tubercular meningitis is a very serious form of tuberculosis that can occur in different forms and can cause mortality and morbidity in endemic developing countries and also in developed countries due to emergences of immune compromised conditions. Further study is needed for better outcome.

Conflict of Interest: None.

Reference:

1. Sathyanarayana S, Baskaya MK, Fowler M, Roberts R, Nanda A. Solitary tuberculoma of the cerebellopontine angle: a rare presentation. *J ClinNeurosci*. 2003;10:120-122.

[https://doi.org/10.1016/S0967-5868\(02\)00269-2](https://doi.org/10.1016/S0967-5868(02)00269-2)
PMid:12464542

2. Arvind C, Korath MP, Raveendranadhan K, Jagadeesan K. A retrospective study of 1247 cases of intracranial tuberculomata diagnosed by computerized tomography. *J Assoc Physicians India*. 1993;41:559-561.

3. Bishburg E, Sunderam G, Beichman LB, Kapila R. Central nervous system TB with the acquired immunodeficiency syndrome and its related complex. *Ann Med Interne*. 1986;105:201-213.

<https://doi.org/10.7326/0003-4819-105-2-210>
PMid:3729203

4. Prabhakar S, Thussu A. Central nervous system TB. *Neurol India*. 1997; 45:132-40.

5. Dutta P, Bhansali A, Singh P. Pituitary Suprasellar tubercular abscess presenting as panhypopituitarism: A common lesion in an uncommon site, a brief review of literature. *Pituitary*. 2006; 9:73-77.

<https://doi.org/10.1007/s11102-006-5420-2>
PMid:16703412

6. Zuger A. Tuberculosis. In: Scheld WM, Whitley RJ, Mara CM, editors. *Infections of central nervous system*. 3. New York: Lippincott-Raven Publishers. 2004;441-460.

7. Shamim MS, Enam SA, Ali RP, Ali SF, Wasay M. Overview of surgical management of Infectious non-suppurative brain lesions (part 1). *Pak J NeurolSci*. 2009;4:77-82.

8. Rock RB, Olin M, Baker CA, Molitor TW and Piterson PK. Central Nervous System TB: Pathogenesis and Clinical Aspects. *ClinMicrobiol Rev*. 2008 ;21:243-261.

<https://doi.org/10.1128/CMR.00042-07>
PMid:18400795 PMCID:PMC2292571

Community Engagement and Readiness for E-waste Initiatives: Attitudes, Barriers and Opportunities

Irin Hossain^{*1}, Md. Shafiur Rahman², Md. Golam Abbas³, Shahria Sattar⁴, Afsana Nazneen⁵

Abstract

Introduction: The research "Community Engagement and Readiness for E-waste Initiatives: Attitudes, Barriers, and Opportunities" investigates the attitudes, barriers, and opportunities regarding e-waste management among community members in four divisional cities of Bangladesh. **Materials and Methods:** A cross-sectional design was employed over six months from January to June 2024, focusing on community members in Dhaka, Chittagong, Rajshahi, and Khulna. A stratified random sampling technique selected 408 participants based on their involvement with e-waste and willingness to participate. Data were collected using a semi-structured questionnaire. **Results:** Participants included 58.8% males and 41.2% females, with the majority aged between 20-30 years. Education levels varied, with 14.5% holding a Bachelor's degree, while 23.5% were classified as illiterate or with minimal education. Most participants lived in urban areas (69.4%). Mobile phones were the most commonly used devices (99.3%), followed by televisions (73.8%), refrigerators (56.9%), and laptops/computers/tablets (17.2%). Recycling was the most common e-waste disposal method (47.3%), with 63% selling old devices. Environmental concern motivated 28% to recycle, while personal values motivated 40.4%. Social media was the most common source of information regarding e-waste disposal (33.8%). The government was perceived as primarily responsible for e-waste recycling (68.4%). A lack of convenient recycling facilities was identified as the most significant barrier (13.5%) hindering participation in e-waste initiatives. Regarding information on e-waste recycling options, 57.8% agreed, with 29.2% strongly agreeing. In believing that e-waste recycling reduces environmental impact, 75.7% agreed, with 25.5% strongly agreeing. Cancer was identified as the most prevalent health concern (28.9%), followed by respiratory problems (25.7%) and skin problems (22.5%). **Conclusion:** While there is a general awareness of the importance of e-waste recycling, significant barriers such as a lack of facilities and information hinder effective participation. To improve community engagement, efforts should focus on enhancing public awareness, improving infrastructure, and incorporating schools and digital platforms into the solution.

Keywords: E-waste, community engagement and readiness, attitudes, barriers and opportunities.

Number of Tables: 03; Number of Figures: 06; Number of References: 42; Number of Correspondences: 04.

*1. Corresponding Author:

Dr. Irin Hossain

Assistant Professor
Department of Occupational and Environmental Health
National Institute of Preventive and Social Medicine
Dhaka 1212, Bangladesh.
Mobile: +880 1710894340
e-mail: irin.hossain@gmail.com
Orcid: <https://orcid.org/0000-0003-1068-674X>

2. Dr. Md. Shafiur Rahman

Associate Professor
Department of Occupational and Environmental Health
National Institute of Preventive and Social Medicine
Dhaka 1212, Bangladesh.

3. Dr. Md. Golam Abbas

Assistant Professor
Department of Occupational and Environmental Health
National Institute of Preventive and Social Medicine
Dhaka 1212, Bangladesh.

4. Dr. Shahria Sattar

Assistant Professor
Department of Occupational and Environmental Health
National Institute of Preventive and Social Medicine
Dhaka 1212, Bangladesh.

5. Dr. Afsana Nazneen

Lecturer
Department of Occupational and Environmental Health
National Institute of Preventive and Social Medicine
Dhaka 1212, Bangladesh.

Introduction:

The 21st century has seen a rapid proliferation of electronic devices, from smartphones and laptops to household appliances and industrial equipment, electronic devices have become integral to modern life, leading to substantial environmental challenges, especially regarding the management of electronic waste (e-waste). E-waste refers to discarded electrical and electronic equipment, and it has become one of the fastest-growing waste streams globally, posing serious

environmental and health risks^{1,3,24-26}. During the 1970s and 1980s, hazardous e-waste that was transferred from industrialized to developing countries seriously contaminated the environment²⁹. In 2019 alone, the world generated 53.6 million metric tons of e-waste, presenting complex environmental, health, and socio-economic issues¹⁻⁴. Managing e-waste effectively is a complex challenge that extends beyond the capabilities of technological solutions alone. It necessitates a multifaceted approach that includes policy frameworks, technological advancements, and, critically, community engagement because communities play a vital role in the success of e-waste management initiatives, as their participation and cooperation are essential for the proper collection, segregation, and recycling of e-waste^{27,28}. Despite the critical importance of community involvement, there remains a significant gap in understanding the factors that influence community engagement and readiness for e-waste initiatives⁵⁻⁸. Attitudinal factors play a significant role in shaping behaviors towards e-waste. Positive attitudes towards recycling and proper disposal can drive community participation, while negative perceptions or lack of awareness can impede efforts¹¹⁻¹³. Barriers to community engagement in e-waste initiatives can be diverse and multifaceted. They may include lack of awareness, inadequate infrastructure, financial constraints, and socio-cultural factors. Understanding these barriers is crucial for designing targeted interventions that can overcome obstacles and promote active participation¹⁴⁻¹⁸. Conversely, opportunities for enhancing community engagement in e-waste management are abundant and varied. These opportunities can arise from educational campaigns, community-based recycling programs, policy incentives, and the integration of local knowledge and practices¹⁹⁻²³. This research investigates community engagement and readiness for e-waste management initiatives in four major divisional cities of Bangladesh: Dhaka, Chittagong, Rajshahi, and Khulna. The study aims to assess attitudes, identify barriers, and explore opportunities for better community participation in e-waste management. Understanding the community's role is critical for fostering a sense of ownership and responsibility in e-waste initiatives⁹⁻¹⁰.

Materials and Methods:

This study employed a cross-sectional design to investigate the attitudes, awareness, and behaviors of community members regarding e-waste management in four divisions of Bangladesh, Dhaka, Chittagong, Rajshahi, and Khulna. These cities were selected to ensure a representative sample of the community, encompassing diverse demographic and socio-economic backgrounds. The study was conducted over a period of six months, commencing from January 2024 to June 2024. The study included community members, both male and female, who were users and handlers of e-waste, aged 18 years and above, and willing to participate by providing informed written consent. Severely ill individuals were excluded from the study to avoid any bias in the data collection process. In a similar study, awareness about the meaning of e-waste revealed that the majority (60%) of

respondents were familiar with the term “e-waste” Utilizing this reported prevalence as a baseline, with a 95% level of significance and a 5% degree of error. The estimated sample size for this study was 369 participants. To allow for potential non-responses, the sample size was increased by 10%, bringing it to 406 participants. Ultimately, interviews were conducted with 408 participants. stratified random sampling technique was used to select the divisional cities, ensuring that each city had a representative sample of the population. Within these cities, eligible study participants were selected purposively. A semi-structured questionnaire was developed and data were collected by Face-to-face interviews. Informed written consent was obtained from all participants prior to their inclusion in the study. Collected data underwent simultaneous checking, editing, coding, and recoding to ensure accuracy and reliability. IBM SPSS version 27 was used for data analysis, aligned with the study's aims and objectives. Descriptive statistics were used to summarize the data, and inferential statistics were employed to identify significant associations between variables.

Results:

The participants consisted of both male (58.8%) and female (41.2%) community members who were involved in the handling of e-waste and aged 18 years and above, with a majority falling within the 20-30 age range (33.1%). The majority of participants had attained a basic education level, with 23.50% being classified as Illiterate/Signature only, followed by 14.20% at the Primary level and 14.50% at the Secondary level. Furthermore, 11.30% held an SSC (Secondary School Certificate), while 11.00% possessed an HSC (Higher Secondary Certificate). Additionally, 14.50% of participants held a Bachelor's degree, and 11.00% had completed a Master's degree or higher. Regarding household type, 29.4% lived in Pucca houses, 21.8% in Semi Pucca houses, 36.3% in Tin Shade houses, and 12.5% in Apartments. In terms of residential area, 69.4% resided in urban areas, with 30.6% living in semi-urban areas. Employment status varied, with 34.6% being employed, 2.7% unemployed, 5.4% students, 1.5% retired, 25.0% housewives, 18.6% involved in business, and 12.3% categorized as 'Others'. Mobile phones were the most commonly used device, with 99.30% of participants reporting usage. Televisions followed, with 73.80% of participants using them. Refrigerators were used by 56.90% of participants, while Laptops/Computers/Tablets were used by 17.20%. Additionally, 77.00% of participants reported using other devices.

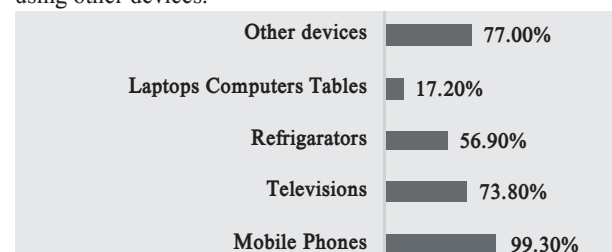


Figure 1: Types of Used E-Devices

Recycling was the most common method, with 47.30% of participants opting for this approach. Throwing in the trash was reported by 15.70% of participants, while Donating was chosen by 7.40%. Selling old e-devices was the most prevalent method, with 63.00% of participants opting to sell their devices.

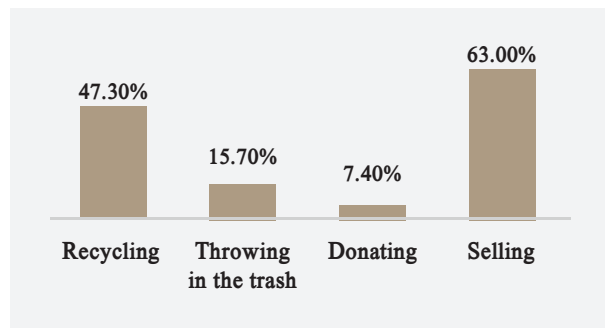


Figure 2: Ways of Disposal of Old E-Devices

Environmental concern was cited by 28.00% of participants, while Personal Values motivated 40.40% of participants to recycle e-waste. Convenience of Recycling Facilities was reported by 38.20% of participants as a motivating factor. Incentives/Rewards played a minor role, motivating only 1.90% of participants, while Government Regulations influenced 6.10% of participants to recycle e-waste. Participants reported various sources of relevant information regarding e-waste disposal, with social media being the most common source, cited by 33.80% of participants. The Internet was also a significant source, with 25.70% of participants reporting it as a source of information. Newspaper and Television were mentioned by 24.00% of participants, while other sources were cited by 15.00%. Additionally, 15.00% of participants reported never having heard about e-waste disposal from any source. Participants identified various entities responsible for e-waste recycling, with the Government being cited by the majority, with 68.40% of participants considering them responsible. Manufacturers were also seen as responsible by 28.40% of participants, while Consumers were mentioned by 26.00%. Additionally, 16.70% of participants cited Others as being responsible for e-waste recycling.

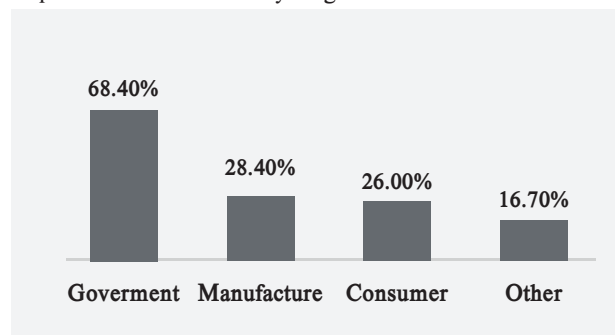


Figure 3: Who is Responsible for E-waste Recycling

Concern about the environmental impact varied among participants, with 44.6% reporting being slightly concerned,

followed by 34.8% not concerned at all, 16.4% moderately concerned, and 4.2% extremely concerned. The majority (55.4%) agreed that it is important to dispose of e-waste properly to protect the environment, with 21.8% strongly agreeing. Regarding appropriate e-waste recycling methods, 75.0% of participants considered formal recycling to be appropriate, while 14.7% preferred informal recycling and 10.3% indicated both methods. Confidence in the community's ability to effectively manage and recycle e-waste was divided, with 43.1% feeling neutral, 33.3% confident and 23.5% not confident. A minority (14.7%) reported difficulties finding e-waste recycling facilities in the community, while 42.2% did not encounter any difficulties, and 43.1% were unsure. Lack of convenient recycling facilities was identified as the most prevalent barrier, with 13.50% of participants reporting this issue. Other barriers included Lack of Knowledge, cited by 7.40% of participants, Cost of Disposal, reported by 4.20% of participants, and Lack of Incentives, mentioned by 1.90%. Privacy Concern was cited as a barrier by 1.30% of participants, while 0.60% reported other reasons hindering their participation in e-waste initiatives. The accessibility of e-waste recycling facilities in the community varied among participants, with 4.20% reporting them as Very Accessible and 21.30% as Somewhat Accessible. Additionally, 24.30% of participants considered the facilities to be Neither Accessible nor Inaccessible. However, 35.50% found them to be Somewhat Inaccessible, while 14.70% deemed them Very Inaccessible. In total, 408 participants provided feedback on the accessibility of e-waste recycling facilities. Regarding the lack of information about e-waste recycling options, 57.80% of participants agreed, with 29.20% strongly agreeing, while only 0.70% disagreed or strongly disagreed. In terms of the belief that e-waste recycling helps reduce environmental impact, 75.70% of participants agreed, with 25.50% strongly agreeing, and 24.00% remaining neutral. Only a small proportion, 0.20%, disagreed with this statement. Health Risks associated with e-waste was considered the most important information, cited by 38.70% of participants, followed by Proper Disposal Method, deemed important by 28.40%. Additionally, 25.70% emphasized the importance of understanding the Environmental Effects of e-waste, while 24.30% valued knowledge about the Recycling Process. Only a negligible proportion of participants, 0.20%, mentioned other aspects as important information regarding e-waste recycling. Education emerged as the primary method, with 55.90% of participants acknowledging its importance. Incorporation with Curriculum was also highlighted significantly, with 50.00% of participants recognizing its role. Organizing Drives was mentioned by 3.90% of participants as a means for schools to promote e-waste recycling, while 2.20% suggested Partnership with Facilities. A small proportion, 0.20%, mentioned other methods for schools to contribute to e-waste recycling efforts. Cancer was identified as the most prevalent health concern, with 28.90% of participants citing it. Respiratory Problems and Skin Problems were also reported, with 25.70% and 22.50% of participants

mentioning them, respectively. Additionally, Neurological Problems were highlighted by 18.10% of participants. Furthermore, 18.40% mentioned other health issues resulting from e-waste contamination.

Table I: Demographic Status of Participants

Traits	Response	N (%)
Resident Ownership	Yes	109 (26.7)
	No	299 (73.3)
Household Type	Pucca	120 (29.4)
	Semi Pucca	89 (21.8)
	Tin Shade	148 (36.3)
	Apartment	51 (12.5)
Residential Area	Urban	283 (69.4)
	Semi Urban	125 (30.6)
Employment Status	Employed	141 (34.6)
	Unemployed	11 (2.7)
	Student	22 (5.4)
	Retired	6 (1.5)
	Housewife	102 (25.0)
	Business	76 (18.6)
	Others	50 (12.3)

Table II: Community Attitudes Towards E-Waste Management and Recycling

Traits	Response	N (%)
How much concerned about environmental impact?	Not concerned at all	142 (34.8)
	Slightly Concerned	182 (44.6)
	Moderately Concerned	67 (16.4)
	Extremely Concerned	17 (4.2)
Is it important to dispose of e-waste properly to protect environment?	Strongly Agree	89 (21.8)
	Agree	226 (55.4)
	Neutral	92 (22.5)
	Disagree	1 (0.2)
What is an appropriate way of e-waste recycling?	Formal Recycling	306 (75.0)
	Informal Recycling	60 (14.7)
	Both	42 (10.3)
How much confident about community's ability to effectively manage and recycle e-waste?	Confident	136 (33.3)
	Neutral	176 (43.1)
	Not Confident	96 (23.5)
Any difficulties finding e-waste recycle facilities in community?	Yes	60 (14.7)
	No	172 (42.2)
	Not Sure	176 (43.1)

Table III: Barriers and Accessibility Towards E-Waste Management and Recycling

Traits	Response	N (%)
Barriers that hinder community participation in e-waste initiatives	Lack of convenient recycling facilities	34 (13.50)
	Lack of knowledge	18 (7.40)
	Privacy concern	10 (4.20)
	Cost of disposal	10 (4.20)
	Lack of incentives	5 (1.90)
	Others	03 (0.6)
Accessibility of e-waste recycle facility in community	Very inaccessible	36 (14.70)
	Somewhat inaccessible	87 (35.50)
	Neither accessible nor inaccessible	60 (24.30)
	Somewhat accessible	52 (21.30)
	Very accessible	10 (4.2)

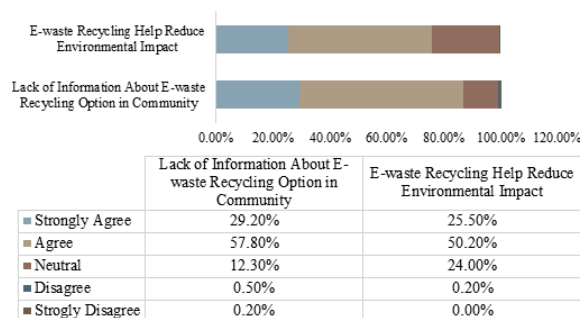


Figure 4: Lack of Information About E-waste Recycling Option in Community & E-waste Recycling Help Reduce Environmental Impact

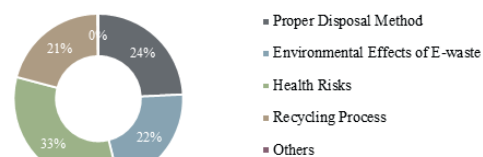


Figure 5: Important Information for Public to Know about E-waste Recycling

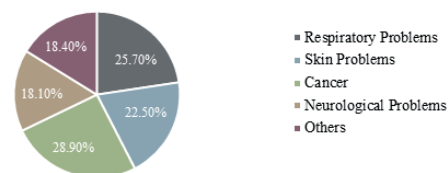


Figure 6: Health Issues Caused Following E-waste Contamination

Discussion:

Comparing the findings from the study titled "Community Engagement and Readiness for E-waste Initiatives: Attitudes, Barriers and Opportunities" with other relevant research provides a broader context and highlights both commonalities and unique insights. Several key areas for comparison include demographic influences, attitudes towards e-waste management, barriers to participation, and community engagement strategies. Similar to the findings from Bangladesh, studies conducted in other developing countries also reveal significant demographic influences on e-waste management practices. For instance, a study in India found that younger populations are more aware and engaged in e-waste management compared to older generations. This aligns with the Bangladesh study, where the majority of participants fell within the 20-30 age range, indicating a trend across similar socio-economic contexts^{30,35}. Attitudes towards e-waste management vary significantly across different regions. In the Bangladesh study, while personal values and convenience were primary motivators for recycling, a study³⁶ in India highlighted environmental concern as a major motivator for e-waste recycling among urban populations. This suggests that cultural and contextual factors play a significant role in shaping attitudes. Additionally, a study³⁷ in Nigeria found that financial incentives were crucial in motivating e-waste recycling, contrasting with the Bangladesh findings where incentives were less significant (only 1.90%). The barriers to effective e-waste management identified in the Bangladesh study, such as lack of convenient recycling facilities and lack of knowledge, are echoed in various international studies. For example, a study³⁸ in China identified similar barriers, emphasizing the need for improved infrastructure and public education. Similarly, in a study conducted in Kenya³⁹, the lack of formal recycling facilities and public awareness were major obstacles. These consistent findings across different countries highlight the global nature of these challenges. The role of educational institutions in

promoting e-waste recycling, as identified in the Bangladesh study, is also supported by another research. For instance, a study⁴⁰ in Thailand emphasized the importance of integrating e-waste education into school curriculums to foster a culture of recycling from a young age. Moreover, the reliance on digital platforms for information dissemination, such as social media and the internet, is a common strategy observed globally. A study⁴¹ in Botswana highlighted the effectiveness of digital campaigns in raising awareness and encouraging proper e-waste disposal practices. Awareness of the health implications of e-waste, such as cancer and respiratory problems, was a significant finding in the Bangladesh study. This is consistent with findings from other regions. For instance, a study⁴² in Ghana also highlighted severe health risks associated with e-waste, including respiratory and dermatological problems, due to the informal recycling processes prevalent in developing countries. This underscores the universal need for public health campaigns to address the health risks of e-waste. In summary, the findings from the Bangladesh study align with those from other developing countries, highlighting common challenges such as lack of infrastructure, need for public education, and the role of cultural factors in shaping attitudes towards e-waste management. However, the emphasis on personal values and convenience as motivators in Bangladesh adds a unique perspective, suggesting that strategies to enhance community engagement must be tailored to local contexts. These comparisons underscore the importance of a multifaceted approach to e-waste management that includes improving infrastructure, enhancing public education, leveraging digital platforms, and addressing health risks associated with e-waste.

Conclusion:

This study highlights critical aspects of community engagement and readiness for e-waste initiatives in Bangladesh. While there is a general awareness and positive attitude towards recycling, significant barriers such as lack of facilities and information hinder effective participation. Addressing these barriers through targeted educational campaigns, improving infrastructure, and leveraging the role of schools and digital platforms can significantly enhance community engagement in e-waste management. The findings underscore the need for a comprehensive, multi-faceted approach to tackle the e-waste challenge, involving community participation, government support, and educational initiatives.

Conflict of Interest: None.

Acknowledgement:

We would like to express our gratitude to the research team and all the participants from Dhaka, Chittagong, Rajshahi, and Khulna. The study would not be feasible without their collaboration and genuineness.

References:

1. BAN/SVTC. Exporting Harm: The High-Tech Trashing of Asia. Basel Action Network and Silicon Valley Toxics Coalition. February 25, 2002.
2. Remesh, B. B., Parande, A. K., & Ahmed, B. C. Electrical and Electronic Waste: A Global Environmental Problem. *Waste Management Research*. 2007; 25: 307-318. <https://doi.org/10.1177/0734242X07076941>

PMid:17874657

3. Sinha, S. (2007). Downside of the Digital Revolution. *Toxics Link*. Available at: <http://www.toxicslink.org/art-view.php>. Accessed December 28, 2007.
4. Widmer, R., Oswald-Krapf, H., Sinha-Khetriwal, A., et al. Global Perspectives on E-waste. *Environmental Impact Assessment Review*. 2005;25: 436-458. <https://doi.org/10.1016/j.eiar.2005.04.001>
5. Brigden, K., Labunska, I., Santillo, D., et al. Chemical Contamination at E-waste Recycling and Disposal Sites in Accra and Korforidua, Ghana. *Greenpeace International Amsterdam*; 2008.
6. Puckett, J. A Place Called Away. In: Hugo, T. *Permanent Error*. Prestell Publishers. ISBN. 2011; 978-3-79134-520-8.
7. Swerts, T. Waste or Opportunity? The Importance of a Progressive India E-waste Policy. *Toxics Link*. Available at: <http://www.toxicslink.org/art-view.php>. Accessed November 17, 2006.
8. UNEP. E-waste: The Hidden Side of IT Equipment's Manufacturing and Use. Early Warnings on Emerging Environmental Threats. *United Nations Environment Programme*. 2005; 5.
9. Oteng-Ababio, M. E-waste: An Emerging Challenge to Solid Waste Management in Ghana. *International Development Planning Review (IDPR)*. 2010;32(2). <https://doi.org/10.3828/idpr.2010.02>
10. Toxics Link. Scrapping the High-tech Myth: Computer Waste in India. *Toxic Links*, Delhi, India.
11. BAN. The Digital Dump: Exporting Re-use and Abuse to Africa. *Basel Action Network*. October 24, 2005. Retrieved from www.ban.org.
12. Oteng-Ababio, M. When Necessity Begets Ingenuity: Scavenging for Survival in Accra, Ghana. *African Studies Quarterly (Forthcoming)*;2012.
13. Grant, R., & Oteng-Ababio, M. Mapping the Invisible and Real African Economy: Urban E-Waste Circuitry. *Urban Geography*. 2012; 33(1): 1-11. <https://doi.org/10.2747/0272-3638.33.1.1>
14. Oteng-Ababio, M. The Legal and the Reasonable: Exploring the Dynamics of E-waste Disposal Strategies in Ghanaian Households. *Journal of US-China Public Administration*. 2012; 9(13): 1548-6591.
15. Agyei-Mensah, S., & Oteng-Ababio, M. Perceptions of Health and Environmental Impacts of E-waste Management in Ghana. *International Journal of Environmental Health Research*. 2012; 11: 1-8. <https://doi.org/10.1080/09603123.2012.667795> PMid:22428915
16. Brook, J. Waste Dumpers turning to West Africa. *The New York Times*. Sunday, July 17, 1988.
17. Daily Graphic. A Ghanaian Newspaper, Daily Graphic. Monday, August 18, 2008. Accra, Ghana.
18. Boon, J. E., Isaacs, J. A., & Gupta, S. M. Economics of PC Recycling. In: *Proceedings of SPIE*, 2001. Retrieved from <http://www.coe.neu.edu/~smgupta/4193-07-SPIE.PDF>. <https://doi.org/10.1117/12.417288>
19. Mundada, M. N., Kumar, S., & Shekdar, A. V. E-Waste: A New Challenge for Waste Management in India. *International Journal of Environmental Studies*. 2004;61: 32-65. <https://doi.org/10.1080/0020723042000176060>
20. US Environmental Protection Agency. (2008). *Electronic Waste Management in the United States*. EPA530-R-08-009 US Environmental Protection Agency. Retrieved from <http://www.epa.gov/osw/conservation/materials/recycling/docs/app-1.pdf>.
21. Ravi, V., Shanker, R., & Tiwari, M. K. Analyzing Alternatives in Reverse Logistics for end-of-life Computers: ANP and Balanced Scorecard Approach. *Computer and Industrial Engineering*. 2005; 48:327-356. <https://doi.org/10.1016/j.cie.2005.01.017>
22. Hicks, C., Dietmar, R., & Eugster, M. The Recycling and

Disposal of Electronic Waste in China- Legislative and Market Response. *Environmental Impact Assessment Review*. 2005; 25: 459-471.
<https://doi.org/10.1016/j.ciar.2005.04.007>

23. Antrekowitsch, H., Potesser, M., Spruzina, W., et al. Metallurgica Recycling of Electronic Scrap. In: Howard, S. M., et al. EPD Congress 2006, 889-908. The Minerals, Metals and Materials Society, TMS, Warrendale, PA, USA.

24. Hageløken, C. (2006). Improving Metal Returns and Eco-efficiency in Electronic Recycling- a Holistic Approach to Interface Optimization between Pre-processing and Integrated Metal Smelting and Refining. In: *Proceedings of the 2006 IEEE International Symposium on Electronics and the Environment*, San Francisco, CA. 8-11 May 2006: pp. 218-223.
<https://doi.org/10.1109/ISEE.2006.1650064>

25. Prakash, S., Manhart, A., Amoyaw-Osei, Y., & Agyekum, O. Socio-economic Assessment and Feasibility Study on Sustainable E-waste Management in Ghana. Accra;2010.

26. ICT4AD. ICT for Accelerated Development- One Laptop Per Child: Mission. Available at: <http://www.laptop.org/vision/mision/>. Accessed August 30, 2007.

27. World Bank. Ghana Country Environmental Analysis. Report 36985-GH. November 2, 2007.

28. Kwakye, M. EPA Lacks the Capacity to Control E-waste Disposal. *The Ghanaian Journal*. Retrieved August 28, 2009, from <http://www.ghanaiantimes.com.gh>.

29. Shinkuma, T., & Huong, N. T. M. The Flow of E-waste Material in the Asian Region and a Reconsideration of International Trade Policies on E-waste; 2008.
<https://doi.org/10.1016/j.ciar.2008.04.004>

30. Hageløken C. Recycling of e-scrap in a global environment-opportunities and challenges. E-waste: implications, regulations, and management in India and current global best practices. 2008:217.

31. Oteng-Ababio M. Electronic waste management in Ghana-issues and practices. *Sustainable development-authoritative and leading edge content for environmental management*. 2012 Aug 1;600(2).
<https://doi.org/10.5772/45884>
 PMid:22428915

32. Daily Graphic. A Ghanaian Newspaper, Daily Graphic. Saturday, November 5, 2005. Accra, Ghana. 2005;5: 21-28.

33. Roy H, Rahman TU, Suhan MB, Al-Mamun MR, Haque S, Islam MS. A comprehensive review on hazardous aspects and management strategies of electronic waste: Bangladesh perspectives. *Heliyon*. 2022 Jul 1;8(7).
<https://doi.org/10.1016/j.heliyon.2022.e09802>
 PMid:35815143 PMCID:PMC9263878

34. Mowla M, Rahman E, Islam N, Aich N. Assessment of heavy metal contamination and health risk from indoor dust and air of informal E-waste recycling shops in Dhaka, Bangladesh. *Journal of Hazardous Materials Advances*. 2021 Dec 1;4:100025.
<https://doi.org/10.1016/j.hazadv.2021.100025>

35. Change, Government of India. E-waste (Management) Rules, 2016. Ministry of Environment, Forest and Climate Change, Government of India;2016.

36. Hossain, S., & Shanta, S. Illegal Import and Trade Off of E-Waste in Bangladesh. *Environment and Social Development Organisation*;2011.

37. Chung, S., & Mo, T. A Comparative Study of E-waste Recycling Systems in Japan, South Korea and Taiwan from the EPR Perspective: Implications for Developing Countries;2008.

38. Borthakur A, Singh P. The journey from products to waste: a pilot study on perception and discarding of electronic waste in contemporary urban India. *Environmental Science and Pollution Research*. 2021 May;28:24511-20.
<https://doi.org/10.1007/s11356-020-09030-6>
 PMid:32356069

39. Eguchi A, Kunisue T, Wu Q, Trang PT, Viet PH, Kannan K, et al. Occurrence of perchlorate and thiocyanate in human serum from e-waste recycling and reference sites in Vietnam: association with thyroid hormone and iodide levels. *Archives of environmental contamination and toxicology*. 2014 Jul;67:29-41.
<https://doi.org/10.1007/s00244-014-0021-y>
 PMid:24718699

40. Khanna, R., Mukherjee, P. S., & Park, M. A critical assessment on resource recovery from electronic waste: Impact of mechanical pre-treatment. *J. Clean. Prod.*, 122319.
<https://doi.org/10.1016/j.jclepro.2020.122319>

41. Needhidasan S, Samuel M, Chidambaram R. Electronic waste-an emerging threat to the environment of urban India. *Journal of environmental health science and engineering*. 2014 Dec;12:1-9.
<https://doi.org/10.1186/2052-336X-12-36>
 PMid:24444377 PMCID:PMC3908467

42. Reid S, Chris X. Consumption of rice and fish in an electronic waste recycling area contributes significantly to total daily intake of mercury. *Journal of Environmental Sciences*. 2015(12):83-6.
<https://doi.org/10.1016/j.jes.2015.10.003>
 PMid:26702970

Microscopic Study on the Diameter of the Parietal Cells of Post Mortem Human Stomach

Pran Krishna Basak¹, Suchitra Talukdar², Md. Ashraful Kabir³, Biplab Kumar Barman^{*4}, Abdullah Al Foysal⁵, Halima Akther Suchi⁶, Mahmuda Sultana⁷, Anup Kumar Biswas⁸, Joyashish Roy⁹, Joyanti Rani Debnath¹⁰, Mahmuda Jannat¹¹

Abstract

Introduction: Disease pattern as well as diagnostic and treatment options may be helped by examining the diameter of parietal cells of human stomach, as the change with age. It seems that there is a few research in this area and needs more studies, including gross anatomical studies, with data available in Bangladesh. **Materials and Methods:** This Cross-sectional descriptive study was carried out at Department of anatomy, Sylhet M.A.G. Osmani Medical College, Sylhet during the periods from January 2013 to December 2013. Fifty human postmortem stomach were selected from unclaimed dead bodies that were under examination in the morgue of department of Forensic Medicine, Sylhet M.A.G. Osmani Medical College, Sylhet. The collected samples were divided into 3 groups upon age. Group A (7-14 years), Group B (15-22 years) and Group C (23-64 years). Histological study was carried out on relatively 18 fresh samples. **Results:** The mean diameter of parietal cells was $14.09(SD \pm 0.91) \mu m$ in the age group of 7 to 14 years; $16.60(SD \pm 0.91) \mu m$ in the age group of 15 to 22 years and $17.81(SD \pm 1.52) \mu m$ in the age group of 23 to 64 years ($p < 0.001$) with $16.69(SD \pm 2.03) \mu m$ in male and $16.49(SD \pm 1.99) \mu m$ in female ($p = 0.825$). A significant positive correlation was observed between age and diameter of parietal cells ($p < 0.001$). **Conclusion:** Age related changes were found in the diameter of parietal cells.

Keywords: Stomach, parietal cells, cadaver.

Number of Tables: 02; Number of References: 13; Number of Correspondences: 04.

1. Dr. Pran Krishna Basak

Assistant Professor
Department of Anatomy
Bangabandhu Medical College
Sunamganj, Bangladesh.

2. Dr. Suchitra Talukdar

Assistant Registrar,
Department of Psychiatry,
Sylhet MAG Osmani Medical College Hospital
Sylhet, Bangladesh.

3. Dr. Md. Ashraful Kabir

Assistant Professor
Department of Anatomy
Sheikh Sayera Khatun Medical College
Gopalganj, Bangladesh.

*4. Corresponding Author:

Dr. Biplab Kumar Barman

Assistant Professor
Department of Surgery
Chandpur Medical College
Chandpur, Bangladesh.
Contact: 01731578070
Email: drbbbarman12@gmail.com

5. Dr. Abdullah Al Foysal

Associate Professor
Department of Anatomy
Estern Medical College, Cumilla, Bangladesh.

6. Dr. Halima Akther Suchi

Associate Professor
Department of Anatomy
Mainamoti Medical College
Cumilla, Bangladesh.

7. Dr. Mahmuda Sultana

Associate Professor
Department of Anatomy
Parkview Medical College
Sylhet, Bangladesh.

8. Lt Col Dr. Anup Kumar Biswas

Department of Reproductive Endocrinology & Infertility
Combined Military Hospital
Dhaka, Bangladesh.

9. Dr. Joyashish Roy

Applied Nutritionist,
Institute of Public Health Nutrition
Dhaka, Bangladesh.

10. Dr. Joyanti Rani Debnath

Junior Consultant
Department Pediatrics
Upazila Health Complex
Hazigonj, Chandpur, Bangladesh.

11. Dr. Mahmuda Jannat

Associate Professor, Dept of Anatomy
Sylhet Women's Medical College
Sylhet, Bangladesh.

Introduction:

The stomach has three histologically distinct regions⁴. Gastric glands, fundic gland (Glands of body and fundus) and pyloric glands¹. The cells of these glands secrete gastric juice which contain mucous, pepsinogen, hydrochloric acid, intrinsic factor, gastrin, and gastric lipase³. Fundic glands contain three major types of cells: parietal, chief and mucous neck cell⁴. The normal human stomach contains approximately 1 billion parietal cells^{6,9}. Parietal (oxyntic) cells are the source of gastric acid and intrinsic factor of castle, a glycoprotein necessary for the absorption of vitamin B12³. They are large, oval and strongly eosinophilic, and have centrally placed nuclei. Parietal cells occur intermittently along the wall of the more apical half of the gland, but can reach as far as the isthmus; they bulge laterally into the surrounding connective tissue⁵. They have a unique ultra-structure related to their ability to secrete hydrochloric acid. The luminal side of the cell is deeply invaginated to form a series of blind-ended channels (canaliculi) that bear numerous irregular microvilli covered by a plasma membrane rich H⁺/K⁺ ATPase antiporter channels. The latter actively secrete hydrogen ions into the lumen; chloride ions follow along the electrochemical gradient. The mitochondria-rich cytoplasm facing these channels contains a tubulo-vesicular system of abundant fine membranous tubules directed towards the canalicular surface⁸. The precise structure of the cells varies with its secretory phase: when stimulated, the number and surface area of the microvilli increases up to five-fold, probably as a result of rapid fusion of the tubule-vesicular system with the plasma membrane. A single parietal cell can concentrate hydrogen up to 4 million times, from pH 7.4 – 0.8⁷. It undergoes a series of well-organized events to generate HCl through the H⁺, K⁺ ATPase and the associated Cl⁻ and K⁺ channels¹⁰. When stimulated, tubulovesicles fuse with the membrane to form an extensive network of canaliculi, increasing the surface area of the parietal cell's apical membrane^{11,12}. This process is reversed at the end of stimulated secretion, when the excess membrane retreats back into the tubulo-alveolar system and microvilli are lost.

Materials and Methods:

Human stomachs were collected from the unclaimed dead bodies autopsied in the Department of Forensic medicine in Sylhet M.A.G. Osmani Medical College, Sylhet during study period from January 2013 to December 2013 meeting the inclusion and exclusion criteria included in the study. The collected samples were divided into 3 groups depending upon age. Each group was again subdivided into two sub-group depending upon their sex.

Table-I Grouping distribution according to age:

Group	Age limit in years	Number of sample		
		Male	Female	Total
A	7-14 years	5	3	8
B	15-22 years	6	4	10
C	23-64 years	18	14	32

Procedure for histological study:

For the measurement of diameter of parietal cells six slides were selected from group A, B & C. (from each group)

Preparation of the slide:

Tissue blocks were fixed in 10% formalin saline in a plastic container. The tissues were washed in running tap water, dehydration was done with ascending grades of alcohol, cleared with xylene, infiltrated and embedded in paraffin. Paraffin blocks were cut at 5 mm thickness and were stained with routine Harris haematoxylin and Eosin (H & E) stain. **Measurement of transversal diameter of parietal cell:**

To get the trans-vertical diameter of each parietal cell, two special measuring instruments were used, stage micrometer and ocular micro-meter. At first the stage micrometer was set on the microscope stage. Then the ocular micrometer was placed at the eye piece. On the stage micrometer there was a straight line which was one millimeter in length was divided into 100 small divisions. Thus each small division measured 0.01mm. The ocular micrometer also had a line, calibrated into small divisions.

100 divisions of stage micro-meter = 1000µm

1 division of stage micrometer = 10 µm

In low magnification(10X)

35 ocular micrometer division = 100 stage division

1 ocular micrometer division = 100/35 stage division = 2.86 stage division

1 Stage division = 10 µm

1 Ocular division + 10 x 2.86 µm = 28.6 µm.

It was to be noted that during this procedure, the objective to see the parietal cell and the eye piece lens used were those as would be used to see the parietal cell. After that standardization, the stage micrometer was removed. Then the slide was placed one by one and the greatest longitudinal and transverse diameter of the parietal cell were measured and expressed in the term of µm. For example, if the longitudinal diameter of parietal cell was equal to 5 small division on the ocular micrometer, then the longitudinal diameter in term of µm would be 5X28.6 µm or 143.0 µm. Then the mean greatest longitudinal diameter and the mean greatest transverse diameter were calculated.

The transverse diameter was then calculated by the following formula: Diameter of parietal cell =

$$\frac{\text{Longitudinal diameter} + \text{transverse diameter}}{2}$$

Results:

In the present study, the mean diameter of parietal cells was 14.09(SD± 0.91) µm in the age group of 7 to 14 years; 16.60 (SD± 0.91) µm in the age group of 15 to 22 years and 17.81(SD± 1.52) µm in the age group of 23 to 64 years. The difference among the groups was statistically significant (F

= 17.290; $p < 0.001$). Distribution of diameter of parietal cells by different age group was shown in Table II.

Table II: Distribution of diameter of parietal cells by different age group

Diameter of parietal cells (µm)	Age group			*P value
	Group A	Group B	Group C	
Mean ± SD	14.09 ± 0.91	16.60 ± 0.91	17.81 ± 1.52	$p < 0.001$
Range	12.98-15.22	15.33-17.89	15.25-19.77	

Group A : 7 to 14 years; Group B: 15 to 22 years ; Group C: 23-64 years

*One way ANOVA test was applied to analyse the data.

Discussion:

In the present study the mean diameter of parietal cells was 14.09 (SD± 0.91) µm in the age group of 7 to 14 years; 16.60 (SD± 0.91) µm in the age group of 15 to 22 years and 17.81 (SD± 1.52) µm in the age group of 23 to 64 years .The difference among the groups was statistically significant($p < 0.001$) This result was correlated with the study of Begum GN 2,13 that mean diameter of parietal cells was 14.44(SD± 1.58) µm in the age group of 2 to 16 years ; 16.87(SD±0.48) µm in the age group of 17 to 22 years and 17.67(SD± 1.28) µm in the age group of 23 to 65 years.

Conclusion:

In the present study, it was observed that a significant change of diameter of parietal cells with advancing age.

Conflict of Interest: We stated that there is no conflict of interest in this study.

Acknowledgement:

1. Deep respect to almighty GOD.
2. Very much grateful to Principle, Sylhet M A G Osmani Medical College .
3. Shows our respect to all unknown cadaver.
4. Thankful to Head of dept of Anatomy and Head of dept of Forensic Medicine. Sylhet MAG Osmani Medical College.

References:

1. Borley NR. Stomach and abdominal oesophagus. In: Standring S, Ellis H, Healy JC, Jonson D, Williams A, Collins P , et al. ,editors. Gray's anatomy :the anatomical basis of clinical practice.40th ed. Edinburg: Elsevier ChurcVeill Livingstone; 2008:1161-67.
2. Begum GN. Histo-morphological Study of Stomach. In: Bangladeshi People. M.Phil. Thesis. Dhaka University of

Dhaka;2006.

3. Datta A K. Essentials Of human anatomy :thorax and abdomen. Part-1, 6th ed. Kolkata:Current Books International. 2004;171.

4. Eroschenko VP , editor. Di Fiore's Atlas of Histology with Functional Correlations. 10th

ed. Philadelphia:Lipincott Willams and Wilkins; 2005.

5. Mescher AL. Junqueira's Basic histology. 10 th ed. New York: McGraw- Hill Company; 2003:300-02.

6. Naik SR , Bajaj SC , Goyal RK , Gupta DN , Chuttani HK. Parietal cell mass in healthy human stomach. Gastroenterology.1971 ;61(5):683-5.

- 7 Rabon, E., Cuppoletti, J., Malinowska, D., et al. Proton secretion by the gastric parietal cell. J. Exp. Biol. 1983; 106:119-133.

<https://doi.org/10.1242/jeb.106.1.119>

PMid:6317787

8. Ross MH , Pawlina W. Histology :a test and atlas .5th ed. Baltimore: Williams and Wilkins; 2005:444-53.

9. Sabiston DC, Jr, editors. The Biological basis of modern surgical practice. North Carolina:

WB saunders company;1991.

10. Schubert, M. "Regulation of gastric acid secretion," in. Physiology of the Gastrointestinal Tract. ed. J. R. Leonard, (Amsterdam: Elsevier Science & Technology); 2012.

11. Sachs, G. Physiology of the parietal cell and therapeutic implications. Pharmacotherapy. 2003; 23: 68s-73s.

<https://doi.org/10.1592/phco.23.13.68S.31931>

PMid:14587960

12. Sachs, G., Shin, J. M., Vagin, O., et al. The gastric H,K ATPase as a drug target: past, present, and future. J. Clin. Gastroenterol. 2007; 41(Suppl. 2), S226-S242.

<https://doi.org/10.1097/MCG.0b013e31803233b7>

PMid:17575528 PMCID:PMC286096

13. Shams-E-Tabriz. Histo-morphological Study of Stomach In Bangladeshi People.

M.Phil. Thesis. Dhaka University of Dhaka;2011.

Utilization Pattern of Analgesics in Orthopedic in-Patient Department at Tertiary Level Teaching Hospital in Dhaka

Shima Akter Khatun*¹, Sumaiya Ahmed², Mosaddek Hossain Mondal³,
Md. Rashel Bin Hossain⁴, Kartick Chanda Shaha⁵, Shusmita Saha⁶

Abstract

Introduction with Objective: The aim of this study was to evaluate the utilization pattern of analgesics in orthopedic in-patient department at tertiary level teaching hospital in Dhaka. **Materials and Methods:** An observational, cross-sectional study was carried out for 6 month from July 2018 to December 2018. Collected data were age, sex, number of the drugs, co-prescribed drugs along with analgesic during the study period. The patients details were recorded in a predegined data collection form and results were analyzed by SPSS Version (20.1). **Results:** Out of 200 patients, 123 were male and 77 were female. Out of 200 patients, most of the patients belonged to 41-50 years (30%). In this study, 55.5% of patients had received single analgesic. Ketorolac was the most commonly prescribed analgesic (43.49%). During hospitalization, majority of the patients have received parenteral preparation. Gastroprotective agents were frequently prescribed along with analgesics. **Conclusion:** The percentages of analgesics were found satisfactory. Regular educational interventions to improve prescribing practices among physicians at different levels may further promote rational prescribing.

Keywords: Analgesics, Orthopedic in-patient department.

Number of Tables: 04; Number of References: 14; Number of Correspondences: 04.

*1. Corresponding Author:

Dr. Shima Akter Khatun

Associate Professor(c.c.)

Department of Pharmacology

Dhaka National Medical College

Dhaka, Bangladesh.

2. Dr. Sumaiya Ahmed

Honorary Medical Officer

Dhaka Medical College and Hospital, Dhaka, Bangladesh.

3. Dr. Mosaddek Hossain Mondal

Lecturer

Department of Biochemistry

Dhaka National Medical College

Dhaka, Bangladesh.

Email: drmosaddekmondal@gmail.com

4. Md. Rashel Bin Hossain

Monitoring and Reporting Officer

Islamic Relief Bangladesh, Dhaka, Bangladesh.

5. Dr. Kartick Chanda Shaha

Associate Professor (c.c.)

Department of Pharmacology

Dhaka National Medical College

Dhaka, Bangladesh.

Email: kartick_shaha@yahoo.com

6. Dr. Shusmita Saha

Professor (c.c.)

Department of Pharmacology

Dhaka National Medical College

Dhaka, Bangladesh.

Introduction:

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage^{1,2}. Analgesics including nonsteroidal anti inflammatory drugs (NSAIDs) are commonly prescribed group of drugs in clinical practice for the management of pain and inflammation^{3,4}. NSAIDs are also most widely prescribed class of medications worldwide and commonly used over the counter⁵. These drugs have a wide range of adverse effects. Gastrointestinal toxicity is a major clinical limitation^{6,7}. Therefore, periodic evaluation of drug utilization patterns needs to be done to enable suitable modifications in the prescription of drugs to increase the therapeutic benefit and decrease the adverse effects. Prescribing pattern studies are conducted to monitor, evaluate and if necessary, suggest modifications in the prescribing behavior of medical practitioners to make medical care rational and cost effective⁸. Rational use of medicines (RUM) is an issue that has global importance, as it aims at evaluating the accessibility, availability, and correct prescribing of the drugs⁹. In developing countries like Bangladesh, where the financial resources are scarce and affordability of the patients is less, implementation of RUM becomes more important and therefore, the assessment of drug utilization is vital for clinical, economic, and educational purposes¹⁰. Drug utilization research studies conducted in the in patient settings are effective tools. Prescribing pattern of commonly used analgesics that help in evaluating drug prescribing trends, efficiency, and cost effectiveness of hospital formularies^{11,12}. Therefore, this study was conducted to observe and analyze the

prescribing pattern of analgesics at orthopedic in patient department of tertiary care hospital of Dhaka.

Material and Methods:

An observational, cross sectional study design was adopted for this study. The data was collected from July 2018 to December 2018 at orthopedic in patient department of Dhaka National Medical College Hospital. **Inclusion Criteria** were Patients who received analgesics in orthopedics ward during study period irrespective of age, sex, diagnosis, and treatment. **Exclusion Criteria** were Prescriptions of patients attending orthopedic OPD and those who were admitted in other in patient department.

Collection of Data: A total 200 patients were enrolled during the study. Demographic data comprised age, sex, and addresses were collected from bed head ticket information file. The clinical data were name of analgesics, route of administration, co prescribed drugs were recorded. These data were documented in a predesigned case record form. Analgesics prescribed by physicians of orthopedic department of this hospital were considered in this study.

Statistical Analysis: The data were analysed by SPSS Version (21.0 method).

Results:

Out of 200 patients, 126 were male and 74 were female.

Table I: Sex of the Study populations (n=200)

Sex	Number	Percentage
Male	126	63%
Female	74	37%

Out of 200 patients, most of the patients belonged to 41-50 years (30%)

Table II: Age of the Study population (n=200)

Years	Numbers	Percentage
20-30	40	20%
31-40	50	25%
41-50	60	30%
51-60	26	13%
61-70	24	12%

In our study, most common NSAIDs prescribed to the patients were ketorolac (54.7%) followed by naproxen (24.0%). Other NSAIDs were diclofenac (11.3%), aceclofenac (8.0%), ibuprofen (2.7%), paracetamol (1.3%).

Table III: Commonly used analgesics of the study population (n=200)

Commonly used analgesics	Frequency	percentage
Ketorolac	90	45%
Naproxen	60	30.0%
Diclofenac	25	12.5%
Aceclofenac	13	6.5%
Ibuprofen	7	3.5%
paracetamol	5	2.5%

Most of the patients were co-prescribed NSAIDs with gastroprotective agents (90%) followed by calcium (65%) and vitamins supplements (32.5%) (Table IV).

Table IV: Most common co-prescribed drugs along with NSAID

Co-prescribed drugs	frequency	percentage
Gastroprotective agent	180	90%
Calcium and Vit D	130	65%
Multivitamin	64	32%

Discussion:

The present study was performed on 200 (Two hundred) prescriptions of both sex from indoor patients of the orthopedic department of Dhaka National Medical College Hospital, Dhaka. Although most of studies have shown that more female patients use NSAIDs than male. However present study showed that more males patients (60%) are using NSAIDs than female patients (40%). out of 200 patients. Majority of patients using NSAIDs were between the ranges of 41-50years (30%), 31-40years (25%) and 21-30years (20%). It shows that NSAIDs are used mainly in middle age group. Similar results have been reported in study done by Niyaz Alam et al. (2013)¹³. In the present study the most common NSAIDs prescribed to the admitted patients were ketorolac (54.7%) followed by diclofenac (24.0%). Other NSAIDs naproxen, ketorolac and ibuprofen 2.7%, 8.0% and 9.3% respectively. In a study on orthopedic patients Gor and Saksen (2011) found that diclofenac (65%) was the highest prescribed drug, followed by nimesulide (10%), ibuprofen (6%), piroxicam (5%), etoricoxib (2%) and others (12%)¹⁰. Globally, NSAIDs are most commonly prescribed drugs for the management of pain and inflammation and the same has been reflected in this study. Despite the wide clinical use of NSAIDs, their gastrointestinal toxicity is the major limitation in clinical use. Hence, they are coprescribed with gastroprotective agents¹⁴. To manage NSAIDs associated GI adverse effects, a PPI, H2 antagonist or local acting antacids must be co-prescribed with NSAIDs. In the present study 90% of patients were co-prescribed with gastroprotective agents along with NSAIDs, out of which 48% were prescribed with proton pump inhibitors and 36% with H2 receptor antagonist. The other concurrently prescribed drugs include calcium (65%) and multivitamins (32%). Near to similar results were obtained in other studies.

Conclusion:

In this study, NSAIDs were more prevalently used in middle age group of male patients. The ketorolac and naproxen were most frequently prescribed drugs. The monotherapy with single NSAID was preferred mode of therapy via parenteral and oral therapy. NSAIDs are vital for clinical management of wide range of pain and inflammatory condition, but it is mostly accompanied by

gastrointestinal complications. In the present study, the gastro protective agents were widely prescribed for prevention and healing of NSAIDs associated ulcers or other GI complications. The study concluded that the prescription of NSAIDs was found to be rational. However to ensure safe, effective and well balanced therapeutic management of this NSAIDs, both patients and prescribers should be more sensitized regarding the appropriate dose, dosage regimen and overall indications. Education program, counseling program, utilization survey, alertness of community pharmacy regarding OTC drugs can be helpful to minimize harmful effect of the drug to patients.

Conflicts of Interest: None.

Acknowledgements:

The authors are grateful to the entire staff of Orthopedics department of the Dhaka National Medical College and Hospital for their cooperation and support during the study period

References:

1. Monfared H, Sferra JJ, Mekhail N. The medical management of chronic pain. *Foot Ankle Clin.* 2004; 9:373 40.
<https://doi.org/10.1016/j.fcl.2004.02.002>
2. Tabish A, Jha RK, Rathod AM, Rathod RM, Gupta KK. Prescribing trend of analgesics in a tertiary health care setup of rural Vidarbha. *Res J Pharm Biol Chem Sci.* 2012; 3:566 71.
3. Ravi Shankar P, Partha P, Nagesh S. Prescribing patterns in medical outpatients. *Int J Clin Pract.* 2002; 56:549 51.
<https://doi.org/10.1111/j.1742-1241.2002.tb11317.x>
4. Sharma T, Dutta S, Dhasmana DC. Prescribing pattern of NSAIDs in orthopaedic OPD of a tertiary care teaching hospital in Uttaranchal. *JK Sci.* 2006; 8:160 2.
5. Kumar A, Dalai CK, Ghosh AK, Ray M. Drug utilization study of co administration of nonsteroidal anti inflammatory drugs and gastroprotective agents in an orthopaedics outpatients department of a tertiary care hospital in West Bengal. *Int J Basic Clin Pharmacol.* 2013; 2:199 202.
<https://doi.org/10.5455/2319-2003.ijbcp20130315>
6. Graumlich JF. Preventing gastrointestinal complications of NSAIDs. Risk factors, recent advances, and latest strategies. *Postgrad Med.* 2001; 109:117 20, 123 8.
<https://doi.org/10.3810/pgm.2001.05.931>
7. Manohar VS, Vinay M, Jayasree T, Kishan PV, Ubedulla S, Dixit R. Prescribing pattern of gastroprotective agents with non steroidal anti inflammatory drugs. *J Pharmacol Pharmacother.* 2013; 4:59 60.
<https://doi.org/10.4103/0976-500X.107684>
8. Shankar PR, Pai R, Dubey AK, Upadhyay DK. Prescribing patterns in the orthopaedics outpatient department in a teaching hospital in Pokhara, Western Nepal. *Kathmandu Univ Med J (KUMJ).* 2007; 5:16 21.
9. Thawani V. Rational use of medicines: Achievements and challenges. *Indian J Pharmacol.* 2010; 42:63 4.
<https://doi.org/10.4103/0253-7613.64486>
10. Gor AP, Saksena M. Adverse Drug Reactions of NSAIDs in Orthopedic Patient. *J Pharmacol Pharmacother.* 2011; 2: 26-9.
<https://doi.org/10.4103/0976-500X.77104>
11. Kaur S, Rajagopalan S, Kaur N, Shafiq N, Bhalla A, Pandhi P, et al. Drug utilization study in medical emergency unit of a tertiary care hospital in North India. *Emerg Med Int.* 2014:973578.
<https://doi.org/10.1155/2014/973578>
12. WHO Collaborating Centre for Drug Statistics Methodology (Norway). Guidelines for ATC Classification and DDD Assignment. Oslo: WHO Collaborating Centre for Drug Statistics Methodology; 2002a.
13. WHO Collaborating Centre for Drug Statistics Methodology (Norway). ATC Index with DDDs. Oslo: WHO Collaborating Centre for Drug Statistics Methodology; 2002b.
14. Muraraiah S, Rajarathna K, Vishwanath M, Ramaswamy A, Kamath SD, Seshu S, et al. Evaluation of WHO prescribing indicators among orthopaedic in-patients at a tertiary care hospital. *J Chem Pharm Res.* 2014;6:278-80

Association of Renal Functional Status in Different Stages of Diabetic Retinopathy

Farah Diba Chowdhury^{*1}, Mirza Omar Beg², Nusrath Jahan Chowdhury³, Barsha Mojumder Papri⁴, Shukdeb Paul⁵

Abstract

Introduction: Diabetic nephropathy (DN) and diabetic retinopathy (DR) are both complications of diabetic microangiopathy with similar pathogenesis and clinical relevance. Many studies have demonstrated an association between diabetic retinopathy and diabetic nephropathy in type 1 diabetes mellitus (T1DM) patients, but this association is less strong in T2DM. There is link exists between different stages of diabetic retinopathy and diabetic nephropathy in T2DM. **Aims and Objective:** To explore the renal functional status in different stages of diabetic retinopathy. **Materials and Methods:** This cross sectional study was conducted in the Department of Biochemistry, Sylhet MAG Osmani Medical College, Sylhet, Bangladesh during the period from July 2019 to December 2020. Forty hospitalized type 2 DM with retinopathy were selected. Previously diagnosed case of nephropathy, history of prolong intake of NSAID'S, patient with any acute condition like fever, heart failure, pregnancy were excluded. Serum creatinine, fasting blood sugar, HbA1c, creatinine clearance rate and urinary total protein were measured. **Results:** The mean age of the patients was 53.66 ± 13.51 years in non- proliferative and 56.21 ± 10.02 years in proliferative diabetic retinopathy; difference was not significant ($p=0.538$). The mean duration of diabetes was significantly greater in proliferative diabetic retinopathy compared to non- proliferative diabetic retinopathy (7.23 ± 2.86 years versus 11.36 ± 4.70 years; $p=0.001$). Raised serum creatinine [11 (42.3%) versus 7 (50.0%); $p=0.641$], decreased creatinine clearance rate [22 (84.6%) versus 14 (100.0%); $p=0.278$] and raised urinary total protein [21 (80.8%); $p=1.000$] did not significantly between non-proliferative and proliferative diabetic retinopathy. **Conclusions:** The renal functional status such as raised serum creatinine, decreased creatinine clearance rate and raised urinary total protein non-significantly greater in proliferative than no-proliferative diabetic retinopathy.

Keywords: Diabetic retinopathy, no-proliferative diabetic retinopathy, proliferative diabetic retinopathy, renal function, chronic kidney disease.

Number of Tables: 02; Number of References: 31; Number of Correspondences: 04.

*1. Corresponding Author:

Dr. Farah Diba Chowdhury
Assistant Professor
Department of Biochemistry
Parkview Medical College
Sylhet, Bangladesh.
Email:chowdhuryfarahdiba@gmail.com
Mobile no:01711102110

2. Dr. Mirza Omar Beg

Junior Consultant
Department of Orthopaedic Surgery
Madhabpur Health Complex
Madhabpur, Habiganj, Bangladesh.

3. Dr. Nusrath Jahan Chowdhury

Associate Professor
Department of Physiology
Parkview Medical College
Sylhet, Bangladesh.

4. Dr. Barsha Mojumder Papri

Assistant Professor
Department Biochemistry
Parkview Medical College, Sylhet, Bangladesh.

5. Dr. Shukdeb Paul

Junior Consultant
Department Medicine
Upazilla Health Complex
Fenchuganj, Sylhet, Bangladesh.

Introduction:

Type 2 diabetes accounts for 90% of the total cases of diabetes making it one of the largest health care challenges facing many developed and developing countries¹. The associated morbidity and mortality can be caused by the disease itself or its complications. Severe and not uncommon complications include chronic kidney disease (CKD) and diabetic retinopathy (DR)². Diabetic retinopathy (DR), a disease of the retina, is the fifth primary reason for acquired sightlessness in the world³. Diabetic retinopathy is characterised by steady and progressive changes in the vasculature of the retina that results from chronic

hyperglycaemia⁴. Diabetic retinopathy is probably the most characteristic, easily identifiable and treatable complication of DM and it remains an important cause for visual loss in the developing world. Since type 2 diabetes mellitus remains undiagnosed for several years, a significant number of people, even in developed countries, already have retinopathy by the time their diabetes is diagnosed⁵. Retinopathy may begin to develop as early as 7 years before the diagnosis of diabetes in patients with type 2 diabetes⁶. The earliest pathologic changes associated with retinopathy are termed mild nonproliferative diabetic retinopathy. The first signs of mild nonproliferative diabetic retinopathy are microaneurysms, which arise most often in areas of capillary occlusion. Subsequently, increasing vascular permeability leads to retinal blot haemorrhages (round, with blurred edges) and “hard” exudates (sharply defined and yellow). Infarctions of the nerve fiber layer, known as soft exudates or cotton-wool spots, appear as white or gray, rounded swellings⁵. Moderate nonproliferative diabetic retinopathy is characterized by intraretinal microvascular abnormalities, including venous caliber changes, beading, and increased capillary dilation and permeability⁵. Proliferative diabetic retinopathy involves neovascularization, the growth of fine tufts of new blood vessels and fibrous tissue from the inner retinal surface or the optic head. Early proliferative changes are confined to the retina, but later invasion of the vitreous body constitutes high-risk proliferative diabetic retinopathy; during this end stage, fibrosis and contracture of the neovasculature result in retinal detachment and haemorrhage, the most important determinants of blindness⁷. Approximately 40% of people with diabetes develop diabetic nephropathy (DN), which has become the leading cause of end-stage renal disease (ESRD) in developed countries⁸. A close relationship has been observed between retinopathy and nephropathy in diabetes mellitus. The retina and the kidney complications of DM both result from damage to small vessels in these organs⁹. Since retinal and renal vessels are exposed to the diabetic mellitus, it is often assumed that progression of diabetic retinopathy and nephropathy occurs at the same time¹⁰. Proliferative diabetic retinopathy may be a highly specific indicator for diabetic nephropathy. Studies have shown that the presence of diabetic retinopathy (DR) itself may leave patients at risk for diabetic nephropathy (DN)^{9,11}.

Materials and Methods:

This cross-sectional study was conducted in Department of Biochemistry, Sylhet MAG Osmani Medical College during the period between July 2019 and June 2020. Forty diagnosed cases of diabetic retinopathy admitted in the Department of Medicine, Sylhet MAG Osmani Medical College Hospital fulfilled the inclusion criteria were enrolled. The clinical histories of the patients were noted. Each patient was examined thoroughly. All the findings, previous history, reports and investigations were analyzed. Detailed history and examination regarding exclusion criteria were also taken. Dilated retinal examination was performed using ophthalmoscope. Any form of diabetic retinopathy was

recorded. Diagnosis and staging of retinopathy were confirmed by consultant physician of the respective units of Department of Medicine. Patient was asked to stay overnight fast and in the next morning after a fasting period of 8 hours, 6 ml of venous blood was collected from ante-cubital vein by plastic disposable syringe under aseptic precaution and was transferred into separate plain glass tubes. Blood samples were kept in room temperature for one hour. After clot retraction centrifugation of the blood was done at a relative centrifugal force of 3000 rpm for 30 minutes. Afterward, serum was removed by disposable pasture pipettes and transferred into air tight tube. Patient was asked to place all his/her urine in a plastic jug for 1 day from 8:00 am to 8:00 am next morning, then researcher herself collected it to measure creatinine clearance rate and urinary total protein. All biochemical analysis of blood and urine samples were performed in the Department of Biochemistry, Sylhet MAG Osmani Medical College, Sylhet by researcher herself with technical assistance of department staff. Serum creatinine, fasting blood sugar, urinary total protein and creatinine clearance rate were measured by Automated Biochemistry Analyzer, Vitros 350 machine with calibration. **Statistical Analysis:** Collected data were checked and edited first. They were processed and analyzed with the help of Statistical Package for Social Science (SPSS) Version 25. Quantitative data were expressed as mean and standard deviation. Qualitative data were expressed as frequency and percentage. **Ethical Implications:** An approval of the study protocol was obtained from Ethical Review Committee of Sylhet MAG Osmani Medical College after commencement of the study. Informed written consent was taken from each patient after explaining all procedures.

Results:

The mean age of the patients was 53.66 ± 13.51 years in non-proliferative and 56.21 ± 10.02 years in proliferative diabetic retinopathy; difference was not significant ($p=0.538$) (Table-I).

The mean duration of diabetes was 7.23 ± 2.86 years in non-proliferative and 11.36 ± 4.70 years in proliferative diabetic retinopathy and duration of diabetes was significantly greater in proliferative diabetic retinopathy compared to non-proliferative diabetic retinopathy ($t=-3.460$ $p=0.001$) (Table- I). In the study serum creatinine was raised in 11 (42.3%) patients of non-proliferative diabetic retinopathy and 7 (50.0%) patients of proliferative diabetic retinopathy; difference was not significant ($p=0.641$) (Table- II).

Creatinine clearance rate was decreased in 22 (84.6%) patients of non-proliferative diabetic retinopathy and 14 (100.0%) patients of proliferative diabetic retinopathy; difference was not significant ($p=0.278$) (Table- II).

Urinary total protein was raised in 21 (80.8%) patients of non-proliferative diabetic retinopathy and 12 (85.7%) patients of proliferative diabetic retinopathy; difference was not significant ($p=1.000$) (Table- II).

Table- I Characteristics of the patients by stage of retinopathy (n = 40).

Characteristics of the patients	Non-proliferative (n=26)	Proliferative (n=14)	p-value
Age (years)	53.66 ± 13.51	56.21 ± 10.02	p=0.538*
Duration of DM (years)	7.23 ± 2.86	11.36 ± 4.70	p=0.01*

*Statistical analysis was done by Unpaired t test and †Fisher's Exact test. P<0.05 was considered as significant.

Table- II : Renal function status of the patients by stage of retinopathy

Biochemical parameters	Non-proliferative (n=26)	Proliferative (n=14)	p-value
Serum creatinine (mg/dl)			
Raised	11 (42.3%)	7 (50.0%)	*p=0.641
Normal	15 (57.7%)	7 (50.0%)	
Creatinine clearance rate (ml/min)			
Decrease	22 (84.6%)	14 (100.0%)	†p=0.278
Normal	4 (15.4%)	0 (0.0%)	
Urinary total protein (gm/day)			
Raised	21 (80.8%)	12 (85.7%)	†p=1.000
Normal	5 (19.2%)	2 (14.3%)	

*Chi-Square test and †Fisher's Exact test were applied to determine the level of significance. P<0.05 was considered as significant

Discussion:

Type 2 diabetes mellitus (DM) is a common chronic disease worldwide¹². The associated morbidity and mortality can be caused by the disease itself or its complications. Severe and not uncommon complications include chronic kidney disease (CKD) and diabetic retinopathy (DR). DR separately has been noted as a major public health problem worldwide as well^{13,14}. The associated problems include disability, increased healthcare costs, and socioeconomic burdens^{15, 16}. Currently, many studies have demonstrated an association between diabetic nephropathy and DR in T1DM patients, but this association is less strong in T2DM^{17,18}. Hence, currently the associations of renal function with DR and its severity in T2DM are inconclusive¹⁹. We found the age of the patients was 53.66 ± 13.51 years in non-proliferative diabetic retinopathy and 56.21 ± 10.02 years in proliferative diabetic retinopathy; difference was not significant (p=0.538). Cho et al.²⁰ found that the age of the patients was 60 ± 11 years in non-proliferative diabetic retinopathy and 57 ± 11 years in proliferative diabetic retinopathy; difference was significant (p=0.003). In our study the duration of diabetes was 7.23 ± 2.86 years in non-proliferative diabetic retinopathy and 11.36 ± 4.70 years in proliferative diabetic retinopathy; duration of diabetes was significantly greater in proliferative diabetic retinopathy compared to non-proliferative diabetic retinopathy (p=0.001). Park et al.²¹ found that the duration of diabetes was 11.9 ± 8.0 years in non-proliferative diabetic retinopathy and 12.0 ± 8.2 years in proliferative diabetic retinopathy; duration of diabetes was significantly greater in non-proliferative diabetic retinopathy compared to proliferative diabetic retinopathy (p<0.001). Cho et al.²⁰ found that the duration of diabetes was 12.2 ± 8.3 years in non-proliferative diabetic retinopathy and 11.9 ± 7.9 years in proliferative diabetic retinopathy; duration of diabetes was

significantly greater in non-proliferative diabetic retinopathy compared to proliferative diabetic retinopathy (p<0.001).

In this study serum creatinine was raised in 42.3% patients of non-proliferative diabetic retinopathy and 50.0% patients of proliferative diabetic retinopathy; difference was not significant (p=0.641). Park et al.²¹ found that serum creatinine increased in non-proliferative diabetic retinopathy than proliferative diabetic retinopathy. In our study creatinine clearance rate was decreased in 84.6% patients of non-proliferative diabetic retinopathy and 100.0% patients of proliferative diabetic retinopathy; difference was not significant (p=0.278). Park et al.²¹ found that deterioration of renal function in proliferative diabetic retinopathy than non-proliferative diabetic retinopathy measured by eGFR. Difference may be due to small sample size in the present study. It is well known that the association between diabetic retinopathy and CKD is strong and the presence of CKD almost always accompany diabetic retinopathy. A large amount of cross-sectional studies demonstrated that the presence of diabetic retinopathy is associated with concurrent renal dysfunction²²⁻²⁴. However, only a few studies have evaluated causal relationship between diabetic retinopathy and CKD. Trevisan et al.²⁵ demonstrated that the rate of renal function decline was larger with those who have retinopathy and proteinuria compared to those without retinopathy. Another study evaluated the effect of retinopathy upon renal outcome in elderly group and showed that retinopathy even affects faster renal function decline in non-DM subjects²⁶. There can be some possible explanation about why diabetic retinopathy severity affects renal function deterioration. Firstly, DR and diabetic CKD are both microvascular complication which lead to extravasation and inflammation. Previous study by Matsuyama et al.²⁷ suggested that pigment epithelium-derived factor, an inhibitor for angiogenesis, is significantly elevated in the type 2 DM patients with diabetic retinopathy and CKD, which may indicate microvascular damage. Another study by Yang et al.²⁸ also suggested that retinal damage marker found in urine proteome reflect renal progression in type 2 DM patients. However, other recent study by McKay et al.²⁹ showed that mere retinal microvascular parameters including vascular caliber, tortuosity, and fractal dimension cannot predict renal outcome in type 2 DM patients. Moriya et al.³⁰ suggested that microalbuminuria together with DR result in glomerulosclerosis and renal progression. In the present study urinary total protein was raised in 21 (80.8%) patients of non-proliferative diabetic retinopathy and 12 (85.7%) patients of proliferative diabetic retinopathy; difference was not significant (p=1.000). This was our observation but other studies did not analyse such correlation. Our results support the common pathogenetic mechanism of diabetic retinopathy and diabetic nephropathy in type 2 diabetic patients. The microvascular changes in both the retina and glomerulus are thought to be initiated by the chronic hyperglycemia, followed by the progressive narrowing and eventual occlusion of vascular lumina, subsequently leading to

inadequate perfusion of affected tissues. In the glomerulus, the widespread capillary occlusion and podocyte loss caused urinary protein loss and renal function decline. In the retina, this induces programmed cell death of Muller and ganglion cells, the losses of endothelial cells in capillaries, together with the losses of pericytes, and eventually leads to the development of retinal microvascular signs including microaneurysms, cotton-wool spots, hemorrhage, arteriovenous nicking, and focal and generalized narrowing³¹.

Conflict of Interest: None

Acknowledgement:

All praise to Allah who has given me the courage and opportunity to complete this thesis. I express my sincere respect and heartfelt gratitude to Dr. Manojit Majumder,

Associate Professor and Head, Department of Biochemistry, Sylhet MAG Osmani Medical College, Sylhet for approving the topic and for his valuable advice, proper guidance, constructive criticism and encouragement in completing my thesis work. I am also expressing my sincere gratitude to my co-guide Dr. Muhammed Ruhul kabir, Assistant Professor, Department of Medicine, Sylhet MAG Osmani Medical College, Sylhet for his valuable suggestions and proper advice in various aspects of this thesis.

References:

1. Langer J, Hunt B, Valentine WJ. Evaluating the Short-Term Cost-Effectiveness of Liraglutide Versus Sitagliptin in Patients with Type 2 Diabetes Failing Metformin Monotherapy in the United States. *J Manag Care Pharmacol*. 2013;19:237-46.
<https://doi.org/10.18553/jmcp.2013.19.3.237>
PMid:23537458 PMCID:PMC10438006
2. Kaewput W, Thongprayoon C, Rangsin R, Ruangkanchanasetr P, Mao MA, Cheungpasitporn W. Associations of renal function with diabetic retinopathy and visual impairment in type 2 diabetes: A multicenter nationwide cross-sectional study. *World J Nephrol*. 2019;8(2):33-43.
<https://doi.org/10.5527/wjn.v8.i2.33>
PMid:30815379 PMCID:PMC6388308
3. Madsen-Bouterse SA, Kowluru RA. Oxidative stress and diabetic retinopathy: pathophysiological mechanisms and treatment perspectives. *Rev Endocr Metab Disord*. 2008;4:315-27.
<https://doi.org/10.1007/s11154-008-9090-4>
PMid:18654858
4. Wu Y, Tang T, Chen B. Oxidative stress: implications for the development of diabetic retinopathy and antioxidant therapeutic perspectives. *Oxid Med Cell Longev*. 2014;2014:752387.
<https://doi.org/10.1155/2014/752387>
PMid:25180070 PMCID:PMC4142742
5. Bult AN, Shalchi Z, Hamoui K, Samadhan A, Powrie J, Smith S, et al. Circulating nucleic acids and diabetic complications. *Ann N Y Acad Sci*. 2006;1075:258-70.
<https://doi.org/10.1196/annals.1368.034>
PMid:17108219
6. Fong DS, Aiello LP, Ferris FL 3rd, Klein R. Diabetic retinopathy. *Diabetes Care*. 2004;27:2540-53.
<https://doi.org/10.2337/diacare.27.10.2540>
<https://doi.org/10.2337/diacare.27.2007.S84>
7. Inzucchi SE, Sherwin RS. Type 1 Diabetes Mellitus. In: Goldman L, Schafer IA, editors. *Goldman's Cecil Medicine*. 24th ed. Philadelphia: Elsevier Saunders. 2012; pp. 236.1-13.
<https://doi.org/10.1016/B978-1-4377-1604-7.00561-3>
8. KDOQI. KDOQI clinical practice guidelines and clinical practice recommendations for diabetes and chronic kidney disease. *Am J Kidney Dis*. 2007;49(2 Suppl 2):12-154.
<https://doi.org/10.1053/j.ajkd.2006.12.005>
9. El-Asrar AM, Al-Rubeaan KA, Al-Amro SA, Moharram OA, Kangave D. Retinopathy as a predictor of other diabetic complications. *Int Ophthalmol*. 2001;24:1-11.
<https://doi.org/10.1023/A:1014409829614>
PMid:11998880
10. Rouf RS, Ashrafuzzaman SM, Latif ZA. Association of retinopathy with chronic kidney disease in diabetes mellitus. *BIRDEM Med J*. 2018;8(3):210-4.
<https://doi.org/10.3329/birdem.v8i3.38123>
11. Rossing P, Hougaard P, Parving HH. Risk factors for development of incipient and overt diabetic nephropathy in type 1 diabetic patients: a 10-year prospective observational study. *Diabetes Care*. 2002;25:859-64.
<https://doi.org/10.2337/diacare.25.5.859>
PMid:11978681
12. Ogurtsova K, Da Rocha Fernandes JD, Huang Y, Linnenkamp U, Guariguata L, Cho NH, et al. IDF Diabetes Atlas: Global estimates for the prevalence of diabetes for 2015 and 2040. *Diabetes Res Clin Pract*. 2017;128:40-50.
<https://doi.org/10.1016/j.diabres.2017.03.024>
PMid:28437734
13. Yau JW, Rogers SL, Kawasaki R, Lamoureux EL, Kowalski JW, Bek T, et al. for Meta-Analysis for Eye Disease (META-EYE) Study Group. Global prevalence and major risk factors of diabetic retinopathy. *Diabetes Care*. 2012;35:556-64.
<https://doi.org/10.2337/dc11-1909>
PMid:22301125 PMCID:PMC3322721
14. Sivaprasad S, Gupta B, Crosby-Nwaobi R, Evans J. Prevalence of diabetic retinopathy in various ethnic groups: a worldwide perspective. *Surv Ophthalmol*. 2012;57:347-70.
<https://doi.org/10.1016/j.survophthal.2012.01.004>
PMid:22542913
15. Corriere M, Rooparinesingh N, Kalyani RR. Epidemiology of diabetes and diabetes complications in the

elderly: an emerging public health burden. *Curr Diab Rep.* 2013;13:805-13.

<https://doi.org/10.1007/s11892-013-0425-5>

PMid:24018732 PMCID:PMC3856245

16. Kapur A, Harries AD. The double burden of diabetes and tuberculosis - public health implications. *Diabetes Res Clin Pract.* 2013;101:10-9.

<https://doi.org/10.1016/j.diabres.2012.12.001>

PMid:23305899

17. Pedro RA, Ramon SA, Marc BB, Juan FB, Isabel MM. Prevalence and relationship between diabetic retinopathy and nephropathy, and its risk factors in the North-East of Spain, a population-based study. *Ophthalmic Epidemiol.* 2010;17:251-65.

<https://doi.org/10.3109/09286586.2010.498661>

PMid:20642348

18. Wolf G, Müller N, Mandecka A, Müller UA. Association of diabetic retinopathy and renal function in patients with types 1 and 2 diabetes mellitus. *Clin Nephrol.* 2007;68:81-6.

<https://doi.org/10.5414/CNP68081>

PMid:17722706

19. Man RE, Sasongko MB, Wang JJ, MacIsaac R, Wong TY, Sabanayagam C, et al. The Association of Estimated Glomerular Filtration Rate with Diabetic Retinopathy and Macular Edema. *Invest Ophthalmol Vis Sci.* 2015;56:4810-6.

<https://doi.org/10.1167/iovs.15-16987>

PMid:26218909

20. Cho A, Park HC, Lee Y-K, Shin YJ, Bae SH, Kim H. Progression of Diabetic Retinopathy and Declining Renal Function in Patients with Type 2 Diabetes. *J Diabetes Res.* 2020;2020:8784139.

<https://doi.org/10.1155/2020/8784139>

PMid:32802891 PMCID:PMC7403926

21. Park HC, Lee Y-K, Cho A, Han Ch, Noh J-W, Shin YJ, et al. Diabetic retinopathy is a prognostic factor for progression of chronic kidney disease in the patients with type 2 diabetes mellitus. *PLoS ONE.* 2019;14:e0220506.

<https://doi.org/10.1371/journal.pone.0220506>

PMid:31356653 PMCID:PMC6663021

22. Park YH, Shin JA, Han JH, Park YM, Yim HW. The association between chronic kidney disease and diabetic retinopathy: the Korea National Health and Nutrition Examination Survey. 2008-2010. *PLoS ONE* 2015;10:e0125338.

<https://doi.org/10.1371/journal.pone.0125338>

PMid:25849364 PMCID:PMC4388494

23. Grunwald JE, Alexander J, Ying GS, Maguire M, Daniel E, Whittock-Martin R, et al. Retinopathy and chronic kidney disease in the Chronic Renal Insufficiency Cohort (CRIC) study. *Arch Ophthalmol.* 2012;130:1136-44.

<https://doi.org/10.1001/archophthalmol.2012.1800>

PMid:22965589 PMCID:PMC3719171

24. Rodriguez-Poncelas A, Mundet-Tuduri X, Miravet-Jimenez S, Casellas A, Barrot-De la Puente JF, Franch-Nadal J, et al. Chronic Kidney Disease and Diabetic Retinopathy in Patients with Type 2 Diabetes. *PLoS ONE.* 2016;11:e0149448.

<https://doi.org/10.1371/journal.pone.0149448>

PMid:26886129 PMCID:PMC4757564

25. Trevisan R, Vedovato M, Mazzon C, Coracina A, Iori E, Tiengo A, et al. Concomitance of diabetic retinopathy and proteinuria accelerates the rate of decline of kidney function in type 2 diabetic patients. *Diabetes Care.* 2002;25:2026-31.

<https://doi.org/10.2337/diacare.25.11.2026>

PMid:12401751

26. Edwards MS, Wilson DB, Craven TE, Stafford J, Fried LF, Wong TY, et al. Associations between retinal microvascular abnormalities and declining renal function in the elderly population: the Cardiovascular Health Study. *Am J Kidney Dis.* 2005;46(2):214-24.

<https://doi.org/10.1053/j.ajkd.2005.05.005>

PMid:16112039

27. Matsuyama K, Ogata N, Matsuoka M, Shima C, Wada M, Jo N, et al. Relationship between pigment epithelium-derived factor (PEDF) and renal function in patients with diabetic retinopathy. *Mol Vis.* 2008;14:992-6.

28. Yang JK, Wang YY, Liu C, Shi TT, Lu J, Cao X, et al. Urine Proteome Specific for Eye Damage Can Predict Kidney Damage in Patients With Type 2 Diabetes: A Case-Control and a 5.3-Year Prospective Cohort Study. *Diabetes Care.* 2017;40:253-60.

<https://doi.org/10.2337/dc16-1529>

PMid:27903615

29. McKay GJ, Paterson EN, Maxwell AP, Cardwell CC, Wang R, Hogg S, et al. Retinal microvascular parameters are not associated with reduced renal function in a study of individuals with type 2 diabetes. *Sci Rep.* 2018;8:3931.

<https://doi.org/10.1038/s41598-018-22360-3>

PMid:29500396 PMCID:PMC5834527

30. Moriya T, Matsubara M, Kishihara E, Yoshida Y, Ouchi M. Type 2 diabetic patients with diabetic retinopathy and concomitant microalbuminuria showed typical diabetic glomerulosclerosis and progressive renal dysfunction. *J Diabetes Complications.* 2016;30:1111-6.

<https://doi.org/10.1016/j.jdiacomp.2016.04.007>

PMid:27138869

31. Zhang H, Wang J, Ying GS, Shen L, Zhang Z. Diabetic retinopathy and renal function in Chinese type 2 diabetic patients. *Int Urol Nephrol.* 2014;46:1375-81.

<https://doi.org/10.1007/s11255-014-0675-4>

PMid:24573395

Evaluation of the Outcome of Ilizarov External Fixator in Tibial Non-union

K M Badar Uddin ^{*1}, MD. Rukanuddawla Khan², Swarupananda Chakraborty³,
Asho Tosh Nath⁴, Sheikh Kawsar Mahmood⁵, Khandoker Muhammad Mazher⁶

Abstract

Introduction: Tibial non-union ranges from 2-10% of all tibia fractures. Infection, deformity, shortening, bone loss, joint stiffness and disability complicate the non-union. Ilizarov method addresses all the above problems simultaneously and offers a panacea for infected non-unions. This study was conducted to evaluate the impact on overall outcome of ilizarov external fixator in tibial non- union. **Materials and Methods:** This prospective study was carried out at the Department of Orthopedic Surgery at Chittagong Medical College Hospital, Chittagong from June 25, 2018 to June 24, 2019. Results were analyzed according to ASAMI scoring system at the end of study by using windows based computer software devised with SPSS-23. **Result:** Out of 12 cases, 11cases (91.7%) were male and only 1 case (8.3%) was female. Mean ($\pm$ SD) age was 27.58 ± 5.62 years. Excellent bony result was obtained in 16.7%, good in 50%, fair in 16.7% and poor in 16.7% of patients. Two (16.7%) patients had excellent, 4 (33.3%) patients had good, 3 (25%) patients had fair and 3 (25%) patient had poor functional outcome. **Conclusion:** Treatment of non-unions of Tibia with Ilizarov ring fixation is effective. However, larger randomized control trial is required to generate more valuable conclusion.

Keywords: Ilizarov external fixator, tibial non-union.

Number of Tables: 06; Number of References: 13; Number of Correspondences: 04.

*1. Corresponding Author:

Dr. K M Badar Uddin

MBBS, MS (Orthopedic Surgery)
Junior Consultant
Upazilla Health Complex
Chokoria, Cox's Bazar, Bangladesh.
Contact: 01817202928

2. Dr. Md Rukanuddawla Khan

MBBS MS, Resident
Department of Orthopaedic Surgery
Chittagong Medical College Hospital
Chittagong, Bangladesh.

3. Dr. Swarupananda Chakraborty

MBBS, MS (Orthopedics)
Junior Consultant
Upazilla Health Complex
Boalkhali, Chattogram, Bangladesh.

4. Dr. Asho Tosh Nath

MBBS, MS (Orthopaedic Surgery)
Medical Officer
Department of Orthopaedics and Traumatology
Chittagong Medical College Hospital
Chittagong, Bangladesh.

5. Dr. Sheikh Kawsar Mahmood

MBBS, MS(Orthopedic Surgery)
Assistant Registrar
Department of Spine Surgery
Chittagong Medical College Hospital
Chittagong, Bangladesh.

6. Dr. Khandoker Muhammad Mazher Ali

MBBS, MS(Orthopedic Surgery)
Medical Officer
Khagrachari Sadar Hospital
Khagrachari, Bangladesh.

Introduction:

The tibia is a weight bearing long bone, the anterior third of which is placed subcutaneously in the leg throughout most of its length, where it is covered only by skin and a thin layer of subcutaneous tissue, with no muscle cuff around¹. Tibia fractures are treated medically, and healthcare use depends on treatment options, which, in turn, vary by injury type and severity and the presence of complications². Fracture nonunion (sometimes referred to as “delayed union”) is a common complication of a tibia fracture; it indicates that fracture healing is not happening in a timely fashion³. Non-unions put additional burden on the patient because they prolong the disability and are associated with substantial pain⁴. Tibial non-unions are estimated to constitute 2-10% of all tibial fractures. The development of a tibial nonunion is related most often to the type and degree of injury, but several additional factors may predispose a patient to a tibial nonunion, such as the degree of fracture comminution and bone loss, whether the fracture is open, and the degree of soft-tissue injury. Subsequent complications, such as infection or compartment syndrome may play a role⁵. Various treatment methods are aimed at tibial non union like extensive debridement and local soft-tissue rotational flaps, packing the defect

with antibiotic impregnated beads. Papineau type open cancellous bone grafting, tibiofibular synostosis cancellous allograft in fibrin sealant mixed with antibiotics, and/or free microvascular soft-tissue and bone transplants. All these treatments have variable rates of success and failure, are limited in their ability to re-establish extremity length and correct deformity. The main surgical principle in the management of diaphyseal bone infection is thorough debridement of all nonviable tissue. The resulting potential shortening, instability or bone loss creates a formidable situation to overcome with standard grafting and stabilization techniques³. Application of the techniques of Ilizarov provides ability to correct deformities, eliminate prolonged pre and postoperative intravenous antibiotic therapy, regenerate new bone tissue without the use of bone grafts, progressively lengthen the extremity, and allow weight bearing during the treatment period⁶. The stability of the fixation and provision for bone transport allows bridging of bone defects, limb lengthening, early weight bearing ambulation and joint mobilization⁷.

Materials & Methods:

In this prospective clinical (hospital based longitudinal) study 12 cases of tibial non union were enrolled in the Department of orthopedics and traumatology of Chittagong Medical College Hospital (CMCH) from June 25, 2018 to June 24, 2019. All the patients were selected according to inclusion criteria, through counseling with patients and his/her relatives. Patients were managed with Ilizarov method. Data were collected by taking detailed history, clinical examination, investigations, operative details and postoperative outcome with predesigned data collection form. Results were analyzed according to ASAMI scoring system at the end of study by using windows based computer software devised with SPSS-23.

Radiological results according to ASAMI Group Grade Criteria

Grade	Criteria
Excellent	Union, no infection, Deformity < 7 deg, Limb length discrepancy < 2.5 cm
Good	Union + any two of the following; absence of infection, < 7 deg deformity and limb length discrepancy of 2.5 cm
Fair	Union + one of the following; Absence of infection, < 7 deg deformity and limb length discrepancy of 2.5 cm
Poor	Non-union/re-fracture/union + infection + deformity. 7 deg + limb length discrepancy 2.5 cm

Functional results according to ASAMI Group

Grade	Criteria
Excellent	Active, no limb, minimum stiffness (loss 15 degree knee extension/ 15 degrees dorsiflexion of ankle), no reflex sympathetic dystrophy (RSD), insignificant pain
Good	Active with one or two of the following limp, stiffness, RSD, significant pain
Fair	Active with three or all of the following limp, stiffness, RSD, significant pain
Poor	Inactive [unemployment or inability to return to daily activities due to injury]

Results:

In the present study, out of 12 cases, 8 (66.7%) were in <30 years age group. Mean ($\pm$ SD) age was 27.58 $\pm$ 5.62 years. Eleven cases (91.7%) in the study were male and only 1 case (8.3%) was female (Table I).

Table I: Age and sex distribution of the respondents. (n=12)

Age (years)	Number	percentage
<30 years	08	66.7%
$\geq$ 30 years	04	33.3%
Sex		
Male	11	91.7%
Female	01	8.3%

* Mean ($\pm$ SD) age was 27.58 $\pm$ 5.62 years. Age range was 18-38 years. Average duration of application of Ilizarov ring fixator in months was 7.67 ($\pm$ 1.30). In majority of the cases (n=8) external fixator held for a time period of 7-8 months. In 2 cases fixator was held for 6 months and in other 2 cases it was held for 10 months (Table III).

Table II: Duration of Ilizarov ring fixator application on responding patients (n=12)

Duration of Ilizarov ring fixator application	Number	Percentage
6 month	02	16.66 %
7 month	04	33.337 %
8 month	04	33.33%
10 month	02	16.66%

After ring removal deformity >7 degree, limb length discrepancy >2.5 cm, inactivity, limping, stiffness and significant pain was observed in 33.3%, 58.3%, 16.6%, 66.6%, 33.4% and 66.6% respectively. None of the patients had reflex sympathetic dystrophy.

Table III: Outcome after removal of the ring among respondents (n=12)

Parameter	Number	percentage
Deformity		
$\leq$ 7 degree	8	66.6%
>7 degree	4	33.3%
Limb length discrepancy		
$\leq$ 2.5 cm	5	41.6%
>2.5 cm	7	58.3%
Activity		
Active	10	83.33%
Inactive	2	16.66%
Limping		
Yes	8	66.6%
No	4	33.3%
Stiffness		
Yes	4	33.4%

Parameter	Number	percentage
No	8	66.6%
Pain		
Significant	8	66.6%
Insignificant	4	33.4%
Reflex sympathetic dystrophy		
Present	0	0%
Absent	12	100%

For bone results 4 criteria were evaluated: Union, deformity, infection, limb length discrepancy (ASAMI Group Grade Criteria). Out of 12 patient's excellent bony result was obtained in 16.7%, good in 50%, fair in 16.7% and poor in 16.7% of patients.

Grade	Number	Percentage
Excellent	02	16.7%
Good	06	50%
Fair	02	16.7%
Poor	02	16.7%

Table IV: Radiological findings of the responding patients at last follow-up (n=12)

Grade	Number	Percentage
Excellent	02	16.7%
Good	04	33.3%
Fair	03	25%
Poor	03	25%

The functional results were based on 5 criteria (ASAMI Group Grade Criteria). Based on these criteria 2 (16.7%) patients had excellent outcome, 4 (33.3%) patients had good outcome, 3 (25%) patients had fair outcome and 3 (25%) patient had poor outcome

Table V: last follow-up functional results of the responding patients (n=12)

Result	Number	Percentage
Satisfactory (Excellent, Good & fair)	09	75%
Unsatisfactory (Poor)	03	25%

Out of 12 patients 9 (75%) had satisfactory outcomes and rest of the 3 (25%) patients had unsatisfactory outcomes.

Table VI: Final outcome among the responding patients

Discussion:

In the present study, mean ($\pm$ SD) age of the 12 patients was 27.58 $\pm$ 5.62 years with a range of 18-38 years. Average age of the patients in the study of Madhusudhan et al. (2008) was 37.2 years with a range of 20 to 52 years⁸. Out of 12 patients, 11 were male and 1 was female, may be due to more outdoor activities of the males and hence making them more prone to trauma. This demographic characteristic were in agreement with Reddy et al. 2018; Sakale et al. 2018; Haque et al. 2013; Bansal et al. 2014 studies carried out in and around our Bangladesh^{9,10,11,7}. Average duration of application of Ilizarov ring fixator in months was 7.67, whereas Bansal et al. (2014) reported average of 5.51 months⁷. In majority of the cases, external fixator held for a time period of 7-8

months which is comparable to Meleppuram, et al. 2017; Sen et al. 2006 studies^{12, 13}. For bone results, 4 criteria were evaluated: Union, deformity, infection, limb length discrepancy (ASAMI Group Grade Criteria). Out of 12 patients, excellent bony result was obtained in 16.7%, good in 50%, fair in 16.7% and poor in 16.7% of patients. The corresponding values in another study (Reddy et al. 2018) were Excellent: 10 (66%), Good: 2 (13.2%), Fair: 1 (6.6%), Poor: 2 (13.2%)⁹. The functional results were based on 5 criteria (ASAMI Group Grade Criteria). Based on these criteria 2 (16.7%) patients had excellent outcome, 4 (33.3%) patients had good outcome, 3 (25%) patients had fair outcome and 3 (25%) patient had poor outcome. The corresponding values in another study (Reddy et al. 2018) were excellent: 9 (59.4%), good: 2 (14.76%), fair: 1 (6.6%), poor: 3 (19.8%)⁹. In this current study though bone results were better than functional results. It shows excellent bone does not guarantee good function outcome. The functional result is affected by the soft tissue and neurovascular structures. Moreover longer time is required for better functional outcome.

Conclusion:

This study suggested that treatment of non-unions of Tibia with Ilizarov fixation is effective achieving good radiological and functional results. However, our study lacks a direct comparison with any other treatment options, further randomized controlled trials are needed to draw more valuable information.

Conflict of Interest: None.

Acknowledgements:

The authors are grateful to the entire staff of department of Orthopaedic Surgery at Chittagong Medical College Hospital during the study period.

References:

1. Rockwood, C. A., Green, D. P., Bucholz, R. W. 'Rockwood and Green's fractures in adults Philadelphia. 6th ed. Lippincott Williams & Wilkins; 2006:Vol. 2.
2. Bhandari, M., Guyatt, G.H., Swiontkowski, M.F., et al. 'Treatment of open fractures of the shaft of the tibia'. J Bone Joint Surg Br. 2001;83(1): 62-68.
<https://doi.org/10.1302/0301-620X.83B1.0830062>
3. Minoo, P., McCarthy, J.J., Herzenberg, J. 'Tibial non-unions,' (Internet). Available from: <https://emedicine.medscape.com/article/1252306-overview>. Updated 2018.
4. Alt, V., Donell, S. T., Chhabra, A., et al. 'A health economic analysis of the use of rhBMP-2 in Gustilo-Anderson grade III open tibial fractures for the UK, Germany, and France,' Injury. 2009; 40(12): 1269-1275.
<https://doi.org/10.1016/j.injury.2009.02.007>
5. McQueen, M.M., Christie, J., Court-Brown, C.M. Acute compartment syndrome in tibial diaphyseal fractures. J Bone Joint Surg Br. 1996;78(1): 95-8.

<https://doi.org/10.1302/0301-620X.78B1.0780095>

6. Babhulkar, S., Pande, K., & Babhulkar, S. 'Nonunion of the Diaphysis of Long Bones,' Clinical Orthopaedics and Related Research. 2005; 431: 50-56.

<https://doi.org/10.1097/01.blo.0000152369.99312.c5>

7. Bansal A, Bansal S, Singh R, Walia JPS, Brar BS. 'Role of Ilizarov ring fixator in infected non union tibia'. IJMDS. 2014;3(2): 451-459.

<https://doi.org/10.19056/ijmdsjssmes/2014/v3i2/81286>

8. Madhusudhan, T. R., Ramesh, B., Manjunath, K., et al. Outcomes of Ilizarov ring fixation in recalcitrant infected tibial non-unions - a prospective study. Journal of Trauma Management and Outcomes. 2008; 2(1).

<https://doi.org/10.1186/1752-2897-2-6>

9. Reddy PD, Kumar KH. Analysis of results of nonunion tibial fractures Ilizarov external fixation. Int J Res Orthop. 2018;4:698-701.

<https://doi.org/10.18203/issn.2455-4510.IntJResOrthop20183371>

10. Sakale H, Agrawal AC, Kar B. Management of infected nonunion of tibia by Ilizarov technique. J Orthop Traumatol Rehabil. 2018;10:1-6.

https://doi.org/10.4103/jotr.jotr_21_18

11. Haque, M.A., Islam, S.M., Chowdhury, M.R. 'Management of Nonunion of Tibia by Ilizarov Technique'.CBMJ. 2013; 2(2): 41-45.

<https://doi.org/10.3329/cbmj.v2i2.16697>

12. Meleppuram, J. J., & Ibrahim, S. Experience in fixation of infected non-union tibia by Ilizarov technique - a retrospective study of 42 cases. Revista Brasileira de Ortopedia (English Edition). 2017; 52(6): 670-675.

<https://doi.org/10.1016/j.rboe.2016.11.008>

<https://doi.org/10.1016/j.rbo.2016.11.009>

13. Sen, C., Eralp, L., Gunes, T. An alternative method for the treatment of nonunion of the tibia with bone loss. J Bone Joint Surg Br. 2006; 88(6):783-9.

<https://doi.org/10.1302/0301-620X.88B6.17515>

Functional Outcome Measures in Acute Low Back Pain Patients in Follow up

Md. Masud Alam^{*1}, Md. Mostafijur Rahman², Kh. Mohammad Ali³, Md. Rakibul Hasan⁴,
Taposh Kumar Ghosh⁵, Md. Aminul Alam⁶, Md. Atikul Aziz⁷

Abstract

Introduction with Objective: To assess the functional outcome measures in acute low back patients in different follow up. **Materials and Methods:** This observational study was carried out at the Department of Physical Medicine and Rehabilitation, Dhaka Medical College Hospital (DMCH), Dhaka from November 2021 - May 2022. All patients of acute low back pain attending the Physical Medicine and Rehabilitation department, Dhaka Medical College Hospital during study period were the study population. Purposive sampling was done according to availability of the patients. All the data were compiled and sorted properly and the quantitative data was analyzed statistically by using Statistical Package for Social Science. **Result:** Mean age of study population was 33.72 ± 10.55 years with a majority of age group 16-45 years. Male predominance was found 57%. At 2 weeks, 6 weeks and 12 weeks 68.9% of the patient's had recovered. 52.2% of patient's noticed days off from their work initially due to low back pain and this figure reduced to 25.6%, 16.6% 8.9% at 2 weeks, 6 weeks and 12 weeks respectively. **Conclusion:** 31.1% of the patient's didn't recover from the presenting episode within 12 weeks.

Keywords: Functional outcome, Low back pain.

Number of Tables: 05; Number of References: 16; Number of Correspondences: 06.

*1. Corresponding Author:

Dr. Md Masud Alam

Senior Medical Physicist
Department of Physical Medicine and Rehabilitation
National Institute of Neurosciences and Hospital
Dhaka, Bangladesh.
Email: masudalam404@gmail.com
Mobile: 01717109927

2. Dr. Md. Mostafijur Rahman

Assistant Registrar
Physical Medicine and Rehabilitation Department
National Institute of Traumatology and Orthopedic
Rehabilitation (NITOR)
Dhaka, Bangladesh.

3. Dr. Kh. Mohammad Ali

Indoor Medical Officer
Department of Physical Medicine and Rehabilitation
Dhaka Medical College Hospital
Dhaka, Bangladesh.

4. Dr. Md. Rakibul Hasan

Indoor Medical Officer
Department of Physical Medicine and Rehabilitation
Dhaka Medical College Hospital
Dhaka, Bangladesh.

5. Dr. Taposh Kumar Ghosh

Indoor Medical Officer
Department of Physical Medicine and Rehabilitation
Dhaka Medical College Hospital, Dhaka, Bangladesh.

6. Dr. Md. Aminul Alam

Registrar
Department of Physical Medicine and Rehabilitation
National Institute of Traumatology and Orthopedics
Rehabilitation (NITOR)
Dhaka, Bangladesh.

7. Dr. Md. Atikul Aziz

Junior consultant
Dept. of Physical Medicine and Rehabilitation
National Institute of Neurosciences & Hospital
Dhaka, Bangladesh.

Introduction:

Low back pain is the most common reason that patients' seek physical therapy¹. It is estimated that 80%-90% of all people experiences at least one episode of back pain in their lifetime². Additionally it causes work losses, which in recent years have increased more rapidly than any other common form of incapacity³. The course of low back pain is extremely unpredictable—probably due to a large number of different and usually unknown underlying pathological processes⁴. It therefore seems unlikely that any particular treatment will show a major effect when applied indiscriminately to all low back pain patients. This is in accordance with recent studies in which various treatment regimes had proved to have little influence on the time to recovery in patients with low back pain⁵. Causes of acute low back pain (LBP) are due to back strain, acute disc herniation, osteoarthritis, spinal stenosis, spondylolisthesis, ankylosing spondylitis, infection and malignancy⁶. In

case of acute LBP 5-10% of cases become chronic⁷. The impact of surgery on the management of acute LBP is low⁸. For the majority of non surgical patients, activity modification, analgesics, muscle relaxant, education, spinal manipulation therapy and epidural injections are recommended to shorten recovery time and as symptomatic therapy⁹. There are many different scales to assess and measure pain intensity and disabilities resulting from low back pain. Among those, Numeric Rating Scale (NRS)¹⁰ and Roland Morris Disability Questionnaire (RMDQ) are two valid, reliable and widely used scales to assess pain intensity and disabilities or functional outcomes respectively. Roland and Morris¹¹ developed a 24-item back pain disability scale to serve as a primary outcome measure. RMDQ is a self administered disability measure in which greater levels of disability are reflected by higher numbers on a 24-point scale. It is among the most widely used measure of back related function¹² and has been proposed as part of an international instrument for standardized use¹³. Roland and Morris 65 classified patients with positive response to 14 or more of the 24 items as having an unfavorable outcome.

Materials & Methods:

This observational study was conducted at the Department of Physical Medicine and Rehabilitation in Dhaka Medical College Hospital, for a period of 6 months following the date of acceptance of research protocol. A total of 90 patients attending in outpatient ward of above mentioned department with acute low back pain <8 weeks were included as study population according to selection criteria. Following informed written consent, detailed history, physical examination and necessary investigations were performed. Data were collected by interview using a structured questionnaire. Collected data were analyzed by the SPSS 26.

Results:

The age range of the patients in this study was 16-60 years. The mean ($\pm$ SD) age of the patients was 33.72 ± 10.55 years. Among the total number of 90 patients, 78(86.7%) cases were of age group 16-45 years and 12(13.3%) cases were >45 years age group. Out of total 90 patients, male was predominant than female, which was 57(63.3%) cases and 33(36.7%) cases respectively (Table I).

Table I: Socio-Demographic Characteristics of the study subjects (n=90)

Parameter	Number	percentage
Age (years)		
16-45	78	86.7%
>45	12	13.3%
Sex		
Male	57	63.7%
Female	33	36.7%

Among the total 90 patients, maximum showed moderate pain intensity which was 50(55.6%) cases followed by severe and mild intensity which was 33(36.7%) and 7(7.8%) cases respectively. Out of 90 patients, 56(62.2%) cases belong to RMDQ <14 group and 34 (37.8%) cases belong to RMDQ $\geq$ 14 group. Out of 90 patients, 47(52.2%) cases were not working due to LBP and 43(47.8%) cases continue their work (Table II).

Table II: Baseline Characteristics of the study subjects (n=90)

Parameter	Number	percentage
Intensity of pain		
Mild	07	7.8%
Moderate	50	55.6%
Severe	33	36.7%
Disability (RMDQ)		
<14	56	62.2%
$\geq$ 14	34	37.8%
Working status		
Working	43	47.8%
Not working	47	52.2%

At 2 weeks, 6 weeks and 12 weeks, 46(51.1%), 57(63.3%) and 62(68.9%) cases became pain free. During enrollment, mild pain intensity was found in 7(7.8%) cases and this figure increased to 18(20%), 20(22.2%) & 20(22.2%) cases at 2 weeks, 6 weeks & 12 weeks respectively. Moderate pain was found in 50(55.6%) cases during enrollment and during follow up, it was found in 21(23.3%), 13(14.4%) & 8(8.9%) cases at 2 weeks, 6 weeks & 12 weeks respectively. Severe pain was found in 33(36.7%) cases at enrollment and this figure decreased to 5(5.6%) cases at 2 weeks and no pain was found at 6 weeks & 12 weeks (Table III).

Table III: Low back pain intensity at enrollment and at follow up (n=90)

Intensity	Enrollment No. (%)	Week 2 No. (%)	Week 6 No. (%)	Week 12 No. (%)
Absent	0	46 (51.1)	57 (63.3)	62 (68.8)
Mild	7 (7.8)	18 (20.0)	20 (22.2)	20 (22.2)
Moderate	50 (55.6)	21 (23.3)	13 (14.4)	8 (8.9)
Severe	33 (36.7)	5 (5.6)	0	0

RMDQ (Roland Morris Disability Questionnaire) = 0 (No Disability) At 2 weeks, 6 weeks and 12 weeks, 60(66.7%), 67(74.4%) and 72(80.0%) cases became disability free. During enrollment, RMDQ <14 was found in 56(62.2%) cases, which was decreased to 25(27.8%), 23(25.6%) and 18(20.0%) cases at 2 weeks, 6 weeks and 12 weeks respectively. RMDQ >14 was found in

34(37.8%) cases during enrollment, which was decreased to 5(5.6%) cases at 2 weeks and no disability was found at 6 weeks & 12 weeks. At enrollment, 47(52.2%) cases could not continue their work due to LBP and this figure decreased to 23(25.6%), 15(16.7%) and 8(8.9%) cases at 2 weeks, 6 weeks and 12 weeks respectively. 43(47.8%) cases did not stop their work at enrollment and this figure raised to 67(74.4%), 75(83.3%) and 82(91.1%) cases at 2 weeks, 6 weeks and 12 weeks respectively (Table IV).

Table IV: Disability at enrollment and at follow up (n=90)

Disability	Enrollment No. (%)	Week 2 No. (%)	Week 6 No. (%)	Week 12 No. (%)
RMDQ = 0	0	60 (66.7)	67 (74.4)	72 (80.0)
RMDQ<14	56 (62.2)	25 (27.8)	23 (25.6)	18 (20.0)
RMDQ 14	34 (37.8)	5 (5.6)	0	0
Not working	47 (52.2)	23 (25.6)	15 (16.7)	8 (8.9)
Working	43 (47.4)	67 (74.4)	75 (83.3)	82 (91.1)

Among the total 90 patients, most of the patients had recovered, which was 62 (68.9%) cases and 28 (31.1%) cases had not recovered (Table V).

Table V: Distribution of study population according to functional outcome (n=90)

Outcome	Frequency	Percentage
Recovered	62	68.9
Not recovered	28	31.1

Discussion:

Most of the patients in this study were in middle age group. The sample population showed, the mean ($\pm$ SD) age of the patients was 33.72 ± 10.55 years, which has more or less similarity with another study done in Bangladesh, where the mean ($\pm$ SD) age of the patients was 38.5 ± 9.01^{14} . Among the total 90 patients, 57 (63.3%) were male and 33 (36.7%) were female. Costeet al¹⁵ studied 103 patents, among them 60% were male. In this study, at 2 weeks, 6 weeks and 12 weeks; 51.1%, 63.3% and 68.9% of participants reported being pain free; 66.7%, 74.4% and 80% reported being disability free. Participants who could not continue their work due to LBP at enrollment was 52.2% and this figure reduced to 25.6%, 16.7% & 8.9% at 2 weeks, 6 weeks & 12 weeks respectively. Nicholas Henschke et al¹⁶ found that among 969 patients; at 6 weeks, 3 months and 12 months; 40%, 52% and 57% of patients reported being pain free; 60%, 71% and 75% reported being disability free respectively. The present study more or less correlates with the above international study. The slight discrepancy in the study may be due to small number of patients included in this study. The present study showed, 68.9% recovered completely by 12 weeks and 31.1% developed chronicity. Nicholas Henschke et al¹⁶ found, 57% recovered completely by 3 months and one third of patients did not recovered within 1 year. In this study, we found, recovery was rapid. Costeet al¹⁵ enrolled 103 patients from French

primary care and found recovery was rapid. The present study more or less correlates with the above international study.

Conclusion:

In this study, most of the patients had recovered from acute low back pain and recovery was rapid.

Conflict of Interest: None.

Acknowledgements:

The authors are grateful to the entire staff of department of Physical Medicine and Rehabilitation at Dhaka Medical College Hospital, Dhaka during the study period.

References:

1. Frymoyer JW. Back pain and sciatica. *N Engl J Med*. 1988; 318: 291-300.
<https://doi.org/10.1056/NEJM198802043180506>
PMid:2961994
2. Milhous RL, Hough LD, Frymoyer JW, Ruess JM, Gallagher RM, Wilder DG, et al.
Determinants of vocational disability in patients with low back pain. *Arch Phys Med Rehabil*. 1989; 70: 589-98.
3. Maniadakes N, Gray A. The economic burden of low back pain in the UK. *Pain*. 2000; 84: 95-103.
[https://doi.org/10.1016/S0304-3959\(99\)00187-6](https://doi.org/10.1016/S0304-3959(99)00187-6)
PMid:10601677
4. Roland M, Morris R. A study of the natural history of low-back pain. *Spine*. 1983; 8: 1145-1550.
<https://doi.org/10.1097/00007632-198303000-00004>
<https://doi.org/10.1097/00007632-198303000-00005>
PMid:6222487
5. Devo RA, Deihl AK, Rosenthal M. How many days of bed rest for acute low back pain? *N Engl J Med*. 1986; 315:1064-1070.
<https://doi.org/10.1056/NEJM198610233151705>
PMid:2945109
6. Patel T, Abna A. Diagnosis and Management of acute low back pain. *American Academy*. 2000; 39:2-13.
7. Lahad A, Matter AD, Berg AO, Deyo RA. The effectiveness of four interventions for the prevention of low back pain. *JAMA*. 1994; 272: 1286-1291.
<https://doi.org/10.1001/jama.272.16.1286>
PMid:7933374
8. Spitzer WO. Scientific approach to the assessment and management of activity-related spinal disorders. A monograph for clinicians. Report of the Quebec Task Force on Spinal Disorders. *Spine*. 1987; 12(suppl 1): S1-S59.
<https://doi.org/10.1097/00007632-198709001-00001>
9. Bigos S. Acute low back problems in adults: assessment and treatment. Agency for Health Care Policy and

Research. Clin Pract Guide Quick Ref Guide Clin. 1994; 1: 1-25.

10. Dionne CE, Von Kroff M, Koepsell TD, Deyo RA, Barlow WE, Checkoway H. Formal education and back pain : a review. *J Epidemiol Community Health*. 2001 Jul; 55(7): 455-68.

<https://doi.org/10.1136/jech.55.7.455>

PMid:11413174 PMCID:PMC1731944

11. Roland M, Morris R. A study of the natural history of back pain. Part 1: Development of a reliable and sensitive measure of disability in low-back pain. *Spine*. 1983; 8: 141-44.

<https://doi.org/10.1097/00007632-198303000-00004>

PMid:6222486

12. Keely P. Psychosocial predictors of health related quality of life and GP consultation in people with CLBP. *J Psychosom Res*. 2004; 56: 612.

<https://doi.org/10.1016/j.jpsychores.2004.04.168>

13. Deyo RA, Battie M, Beurskens AJHM, Bombardier C, Croft P, Koes B, et al. Outcome measures for low back pain research: A proposal for standardized use. *Spine*.

1998; 23: 2003-2013.

<https://doi.org/10.1097/00007632-199809150-00018>

PMid:9779535

14. Ahmed B, Alom S, Rahid I, Rahman N, Rahman A, Uddin T, et al. Effect of TENS on patients with acute low back pain. *JAFMC Bangladesh*. 2007; 7(2): 29-31.

<https://doi.org/10.3329/jafmc.v7i2.10393>

15. Coste J, Delecoevillerie G, Cohen de Lara A, Le Parc JM, Paolaggi JB. Clinical course and prognostic factors in acute low back pain: an inception cohort study in primary care practice. *BMJ*. 1994; 308:577-80.

<https://doi.org/10.1136/bmj.308.6928.577>

PMid:8148683 PMCID:PMC2539597

16. Nicholas Henschke, Christopher G Maher, Kathryn M Refshauge, Robert G Herbert, Robert G Gunning, Jane Bleasel, et al. Prognosis in patients with recent onset low back pain in Australian primary care: inception cohort study. *BMJ*. 2008; 337: a171.

<https://doi.org/10.1136/bmj.a171>

PMid:18614473 PMCID:PMC2483884

Dietary Adherence and Glycemic Status among Type 2 Diabetes Patients in Rural Areas

Md. Ali Ajim¹, Mst. Lutfun Nahar Juty², Faisal Ahmed³, Jannat Ara⁴, Wahida Yasmeen⁵,
Mohammad Nurunnabi^{*6}

Abstract

Introduction: The prevalence of diabetes is rising sharply in rural areas, largely due to changes in lifestyle and dietary habits. Enhancing quality of life and preventing acute metabolic disorders as well as long-term effects by reducing premature morbidity and mortality is the core target of therapy for individuals with type 2 diabetes mellitus (T2DM). **Aims and Objectives:** To assess the level of adherence to dietary recommendations (DRs) among T2DM patients in rural areas and the glycemic status among them. **Materials and Methods:** This cross-sectional study was conducted among 228 purposively selected, diagnosed T2DM patients who attended the outpatient department of the Pirojpur Diabetic Association in Barisal from January to December 2023. Face-to-face interviews were used to collect data using a pretested, semi-structured questionnaire. **Results:** The study participants were adult patients with T2DM, with a mean age of 54.7 ± 11.7 years. The mean duration of diabetes was 7.5 ± 6.4 years. The study revealed that only 30.7% of participants had good adherence to DRs, while the majority (69.3%) had poor adherence. Furthermore, 35.5% of participants had good glycemic control, whereas 64.5% had poor glycemic status. **Conclusion:** Poor adherence contributes to poor glycemic control. Therefore, it is crucial to implement effective measures to improve adherence to DRs and enhance glycemic management. These steps will ultimately help prevent diabetic complications and reduce diabetes-related costs for rural residents.

Keywords: Dietary recommendations, glycemic status, type 2 diabetes mellitus, Bangladesh.

Number of Tables: 05; Number of References: 25; Number of Correspondences: 06.

1. Dr. Md. Ali Ajim, MBBS, MPH

Medical Officer
Public Health and Administration
Directorate General of Health Services (DGHS)
Dhaka 1212, Bangladesh.
Orcid : <https://orcid.org/0009-0006-8829-5422>

2. Dr. Mst. Lutfun Nahar Juty, MBBS

Medical Officer
Department of Radiology
Sir Salimullah Medical College Hospital
Dhaka 1000, Bangladesh.
Orcid : <https://orcid.org/0009-0009-6715-5078>

3. Dr. Faisal Ahmed, MBBS, MPH

Deputy Civil Surgeon
Public Health and Administration
Civil Surgeon's Office
Netrokona 2400, Bangladesh.
Orcid : <https://orcid.org/0009-0002-8780-5196>

4. Dr. Jannat Ara, MBBS

Assistant Registrar
Department of Pediatrics Hematology and Oncology
Mymensingh Medical College Hospital
Mymensingh 2200, Bangladesh.
Orcid : <https://orcid.org/0009-0006-3177-6583>

5. Dr. Wahida Yasmeen, BDS, MPH

Assistant Professor
Department of Dental Public Health
Rangpur Community Dental College
Rangpur 5400, Bangladesh.
Orcid : <https://orcid.org/0009-0005-3129-232X>

*6. Corresponding Author:

Dr. Mohammad Nurunnabi, MBBS, MPH
Assistant Professor
Department of Community Medicine and Public Health
Sylhet Women's Medical College
Sylhet 3100, Bangladesh.
Mobile : +880 1717870559
Email : nur.somch@gmail.com
Orcid : <https://orcid.org/0000-0001-9472-9369>

Introduction:

Diabetes Mellitus (DM) is a prevalent non-communicable disease that continues to pose an existential threat to global health¹. Type 2 diabetes (T2DM), the most prevalent kind of diabetes, develops when the body's capacity to use insulin is reduced, which is generally caused by a combination of genetic and lifestyle factors. Typically developing in adulthood, the incidence of T2DM has surged in recent years,

largely driven by sedentary lifestyles, poor dietary habits, and increasing obesity rates^{2,3}. According to the International Diabetes Federation (IDF Diabetes Atlas, 10th edition, 2021), approximately 537 million adults (ages 20-79) are living with diabetes- about 1 in 10 people. This number is projected to rise to 643 million by 2030 and 783 million by 2045. Diabetes-related deaths increased from 4.6 million in 2011 to 6.7 million in 2021. In Bangladesh, the prevalence of diabetes among adults is rising at an alarming rate. According to the IDF, around 13.2 million adults were living with diabetes in 2021, up from just 1.75 million in 2000. The adult diabetes prevalence in Bangladesh was about 14.2% in 2021. Diabetes-related deaths among adults (20-79 years) amount to approximately 76,000 annually, with 4.2% of these deaths occurring in people under 60 years⁴. The primary goals of diabetes treatment are to prevent or delay complications and improve quality of life. Key components of diabetes management include a healthy eating pattern, regular physical activity, and, in many cases, pharmacotherapy⁵. For individuals with T2DM, following appropriate dietary DRs is a critical aspect of management and is often considered the first line of treatment. An ideal diet involves consuming fewer carbohydrates and fats, more fiber, less sodium, and foods with health-promoting properties such as fish, soy products, fruits, and vegetables⁶. Medical Nutrition Therapy (MNT), has been shown to reduce HbA1c levels by 1.0–1.9% in individuals with type 1 diabetes and by 0.3–2.0% in those with T2DM. MNT or DRs have implications for promoting healthful eating patterns, emphasizing nutrient-dense foods in appropriate portions to improve overall health, achieve and maintain body weight goals, meet individualized glycemic, blood pressure, and lipid targets, and eventually delay or prevent diabetes complications^{5,7}. This study aimed to explore the association between dietary adherence and glycaemic status among rural diabetes patients in Bangladesh. The findings will assist clinicians in providing more tailored dietary advice and highlight the significance of developing structured food guidelines for diabetes patients in the country.

Materials and Methods:

A descriptive cross-sectional study was conducted to evaluate the level of adherence to dietary recommendations and the glycemic status of type 2 diabetes patients in rural areas. The study was directed among 228 outpatients who attended the Pirojpur Diabetic Association in Pirojpur, Barisal, Bangladesh. The study population comprised adult males and females aged 18 and older who were diagnosed with type 2 diabetes mellitus (T2DM) and resided outside the municipal areas. Patients with gestational diabetes mellitus (GDM) were excluded from the study. The study participants were conveniently interviewed using a pretested semi-structured questionnaire through face-to-face interactions from January to December 2023. The questionnaire included questions regarding socio-demographic characteristics, factors associated with

dietary adherence, and glycemic status. To assess adherence to DRs, the "Perceived Dietary Adherence Questionnaire" (PDAQ) was employed. After the completion of data collection, the data were checked and verified for any omission, error, or irrelevance. Data were coded, entered, and analyzed in IBM SPSS v25. Descriptive statistics such as mean, standard deviation, and percent were computed for the continuous variables of the participants. Chi-square and logistic regression test was used, and a p-value of <0.05 at a 95% confidence interval was taken as significant. The results were presented in tables.

Ethical approval

Participants were thoroughly informed about the study and encouraged to take part. Informed written consent was obtained from each participant. Ethical approval was granted by the Institutional Review Board (IRB) of the National Institute of Preventive and Social Medicine (NIPSOM) in Dhaka 1212, Bangladesh (NIPSOM/IRB/2023/06).

Results:

Table I presents the socio-demographic characteristics of the respondents. Among the 228 participants, the majorities were female (57.9%), while males accounted for 42.1%. The mean age of the participants was 54.7 (± 11.7) years, with an age range of 28 to 85 years. Most participants (43.9%) fell within the age group of 41-60 years. Regarding education, 43.4% of the respondents had completed primary education. In this study, more than half of the respondents (56.1%) were housewives, and 16.2% were engaged in business. The mean monthly family income was 17,000.6 ($\pm 9,000.1$) BDT, with over half of the respondents (54.8%) earning between 10,001 and 20,000 BDT per month. Nutritional status was assessed by calculating BMI, categorized according to the Asian BMI classification. Only 36.4% had a normal BMI, while a notable 33.3% were classified as obese. Table II shows the disease and individual diet-related characteristics of the participants. The mean duration of diabetes among respondents was 7.5 (± 6.4) years. Among the 228 individuals, 52.6% had diabetes for >5 years, while 47.4% had diabetes for ≤ 5 years. Most participants (68.2%) were on oral medication for their diabetes, 4.4% did not take any medication, only 1.8% individuals were on insulin, and approximately one-fourth (25.4%) used both oral agents and insulin. The majority (61.8%) of respondents reported no family history of diabetes among their parents or siblings, while the remaining participants had a family history of the condition. Among the participants, 49.1% had one or more comorbidities. More than half (54.8%) engaged in regular physical exercise. However, over two-thirds (69.7%) of the participants reported that they could not afford the cost of the recommended diet. Additionally, 48.2% expressed a preference for sugar-sweetened beverages. Approximately three-fourths

(72.8%) of respondents reported having self-control over their diet. In this study, only 30.7% revealed good dietary adherence, while the majority (69.3%) exhibited poor adherence to DRs. Table III presents the association between dietary adherence and perceived factors. The regression analysis revealed a statistically significant association between absence of self-control over diet and poor dietary adherence ($p=0.007$). Furthermore, participants who reported spending too much time preparing the recommended diet and those facing challenges adhering to DRs during social or work events were also significantly associated with poor dietary adherence ($p<0.05$). Table IV depicts the association between dietary adherence and glycemic status. There was a significant association ($p<0.001$) between dietary adherence and glycemic status, indicating that those with good adherence were more likely to obtain good glycemic status. Table V shows the results of a logistic regression analysis that evaluated the effects of gender, physical activity, dietary adherence, difficulties adherence to the recommended diet during social or work events, self-control over food, and a preference for sweetened beverages on glycemic status. Poor dietary adherence was significantly associated with poor glycemic status ($p<0.001$). Gender and self-control over eating were substantially related to glycemic status ($p<0.05$).

Table I: Socio-demographic characteristics (n=228)

Characteristics	Frequency (n)	Percentage (%)
Gender		
Male	96	42.1
Female	132	57.9
Age groups (in years)		
18-40	32	14.0
41-60	124	54.4
>60	72	31.6
Mean±SD		54.7±11.7
Level of education		
Primary	99	43.4
Secondary	87	38.2
Higher Secondary	23	10.1
Graduation	15	6.6
Post-graduation	4	1.8
Occupation		
Housewife	128	56.1
Business	37	16.2
Service holder	28	12.3
Retired	18	7.9
Others	17	7.5
Average monthly family income (BDT)		
≤10,000	52	22.8
10,001-20,000	125	54.8
20,001-30,000	39	17.1
>30,000	12	5.3
Mean±SD		17,000.6±9,000.1
Nutritional status (in BMI)		
Underweight	14	6.1
Normal range	83	36.4
Overweight	55	24.1
Obese I	68	29.8
Obese II	8	3.5

Table II: Disease and diet related information (n=228)

Traits	Frequency (n)	Percentage (%)
Duration of DM		
≤5 years	108	47.4
>5 years	120	52.6
Mean±SD		7.5±6.4
Type of treatment respondent follows		
No drug	10	4.4
Oral hypoglycemic agent	156	68.4
Insulin	4	1.8
(OHA + Insulin)	58	25.4
Family history of DM		
Yes	87	38.2
No	141	61.8
Comorbidity		
Present	112	49.1
Absent	116	50.9
Regular physical exercise		
Yes	125	54.8
No	103	45.2
Cost for recommended diet		
Affordable	69	30.3
Not affordable	159	69.7
Sugar-sweetened beverage preference		
Preference	110	48.2
No preference	118	51.8
Self-control on diet		
Have	166	72.8
Don't have	62	27.2
Adherence to dietary recommendations		
Good adherence	70	30.7
Poor adherence	158	69.3

Table III: Factors associated with dietary adherence (n=228)

Factors	Reference category	Adjusted Odds Ratio (AOR)	95% CI	p-value
Takes too long time (Yes)	No	2.070	1.036-4.137	*0.039
Face problem adhering to diet during social or work events (Yes)	No	2.391	1.164-4.912	*0.018
Have self-control (No)	Yes	4.199	1.468-12.015	*0.007
Prefer sweetened beverage (Yes)	No	1.732	0.877-3.421	0.114
Problem to remember recommended diet (Yes)	No	1.401	0.617-3.180	0.420

*Statistically significant value

Table IV: Association of dietary adherence with glycemic status (n=228)

Dietary adherence	Glycemic status		Test of significance	p-value
	Poor n(%)	Good n(%)	Total n(%)	
Poor	125(79.1)	33(20.9)	158(100)	$\chi^2 = 48.157$ *0.001
Good	22(31.4)	48(68.6)	70(100)	

*Statistically significant value

Table V: Summary of logistic regression model to see associated factors of glycemic status (n=228)

Factors	Reference category	AOR	95% CI	p-value
Gender (Female)	Male	2.055	1.041-4.058	*0.038
Physical exercise (No)	Yes	1.845	0.941-3.615	0.074
Dietary adherence (Poor)	Good	5.845	2.847-12.001	*0.001
Face difficulty adhering to diet during social or work events (Yes)	No	0.859	0.398-1.857	0.700
Have self-control (No)	Yes	6.149	1.932-19.568	*0.002
Prefer sugar-sweetened beverage (Yes)	No	1.551	0.759-3.172	0.229

*Statistically significant value

Discussion:

The study found that only 30.7% of participants adhered well to DRs, indicating that the majority (69.3%) had poor adherence. These findings are consistent with various studies conducted in different countries. For example, a study in India using the PDAQ tool reported a good adherence rate of 28%.⁸ In Ethiopia, another study found that 33.5% of participants had good dietary adherence.⁹ However, some studies reported lower adherence rates; a study in Oman indicated good adherence at 25.7%, while a study in Nepal showed only 15.7% of participants adhered well to DRs.^{10,11} These disparities may arise from differences in settings, socio-demographic characteristics, and dietary habits among the study populations. No similar studies have been conducted in Bangladesh using the PDAQ to assess dietary adherence. However, one study that utilized a three-point scale to evaluate non-adherence found a non-adherence rate of 88%.¹² Another Bangladeshi study identified a significant association ($p<0.001$) between the time taken to prepare the recommended diet and dietary adherence.¹³ It also found a significant association ($p<0.001$) between difficulties in adhering to DRs and overall dietary adherence, with those facing challenges prone to have poor adherence. In fact, a separate study reported that 91% of respondents encountered difficulties adhering to their recommended diets.⁸ In the current study, more than two-thirds (69.7%) of participants reported that they could not afford the recommended diet, which significantly contributed to non-adherence. A study in India found that approximately 76% of participants faced similar financial constraints regarding the cost of the recommended diet.⁸ For instance, a study in Bangladesh identified cost as a primary barrier to accessing medication.¹³ It was revealed that participants who could afford the recommended diet were nearly three times more likely to adhere to it compared to those who could not.^{10,14} In this study, only 35.5% of participants achieved good glycemic status, while 64.5% had poor glycemic control. These findings are consistent with other research in the field. Poor glycemic control has been reported in various studies, including 59.5% in West Ethiopia, 65% in India, 65.4% in Nepal, 60.5% in Ethiopia, 80.5% in Palestine, and 55% in Niger.¹⁶⁻²¹ A study in Bangladesh indicated that 81.2% of patients had poor glycemic control based on HbA1c levels²², while another study in Bangladesh reported poor glycemic control in 69% of patients.²³ The discrepancy

between the current study and these other studies may be attributed to the statistic that the aforementioned studies utilized the HbA1c test, which is the recommended gold standard for assessing glycemic control, whereas this study assessed glycemic status using fasting blood sugar (FBS) levels. Dietary adherence and glycemic status were shown to be significantly associated ($p<0.001$), revealing that individuals who adhered to their diets well had a higher probability of reaching optimal glycemic levels. Conversely, individuals who did not follow the recommended diet closely had a 5.8-fold increased risk of having low glycemic status. This result is consistent with earlier studies that have demonstrated a strong association between poor glycemic management and low self-care behavior compliance.²⁴ Furthermore, a related study revealed a positive association between reduced HbA1c values and following the diabetic dietary guidelines as evaluated by the PDAQ.²⁵

Conclusion:

Based on the results of the study, it can be concluded that the majority of participants from rural areas had poor adherence to DRs. The main factors significantly associated with dietary adherence included the time taken to prepare the recommended diet, challenges encountered during social or professional events, self-control over food, preference for sweetened beverages, and challenges in remembering the recommended diet. It is essential to develop simplified and practical dietary guidelines that are easy for individuals in rural areas to follow. Furthermore, policies should be established to promote access to diabetes education and counseling in this region.

Conflict of Interest: None.

Acknowledgments:

The authors are thankful to all the participants and hospital authorities for their heartfelt cooperation.

References:

1. Global Health Estimates [Internet]. World Health Organization (WHO): 2022. Available from: <https://www.who.int/data/global-health-estimates> (Retrieved on October 23, 2023)
2. Lotfy M, Adeghate J, Kalasz H, Singh J, Adeghate E. Chronic complications of diabetes mellitus: a mini review. *Current diabetes reviews*. 2017;13(1):3-10. <https://doi.org/10.2174/1573399812666151016101622> PMID:26472574
3. Shaanta IJ, Nurunnabi M, Biswas N, Nahar A, Tarafdar MA, Hossain A. Factors associated with Gestational Diabetes Mellitus: A Hospital based Cross-sectional Study in Dhaka. *Z H Sikder Women's Medical College Journal*. 2023;5(2):30-33. <https://doi.org/10.47648/zhswwmcj.2023.v0502.05>
4. International Diabetes Federation. IDF Diabetes Atlas 10th edition 2021 [Internet]. IDF Diabetes Atlas. 2021. Available from: <https://diabetesatlas.org> (Retrieved on

October 23, 2023)

5. American Diabetes Association. American Diabetes Association Standards of medical care in diabetes-2017. *Diabetes care*. 2017;40:S1.

<https://doi.org/10.2337/dci17-0007>

6. Khan AR, Lateef ZN, Al Aithan MA, Bu-Khamseen MA, Al Ibrahim I, Khan SA. Factors contributing to non-compliance among diabetics attending primary health centers in the Al Hasa district of Saudi Arabia. *Journal of Family and Community Medicine*. 2012;19(1):26-32.

<https://doi.org/10.4103/2230-8229.94008>

PMid:22518355 PMCID:PMC3326767

7. Asaad G, Sadegian M, Lau R, Xu Y, Soria-Contreras DC, Bell RC, et al. The reliability and validity of the perceived dietary adherence questionnaire for people with type 2 diabetes. *Nutrients*. 2015; 7(7):5484-96.

<https://doi.org/10.3390/nu7075231>

PMID: 26198247 PMCID: PMC4517008

8. Bai RR, Kumar R. Perceived Dietary Adherence and its Barriers to Dietary Recommendations among Type 2 Diabetes Mellitus Patients. *Innovational: Journal of Nursing and Healthcare*. 2020;6(3):1-5.

9. Mohammed AS, Adem F, Tadiwos Y, Woldekidan NA, Degu A. Level of adherence to the dietary recommendation and glycemic control among patients with type 2 diabetes mellitus in Eastern Ethiopia: a cross-sectional study. *Diabetes, Metabolic Syndrome and Obesity*. 2020:2605-12.

<https://doi.org/10.2147/DMSO.S256738>

PMID: 32801812 PMCID: PMC7384875

10. Ayele AA, Emiru YK, Tiruneh SA, Ayele BA, Gebremariam AD, Tegegn HG. Level of adherence to dietary recommendations and barriers among type 2 diabetic patients: a cross-sectional study in an Ethiopian hospital. *Clinical diabetes and endocrinology*. 2018;4:1-7.

<https://doi.org/10.1186/s40842-018-0070-7>

PMID: 30519484 PMCID: PMC6267803

11. Baral J, Karki KB, Thapa P, Timalsina A, Bhandari R, Bhandari R, et al. Adherence to Dietary Recommendation and Its Associated Factors among People with Type 2 Diabetes: A Cross-Sectional Study in Nepal. *Journal of Diabetes Research*. 2022; (1):6136059.

<https://doi.org/10.1155/2022/6136059>

PMID: 36313817 PMCID: PMC9616656

12. Saleh F, Mumu SJ, Ara F, Hafez MA, Ali L. Non-adherence to self-care practices & medication and health related quality of life among patients with type 2 diabetes: a cross-sectional study. *BMC public health*. 2014; 14:1-8.

<https://doi.org/10.1186/1471-2458-14-431>

PMID: 24885315 PMCID: PMC4019601

13. Vanderlee L, Ahmed S, Ferdous F, Farzana FD, Das SK, Ahmed T, et al. Self-care practices and barriers to

compliance among patients with diabetes in a community in rural Bangladesh. *International Journal of Diabetes in Developing Countries*. 2016; 36:320-6.

<https://doi.org/10.1007/s13410-015-0460-7>

14. Worku A, Mekonnen Abebe S, Wassie MM. Dietary practice and associated factors among type 2 diabetic patients: a cross sectional hospital based study, Addis Ababa, Ethiopia. *Springer Plus*. 2015; 4:1-8.

<https://doi.org/10.1186/s40064-015-0785-1>

PMID: 25635244 PMCID: PMC4306673

15. Mirahmadizadeh A, Khorshidsavar H, Seif M, Sharifi MH. Adherence to medication, diet and physical activity and the associated factors amongst patients with type 2 diabetes. *Diabetes Therapy*. 2020; 11:479-94.

<https://doi.org/10.1007/s13300-019-00750-8>

PMID: 31916213 PMCID: PMC6995790

16. Dedefo MG, Abate SK, Ejeta BM, Korsaa AT. Predictors of poor glycemic control and level of glycemic control among diabetic patients in west Ethiopia. *Annals of Medicine and Surgery*. 2020; 55:238-43.

<https://doi.org/10.1016/j.amsu.2020.04.034>

PMID: 32528672 PMCID: PMC7283090

17. Goyal J, Kumar N, Sharma M, Raghav S, Bhatia PS. Factors affecting glycemic control among patients with type 2 diabetes at a tertiary health care center of western up region: A cross-sectional study. *International Journal of Health Sciences and Research*. 2019; 9(3):12-20.

18. Pokhrel S, Shrestha S, Timilsina A, Sapkota M, Bhatt MP, Pardhe BD. Self-care adherence and barriers to good glycaemic control in Nepalese type 2 diabetes mellitus patients: a hospital-based cross-sectional study. *Journal of multidisciplinary healthcare*. 2019:817-26.

<https://doi.org/10.2147/JMDH.S216842>

PMID: 31632050 PMCID: PMC6791337

19. Fasil A, Biadgo B, Abebe M. Glycemic control and diabetes complications among diabetes mellitus patients attending at University of Gondar Hospital, Northwest Ethiopia. *Diabetes, metabolic syndrome and obesity: targets and therapy*. 2018:75-83.

<https://doi.org/10.2147/DMSO.S185614>

PMID: 30613158 PMCID: PMC6306061

20. Radwan M, Elsous A, Al-Sharif H, Abu Mustafa A. Glycemic control among primary care patients with type 2 diabetes mellitus in the Gaza Strip, Palestine. *Therapeutic advances in endocrinology and metabolism*. 2018; 9(1):3-14.

<https://doi.org/10.1177/2042018817742070>

PMID: 29344335 PMCID: PMC5761953

21. Ufuoma C, Godwin YD, Kester AD, Ngozi JC. Determinants of glycemic control among persons with type 2 diabetes mellitus in Niger Delta. *Sahel Medical Journal*. 2016;19(4):190.

<https://doi.org/10.4103/1118-8561.196361>

22. Selim S, Pathan F, Saifuddin M, Latif Z, Karim N. The challenge of proper glycaemic control among patients with type 2 diabetes in Bangladesh. *Sri Lanka Journal of Diabetes Endocrinology and Metabolism*. 2016;6(2):16-20.

<https://doi.org/10.4038/sjdem.v6i2.7310>

23. Afroz A, Chowdhury HA, Shahjahan M, Hafez MA, Hassan MN, Ali L. Association of good glycemic control and cost of diabetes care: experience from a tertiary care hospital in Bangladesh. *diabetes research and clinical practice*. 2016;120:142-8.

<https://doi.org/10.1016/j.diabres.2016.07.030>

PMID: 27552073

24. Almomani MH, Al-Tawalbeh S. Glycemic control

and its relationship with diabetes self-care behaviors among patients with type 2 diabetes in Northern Jordan: a cross-sectional study. *Patient preference and adherence*. 2022;449-65.

<https://doi.org/10.2147/PPA.S343214>

PMID: 35221675 PMCID: PMC8865859

25. Raj GD, Hashemi Z, Contreras DC, Babwik S, Maxwell D, Bell RC, et al. Adherence to diabetes dietary guidelines assessed using a validated questionnaire predicts glucose control in adults with type 2 diabetes. *Canadian Journal of Diabetes*. 2018;42(1):78-87.

<https://doi.org/10.1016/j.cjcd.2017.04.006>

PMID: 28648765

Improving Antibiotic Prescribing in Bangladesh Comparing with the United Kingdom: A Systematic Review

Abu Hanif^{*1}, Naznin Parvin², Lokiat Ullah³

Abstract

Antimicrobial resistance (AMR) has emerged as a significant global public health threat, jeopardizing the effectiveness of antibiotics and complicating the treatment of infectious diseases. The World Health Organization (WHO) has identified AMR as a critical issue, attributing its rise to factors such as overprescribing, self-medication, and inadequate antimicrobial stewardship (AMS) practices. In low- and middle-income countries (LMICs) like Bangladesh, the challenge is exacerbated by limited healthcare infrastructure, a high prevalence of informal healthcare providers, and a lack of awareness regarding the responsible use of antibiotics. In contrast, high-income countries such as the United Kingdom have implemented structured AMS frameworks aimed at promoting rational antibiotic prescribing and reducing unnecessary use. Initiatives like the TARGET Antibiotic Checklist have been effective in improving physician practices and enhancing patient education, leading to better health outcomes and a reduction in AMR. This systematic review seeks to compare AMS practices and antibiotic prescribing patterns in Bangladesh and the UK, highlighting the disparities in awareness, knowledge, and implementation of AMS strategies. By examining the current state of antibiotic use in both countries, the review aims to identify key challenges and propose actionable recommendations to improve AMS efforts, particularly in LMICs where the burden of AMR is most acute.

Keywords: Antibiotic stewardship, antimicrobial resistance, antibiotic prescribing patterns, self-medication, Bangladesh, United Kingdom.

Number of Tables: 04; Number of Figure: 01; Number of References: 20; Number of Correspondences: 03.

*1. Corresponding Author:

Abu Hanif

Student

Department of Pharmaceutical Sciences

North South University

Dhaka, Bangladesh.

Email: hanifabu834@gmail.com

Mobile: +8801918709636

2. Dr. Naznin Parvin

Dental Surgeon

Mandy Dental College & Hospital

Dhaka, Bangladesh.

3. Dr. Lokiat Ullah

Physician, Entrepreneur &

Human Rights Worker

Dhaka, Bangladesh.

Introduction:

Antibiotic resistance (ABR) is a pressing global health challenge that threatens the efficacy of antimicrobial treatments and poses significant risks to patient safety and public health. The World Health Organization (WHO) has declared antibiotic resistance as one of humanity's top ten global public health threats, urging countries to take immediate action to combat this crisis (World Health Organization, 2021). The misuse and overuse of antibiotics are key drivers of ABR, leading to the emergence of resistant bacterial strains

that complicate treatment options and increase morbidity and mortality rates¹. In Bangladesh, the situation is particularly alarming. A study highlighted that antibiotic consumption in the country is significantly higher than the global average, with self-medication and over-the-counter sales contributing to this trend². The lack of stringent regulations governing the sale of antibiotics, coupled with inadequate public awareness about the dangers of misuse, exacerbates the problem³. Furthermore, healthcare providers often prescribe antibiotics without proper diagnosis, driven by patient expectations and a lack of diagnostic facilities⁴. This inappropriate prescribing not only contributes to the rise of antibiotic-resistant pathogens but also leads to increased healthcare costs and prolonged illness⁵. In contrast, the United Kingdom (UK) has made substantial progress in managing antibiotic prescribing through the implementation of robust antibiotic stewardship programs. These programs are designed to promote the appropriate use of antibiotics, reduce unnecessary prescriptions, and ultimately curb the development of resistance⁶. The UK government has established guidelines and public awareness campaigns aimed at both healthcare providers and the general public, emphasizing the importance of responsible antibiotic use⁷. As a result, studies have shown a decline in antibiotic prescriptions and a corresponding reduction in resistance rates for certain pathogens in the UK⁸. Despite the differences in antibiotic prescribing practices between Bangladesh and the UK, there is a growing recognition of the need for a global response to antibiotic resistance. The One Health approach, which considers the interconnectedness of human, animal, and environmental health, has been advocated as a comprehensive strategy to address the

issue⁸. This approach emphasizes the importance of collaborative efforts among various sectors to ensure the responsible use of antibiotics across all domains. The objective of this systematic review is to compare antibiotic prescribing practices in Bangladesh and the UK, focusing on the prevalence of inappropriate prescribing and the effectiveness of interventions aimed at improving these practices. By synthesizing the existing literature, this review aims to identify key factors contributing to antibiotic misuse in Bangladesh and highlight successful strategies employed in the UK that could be adapted to the Bangladeshi context. The findings of this review will provide valuable insights for policymakers, healthcare providers, and public health advocates in Bangladesh as they seek to combat the growing threat of antibiotic resistance.

Methods:

Study Design: This systematic review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure a comprehensive and transparent approach to the review process⁹. The review aims to synthesize original research articles that examine antibiotic prescribing practices and interventions in Bangladesh and the United Kingdom.

Inclusion Criteria: Studies were included in the review if they met the following criteria:

- **Original Research:** The study must present original research findings, including quantitative data on antibiotic prescribing practices or interventions.
- **Geographical Focus:** The study must focus on antibiotic prescribing practices in either Bangladesh or the UK.
- **Language:** Articles must be published in English.
- **Relevant Outcomes:** The study must report on outcomes related to antibiotic prescribing, such as prevalence rates, prescribing patterns, or the effectiveness of interventions aimed at improving antibiotic use.

Exclusion Criteria: Studies were excluded from the review if they:

- Were qualitative studies, reviews, or opinion pieces without original data.
- Focused on veterinary antibiotics or animal health.
- Did not provide specific data on antibiotic prescribing practices or interventions.
- We're not peer-reviewed or published in predatory journals.

Search Strategy: A systematic literature search was conducted across multiple electronic databases, including PubMed, Scopus, Web of Science, and Google Scholar. The search was performed in July 2024, using a combination of keywords and Medical Subject Headings (MeSH) terms. The following search strategy was employed: (Table I)

Table I: Search Strategy

Aspect	Bangladesh	United Kingdom
Keywords	"Antibiotic prescribing Bangladesh" "Antibiotic resistance Bangladesh" "Antimicrobial stewardship Bangladesh" "Self-medication antibiotics Bangladesh"	"Antibiotic prescribing UK" "Antibiotic resistance UK" "Antimicrobial stewardship UK" "Antibiotic guidelines UK"
Search String	("Antibiotic prescribing" OR "Antibiotic resistance" OR "Antimicrobial stewardship") AND "Bangladesh"	("Antibiotic prescribing" OR "Antibiotic resistance" OR "Antimicrobial stewardship" OR "Antibiotic guidelines") AND "UK"
Filters Applied	- Original research articles - Published in English - No year restrictions - Focused on human subjects - Reported quantitative data related to antibiotic prescribing practices or interventions	- Original research articles - Published in English - No year restrictions - Focused on human subjects - Reported quantitative data related to antibiotic prescribing practices or interventions

Study Selection:

The study selection process followed the PRISMA guidelines and involved four key phases: identification, screening, eligibility, and inclusion. Initially, a comprehensive search was conducted across databases such as Google Scholar, PubMed, and EMBASE using predefined search queries combining keywords like "antibiotic prescribing," "antibiotic resistance," and "antimicrobial stewardship" with "Bangladesh." A total of 1,700 studies were identified, of which 50 duplicates were removed. The remaining 1,650 studies underwent title and abstract screening, during which 1,200 were excluded for not meeting the inclusion criteria. This left 450 studies for full-text review. After assessing these full-text articles for eligibility based on relevance, methodology, and inclusion criteria, 40 studies were excluded for lack of quantitative data or focus on non-human subjects. Finally, 10 studies were included in the systematic review to evaluate antibiotic prescribing practices and interventions in Bangladesh and the UK. The methodology employed in this analysis is presented below (Table II, Figure 1).

Table II: Search Methodology

Google Scholar	25 July 2024	((antibiotic prescribing [All Fields] OR antibiotic resistance [All Fields] OR antimicrobial stewardship [All Fields]) AND Bangladesh [All Fields] AND English[lang])	1,200
PUBMED	25 July 2024	(antibiotic prescribing [MeSH Terms] OR antibiotic resistance [MeSH Terms] OR antimicrobial stewardship [MeSH Terms]) AND Bangladesh [MeSH Terms] AND English[lang])	350
EMBASE	25 July 2024	(antibiotic prescribing OR antibiotic resistance OR antimicrobial stewardship) AND Bangladesh AND [english]/lim	150

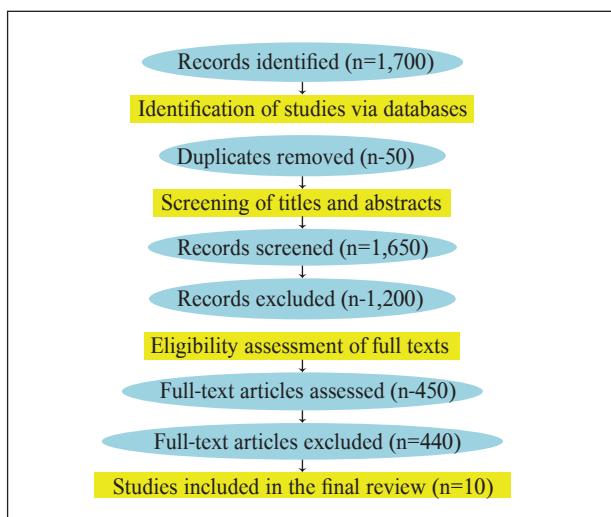


Fig 1: PRISMA Flowchart of the studies selected for the current study

Data Extraction and Quality Assessment:

Data from the included studies were systematically extracted using a standardized data extraction form to ensure consistency and comprehensiveness. Key information collected for each study included the author(s) and publication year, study design, population characteristics such as sample size and demographics, the study setting (e.g., hospital or community), findings related to antibiotic prescribing practices, any interventions implemented, and the outcomes measured. To evaluate the methodological quality of the studies, the Joanna Briggs Institute (JBI) critical appraisal tools were employed. These tools provided a structured approach to assess various research designs and ensured a rigorous evaluation of each study's reliability and validity. Studies were assessed on

criteria such as the clarity of objectives, appropriateness of the study design, justification of sample size, and robustness of data analysis methods. This process ensured that only high-quality studies were included in the systematic review, enhancing the credibility and reliability of the findings. **Data Synthesis:** A narrative synthesis approach was employed to summarize and compare the findings of the included studies. The synthesis focused on identifying common themes, trends, and variations in antibiotic prescribing practices between Bangladesh and the UK. Where applicable, quantitative data were summarized using descriptive statistics, and key interventions were highlighted to illustrate effective strategies for improving antibiotic prescribing.

Results:

Table I presents the baseline characteristics of various studies included in the systematic review, focusing on antibiotic prescribing patterns, antimicrobial stewardship (AMS) practices, and associated outcomes in Bangladesh and the United Kingdom. It summarizes key findings and outcomes related to physician awareness of antimicrobial stewardship programs (ASPs), common antibiotic prescribing practices, and the impact of public health initiatives such as education campaigns and feedback mechanisms. The studies from Bangladesh highlight significant gaps in knowledge and practices related to AMS, as well as a high prevalence of self-medication. In contrast, studies from the UK show more structured AMS frameworks and demonstrate positive outcomes from interventions like audit-feedback loops and educational campaigns. Key findings include the widespread use of broad-spectrum antibiotics in both countries, variations in prescribing practices based on health settings, and the effect of interventions in reducing unnecessary antibiotic prescriptions and promoting appropriate AMS practices.

Table III : Baseline characteristics of the included studies

Study	Study design	Sample size	Key Findings	Outcomes
Humayun Kabir et. al, Bangladesh (2023)	Cross-sectional Survey	1102	37% of respondents used antibiotics without a prescription. Significant associations with age, knowledge, and attitudes.	Identified gaps in awareness and high prevalence of self-medication, contributing to antibiotic resistance.
S.A. Sumon et.al Bangladesh (2023)	Cross-sectional Survey	559	40.6% of physicians were aware of ASPs, with higher awareness in public hospitals (43.8%) compared to private hospitals (27.1%). No hospitals had ASP initiatives in place. 55.1% of physicians were open to receiving feedback from ASPs regarding their antibiotic choices. Only 30.9% waited for microbiological test results before prescribing antibiotics.	There is a significant gap in knowledge and practices regarding ASPs and rational antibiotic prescribing among physicians in Bangladesh. Context-specific ASP activities, improved guidelines, and better laboratory facilities are essential to combat AMR.

Study	Study design	Sample Size	key Findings	Outcomes
			Physicians aware of ASPs were 33% less likely to wait for lab results before prescribing. 42.5% of physicians considered patients' affordability when prescribing antibiotics.	
Sejal Parekh et.al UK (2023)	Structured observational study	69,861	62,544 (30%) were for respiratory tract infections (RTIs), 43,093 (21%) for urinary tract infections (UTIs), 30,764 (15%) for dental infections.	The discussions facilitated by the antibiotic checklist also led to an additional 16,625 influenza vaccinations being administered, demonstrating a positive side effect of the initiative in promoting overall public health. The TARGET Antibiotic Checklist represents an effective intervention within the framework of AMS, promoting better communication, patient education, and ultimately contributing to the reduction of AMR.
Alice P. McCloskey et. al., UK (2023)	Retrospective observational study	62,949,272 antibiotic prescriptions from 6,370 General Practices	In the UK, a substantial proportion of antibiotics are prescribed for urinary (22.7%) and respiratory (46%) symptoms.	This study contributes valuable insights into antibiotic prescribing trends in primary care in England, reinforcing the importance of AMS in addressing AMR.
Afroza Sultana et. al. Bangladesh (2023)	Cross-sectional study	320	Medicine OPD: Most commonly prescribed antibiotic: Cephalosporin (51.4% of cases) Other commonly prescribed antibiotics: Azithromycin (24.3%) and others (21.6%). Surgery OPD: Most commonly used antibiotics: Flucloxacillin (82.5%) and Cephalosporin (30.0%). Gynaecology & Obstetrics OPD: Most commonly prescribed antibiotics: Quinolones (46.0%) and other groups of antibiotics (54.0%).	The study concluded that the most commonly used antibiotics across the different OPDs of the hospital were Cephalosporin, Azithromycin, and Flucloxacillin. These findings highlight the prevalent prescribing patterns and provide insights into antibiotic usage in a tertiary care setting.

Study	Study design	Sample Size	key Findings	Outcomes
Rhys Owens et.al., UK (2024)	Retrospective observational study	647	A total of 647 patients were discharged, and 184 patients were reviewed. Out of 1658 antibiotic DOTs, 403 (24%) were classified as excess DOTs. The excess DOTs were categorized based on their timing: 27.8% were due to issues at the initiation of therapy (time point A). 45.7% occurred during the antibiotic review before 72 hours (time point B). 26.6% were attributed to prolonged antibiotic courses (time point C).	The study found that 24% of antibiotic DOTs were unnecessary. The authors identified that the pre-72 hours antibiotic review presented the greatest opportunity to safely reduce antibiotic use, suggesting it as a potential target for future interventions in line with the UK's antimicrobial resistance (AMR) strategy.
Abdullah Masud et.al., Bangladesh (2024)	Cross-sectional study	365	Antibiotic Dispensing: Of the observed dispensing events, 25.9% were antibiotics. 56.6% of customers purchased antibiotics without a prescription, primarily for non-severe conditions such as: Upper respiratory tract infections (37.4%) Fever (31.7%) Uncomplicated skin infections (20%) Gastrointestinal infections (11.2%) Urinary tract infections (10.1%) Types of Antibiotics Purchased: Commonly purchased antibiotics included: Macrolides (21.8%) Third-generation cephalosporins (20.8%) Second-generation cephalosporins (16.9%) WHO-AWeRe Classifications: 73.5% of antibiotics fell into the "Watch" category. 23.1% were in the "Access" category.	The study highlights the widespread sale of broad-spectrum antibiotics without prescriptions in Bangladesh. It emphasizes the need for tailored interventions that consider the health-seeking behaviors prevalent in informal healthcare settings in LMICs. Challenges to enforcing prescription-only rules include easy access to antibiotics through community pharmacies and potential conflicts of interest. Effective interventions should involve user-centric approaches, co-designed research with stakeholders, and prioritization of mass awareness and monitoring of over-the-counter antibiotic sales.

Study	Study design	Sample Size	key Findings	Outcomes
			8.8% were not recommended beta-lactamase inhibitors. Prescription Behavior: The likelihood of presenting a prescription while purchasing antibiotics was 27% lower for individuals aged 6–59 compared to those aged ≤ 5 or ≥ 60. Conditions like lower respiratory tract infections and enteric fever had higher prescription rates, with adjusted prevalence ratios of 1.78 and 1.87, respectively. Other demographic factors (sex, urban-rural location, income, education, number of health symptoms) did not significantly influence prescription likelihood after adjusting for confounders.	
Rabeya Sultana et.al., Bangladesh (2023)	Mixed-method research study.	583	25.7% of respondents visited an MBBS doctor, 8.1% visited a BDS dentist, and 66.2% consulted traditional healers or pharmacies. Men were found to take more antibiotics for treatment than women, with a significant difference ($p < 0.02$). Prescribing Practices: New graduate doctors and traditional healers were noted to prescribe antibiotics for longer durations. The duration of antibiotic prescriptions varied significantly by the type of physician ($p < 0.02$). Common antibiotics prescribed included: Upper respiratory tract infections (26%) Cold and fever (21%) Diarrhea (12%) STDs (9%) Hypertension (8%) Urinary tract infections (7.5%) Diabetes (5%) Lower respiratory infections (4%) Types of antibiotics used included: Cephalosporins (31.4%) Macrolides (27.6%) Quinolones (17.8%) Metronidazole (13%) Penicillin (10.1%)	The study found that the majority of respondents had poor knowledge of antimicrobial resistance and were unaware of the negative consequences of antibiotic overuse. The findings indicate a pressing need for community-based awareness programs to educate the public about antimicrobial resistance and the risks associated with the overuse of antibiotics.

Study	Study design	Sample Size	key Findings	Outcomes
			Knowledge of AMR: Approximately 65.8% of caregivers lacked knowledge about antimicrobial resistance and the negative effects of antibiotic overuse.	
G Carney et. al., UK (2024)	Cluster randomized control trial.	5073	A total of 21,307 cases of uncomplicated lower UTI were identified among the three trial arms during the study period. The combination of receiving both the AF and ES increased the relative probability of prescribing nitrofurantoin as the first-line treatment for uncomplicated lower UTIs by 28% (Odds Ratio [OR] 1.28; 95% Confidence Interval [CI] 1.07 to 1.52), compared to the control arm. This increase translates to an additional 8.7 cases of uncomplicated UTI being treated with nitrofurantoin per 100 family physicians during the 6-month study period.	The study concluded that providing audit and feedback prescribing data along with educational materials can significantly improve the prescribing practices of primary care physicians regarding antibiotics for uncomplicated lower UTIs.
Rasha Abdelsalam Elshenawy, Uk (2024)	Cross-sectional design	7,982	Public Health Impact: 46% (64 participants) strongly agreed that antimicrobial resistance (AMR) profoundly affects public health and clinical decisions. 39% (55 participants) strongly agreed that efforts against AMR within the trust have long-term societal effects. 52% (74 participants) agreed that AMS implementation leads to improved patient outcomes. 42% (59 participants) agreed that AMS promotes judicious antibiotic use. 21% (30 participants) strongly disagreed that delayed antibiotic prescribing effectively contributes to AMS. Perceptions During COVID-19: Communication: 39% agreed that communication with microbiologists and the AMS team significantly enhanced informed decisions about antibiotic use.	The results highlight the importance of clear communication, updated guidelines, and educational interventions in improving antibiotic prescribing practices and combating

Study	Study design	Sample Size	key Findings	Outcomes
			Guidelines and Practices: 38% agreed that broad-spectrum antibiotics are more effective against resistant pathogens. 31% disagreed that changing clinical conditions influenced antibiotic prescribing. 35% agreed on the adaptability and efficiency of updated antibiotic guidelines during the pandemic. 21.8% prioritized clinical judgment over guidelines. Antibiotic Stewardship Implementation: Post-Culture Review: 59.2% agreed on the need to review IV antibiotic use after receiving culture results. Technology in Meetings: 46.5% agreed on the importance of using technology platforms (e.g., Zoom, Teams) for multidisciplinary meetings. Overuse of Antimicrobials: 43.7% agreed that the overuse/misuse of antimicrobials during the pandemic could significantly influence AMR. Guideline Compliance: 54.9% remained neutral regarding compliance with local antimicrobial guidelines. Positive Impact of AMS Strategies: Multidisciplinary Team Meetings: 86.6% believed these meetings were beneficial. Regular Antimicrobial Surveillance: 83.8% found this effective. AMS Ward Rounds: 79.6% indicated effectiveness. Other Strategies: Over 70% found prospective audit and feedback, antibiotic review, and intravenous-to-oral antibiotic switch effective. 65.5% considered AMS education and training impactful, though nearly one-third felt it had no influence.	AMR, especially during crisis situations like the COVID-19 pandemic. The study underscores the necessity for tailored educational strategies to address the specific needs and contexts of various healthcare professionals.

Table IV provides a comparative analysis of AMS practices between Bangladesh and the United Kingdom, highlighting key aspects such as study designs, awareness of AMS, prescribing trends, self-medication, patient education, challenges, and recommendations. The analysis indicates that while Bangladesh faces significant challenges in AMS implementation, such as poor infrastructure, lack of formal AMS programs, and widespread self-medication, the UK has a more structured AMS framework integrated into national health strategies. The UK also benefits from widespread public education and professional engagement through initiatives like the TARGET Antibiotic Checklist, which has demonstrated effectiveness in reducing unnecessary antibiotic use and improving patient outcomes. The table emphasizes the need for tailored interventions in Bangladesh, including the establishment of AMS programs and greater public awareness campaigns.

Table IV: Comparative Analysis of Antimicrobial Stewardship (AMS) Practices in Bangladesh and the United Kingdom

Aspect	Bangladesh	United Kingdom
Study Designs	Cross-sectional surveys dominate (e.g., 50% of studies). Focus on knowledge, attitudes, and practices.	More diverse designs, including retrospective observational studies and randomized controlled trials (10%).
Awareness of AMS	Limited awareness among physicians (40.6%), no hospitals implementing structured AMS programs.	High awareness; AMS integrated into national health strategies (e.g., TARGET Antibiotic Checklist).
Prescribing Trends	High use of broad-spectrum antibiotics: cephalosporins (51.4%), macrolides (21.8%), quinolones (17.8%).	Targeted prescribing: nitrofurantoin (first-line for UTIs) and improved compliance with AMS guidelines.
Self-Medication	56.6% of customers purchased antibiotics without prescriptions, primarily for mild conditions (URTIs, fever).	AMS education reduced unnecessary prescription; discussions via TARGET Checklist increased public engagement.
Patient Education	Limited focus on public awareness; high reliance on informal healthcare providers (66.2% consulted traditional healers).	Structured programs like TARGET Antibiotic Checklist provided 69,861 patient information leaflets and improved AMS.
Challenges	Poor infrastructure, lack of diagnostics, and informal practices in dispensing antibiotics.	Resistance to guideline updates during crises like COVID-19; need for continued multidisciplinary engagement.
Key Outcomes	Identified critical gaps in AMS implementation; highlighted the need for community-based awareness campaigns and ASPs.	Demonstrated reductions in unnecessary DOTs and improved first-line prescribing practices (e.g., for UTIs).

Aspect	Bangladesh	United Kingdom
Recommendations	Establish ASPs in hospitals, improve lab facilities, focus on public awareness and physician training.	Enhance feedback mechanisms and strengthen multidisciplinary team involvement in AMS programs.

Discussion:

The findings from this systematic review highlight significant disparities in antibiotic prescribing patterns and antimicrobial stewardship (AMS) practices between Bangladesh and the United Kingdom. The results underscore critical gaps in physician awareness, public education, and the implementation of structured AMS programs, particularly in Bangladesh, which may contribute to the rising rates of antimicrobial resistance (AMR).

Awareness and Knowledge Gaps: In Bangladesh, the studies revealed a concerning lack of awareness regarding AMS among physicians, with only 40.6% acknowledging the existence of antimicrobial stewardship programs. This is consistent with previous research indicating that low awareness and knowledge of AMS significantly contribute to irrational antibiotic-prescribing practices (Khan et al., 2020).¹⁰ The high prevalence of self-medication (37% to 56.6%) further exacerbates the issue, as patients frequently access antibiotics without professional guidance. This behavior is particularly alarming given that self-medication is associated with increased AMR due to inappropriate usage¹¹. Conversely, the UK demonstrates a more integrated approach to AMS, with established frameworks and high awareness levels among healthcare professionals. The TARGET Antibiotic Checklist exemplifies a successful intervention that has enhanced communication between healthcare providers and patients, leading to improved prescribing practices¹². The contrast in awareness and implementation of AMS initiatives between the two countries highlights the urgent need for targeted educational campaigns in Bangladesh to raise awareness and promote rational antibiotic use.

Prescribing Trends and Self-Medication:

The prescribing patterns observed in Bangladesh, characterized by a high reliance on broad-spectrum antibiotics such as cephalosporins and macrolides, raise concerns about the potential for increased AMR. Studies have shown that the overuse of broad-spectrum antibiotics is a significant driver of resistance¹³. The findings from the UK, which indicate a more judicious use of antibiotics particularly the preference for nitrofurantoin as a first-line treatment for urinary tract infections demonstrate the positive impact of structured AMS interventions¹⁴. The high rates of self-medication in Bangladesh, especially for non-severe conditions like upper respiratory tract infections, highlight the need for stricter regulations on antibiotic sales and greater public awareness about the risks associated with self-medication¹⁵. The WHO

emphasizes that community education is crucial in combating AMR and promoting responsible antibiotic use¹⁶.

Challenges and Recommendations:

The challenges faced by Bangladesh in implementing effective AMS programs are multifaceted, including poor healthcare infrastructure, a lack of diagnostic facilities, and the prevalence of informal healthcare providers. These barriers hinder the establishment of formal AMS initiatives and contribute to the ongoing cycle of inappropriate antibiotic use^{17,18}. In contrast, the UK benefits from a more robust healthcare system that supports the integration of AMS into routine clinical practice. To address these challenges, Bangladesh must establish formal AMS programs within healthcare facilities, improve laboratory capacity for accurate diagnostics, and develop comprehensive public awareness campaigns aimed at educating the population about the dangers of antibiotic misuse¹⁹. Tailored interventions that consider local health-seeking behaviors and cultural practices are essential for promoting rational antibiotic use²⁰.

Conclusion:

In conclusion, the disparities in AMS practices between Bangladesh and the UK underscore the urgent need for comprehensive strategies to combat AMR. While the UK has made significant strides in implementing effective AMS frameworks, Bangladesh faces considerable challenges that require immediate attention. By prioritizing education, establishing formal AMS programs, and addressing the factors contributing to self-medication, Bangladesh can work towards reducing the burden of AMR and promoting the responsible use of antibiotics.

Conflict of Interest: None.

Acknowledgement:

I am grateful to all the faculty members of North South University and Biopharma Limited., Dhaka, Bangladesh.

References:

1. Ventola CL. The antibiotic resistance crisis: part 1: causes and threats. *Pharmacy and therapeutics*. 2015 Apr;40(4):277.
2. Hicks JP, Latham SM, Huque R, Das M, Newell J, Abdullah SM, et al. Antibiotic practices among household members and their domestic animals within rural communities in Cumilla district, Bangladesh: a cross-sectional survey. *BMC Public Health*. 2021 Dec;21:1-0.
<https://doi.org/10.1186/s12889-021-10457-w>
PMid:33632193 PMCID:PMC7908663
3. Ahmed I, Rabbi MB, Sultana S. Antibiotic resistance in Bangladesh: A systematic review. *International Journal of Infectious Diseases*. 2019 Mar 1;80:54-61.

<https://doi.org/10.1016/j.ijid.2018.12.017>

PMid:30634043

4. Biswas M, Roy DN, Tajmim A, Rajib SS, Hossain M, Farzana F, et al. Prescription antibiotics for outpatients in Bangladesh: a cross-sectional health survey conducted in three cities. *Annals of clinical microbiology and antimicrobials*. 2014 Dec;13:1-7.

<https://doi.org/10.1186/1476-0711-13-15>

PMid:24755269 PMCID:PMC4004450

5. Laxminarayan R, Duse A, Wattal C, Zaidi AK, Wertheim HF, Sumpradit N, et al. Antibiotic resistance-the need for global solutions. *The Lancet infectious diseases*. 2013 Dec 1;13(12):1057-98.

[https://doi.org/10.1016/S1473-3099\(13\)70318-9](https://doi.org/10.1016/S1473-3099(13)70318-9)

PMid:24252483

6. Morley GL, Wacogne ID. UK recommendations for combating antimicrobial resistance: A review of 'antimicrobial stewardship: Systems and processes for effective antimicrobial medicine use'(NICE guideline NG15, 2015) and related guidance. *Archives of Disease in Childhood-Education and Practice*. 2018 Feb 1;103(1):46-9.

<https://doi.org/10.1136/archdischild-2016-311557>

PMid:28794004

7. England PH. English Surveillance Programme for Antimicrobial Utilisation and Resistance (ESPAUR): report 2014. London, England. 2014.

8. Rummery K, Coleman A. Primary health and social care services in the UK: progress towards partnership? *Social Science & Medicine*. 2003 Apr 1;56(8):1773-82.

[https://doi.org/10.1016/S0277-9536\(02\)00173-9](https://doi.org/10.1016/S0277-9536(02)00173-9)

PMid:12639593

9. Masud A, Walpola RL, Sarker M, Kabir A, Asaduzzaman M, Islam MS, et al. Understanding Antibiotic Purchasing Practices in Community Pharmacies in Bangladesh: A Potential Driver of Emerging Antimicrobial Resistance.

10. Sarker MS, Nath SC, Ahmed I, Siddiky NA, Islam S, Kabir ME, Bupasha ZB. Knowledge, attitude and practice towards antibiotic use and resistance among the veterinarians in Bangladesh. *Plos one*. 2024 Aug 13;19(8):e0308324.

<https://doi.org/10.1371/journal.pone.0308324>

PMid:39137217 PMCID:PMC11321546

11. Kulkarni MP, Garg MA, Ajmera MA, Mahajan MA, Gadekar MS, Kulkarni MP. Global scenario of self-medication: A review of literature. *Indian journal of commerce and management studies*. 2018 Jan 31;9(1):99-107.

<https://doi.org/10.18843/ijcms/v9i1/14>

12. Parekh S, Hayes CV, Loader J, Ashiru-Oredope D, Hand K, Hicks G, et al. The use of the TARGET antibiotic checklist to support antimicrobial stewardship

in England's community pharmacies. *Antibiotics*. 2023 Mar 24;12(4):647.

<https://doi.org/10.3390/antibiotics12040647>

PMid:37107009 PMCID:PMC10135131

13. Owens R, Bamford K, Pinion S, Garry E, Cranmer E, Pearce C, et al. Assessment of the appropriateness of antibiotic prescribing in an acute UK hospital using a national audit tool: a single centre retrospective survey. *European Journal of Hospital Pharmacy*. 2024 Nov 1;31(6):505-10.

<https://doi.org/10.1136/ejpharm-2022-003569>

PMid:37117009

14. Carney G, Maclure M, Patrick DM, Otte J, Ambasta A, Thompson W, et al. Pragmatic randomised trial assessing the impact of peer comparison and therapeutic recommendations, including repetition, on antibiotic prescribing patterns of family physicians across British Columbia for uncomplicated lower urinary tract infections. *BMJ Quality & Safety*. 2024 Oct 16.

<https://doi.org/10.1136/bmjqs-2024-017296>

PMid:39414374

15. Mahmudul Islam AF, Raihan MA, Ahmed KT, Islam MS, Nusrat NA, Hasan MA, et al. Prevalence of inappropriate antibiotic doses among pediatric patients of inpatient, outpatient, and emergency care units in Bangladesh: A cross-sectional study. *PLOS Global Public Health*. 2024 Sep 10;4(9):e0003657.

<https://doi.org/10.1371/journal.pgph.0003657>

PMid:39255277 PMCID:PMC11386430

16. World Health Organization, 2015,

<https://www.who.int/>

17. Sultana R, Mohim IA, Rahim M, Rahim M, Islam MS. Physicians' antibiotics prescribing patterns for common diseases and knowledge on antimicrobial resistance: A descriptive cross-sectional study. *Asia Pacific Journal of Health Management*. 2023 Jun 1;18(2):80-6.

<https://doi.org/10.24083/apjhm.v18i2.1979>

18. Sultana A, Kabir ML, Yusuf MA, Jahan T, Khan A, Firdousi T, et al. Prescription Pattern of Different Groups of Antibiotics at Out Patient Department of a Tertiary Medical College Hospital in Dhaka City. *Journal of National Institute of Neurosciences Bangladesh*. 2023 Oct 4;9(1):54-8.

<https://doi.org/10.3329/jninb.v9i1.65443>

19. Sumon SA, Anwar MM, Akther FM, Priyanka AS, Tamanna T, Rahman A, et al. Perceptions of antibiotic stewardship programmes and determinants of antibiotic prescribing patterns among physicians in tertiary hospitals in Bangladesh: implications for future policy and practice. *Journal of Hospital Infection*. 2024 Feb 1;144:56-65.

<https://doi.org/10.1016/j.jhin.2023.11.010>

PMid:38070709

20. Kabir H, Hasan MK, Akter N, Tassdik H, Islam MF, Jannat H, et al. Antibiotics administration without prescription in Bangladesh. *IJID regions*. 2023 Jun 1;7:11-7.

<https://doi.org/10.1016/j.ijregi.2023.02.001>

PMid:36941825 PMCID:PMC10023939

Infertility Due to Obesity in Women: Endocrine Pathways

Murshida Afroz Lubna^{*1}, Umme Sayeeda Bilkish²

Abstract

Infertility is a significant global health issue, with a negative impact on people's wellbeing and human rights. Despite the longstanding association between obesity and infertility, there remains uncertainty, about the precise mechanisms underpinning this association and best management strategies. In this article, we aimed to address these uncertainties by reviewing the recent literatures. We found that, obese women undergo perturbations of the 'hypothalamic pituitary ovarian axis', and frequently suffer of menstrual dysfunction leading to anovulation and infertility. Besides the hormone disorders and subfertility that are common in the polycystic ovary syndrome (PCOS), in obesity the adipocytes act as endocrine organ. The adipose tissue indeed, releases a number of bioactive molecules, namely adipokines that variably interact with multiple molecular pathways of insulin resistance, inflammation, hypertension, cardiovascular risk, coagulation, and oocyte differentiation and maturation.

Keyword: Obesity, Infertility, hypothalamic-pituitary-ovarian axis.

Number of References: 36; Number of Correspondences: 04.

*1. Corresponding Author:

Dr. Murshida Afroz Lubna

MBBS, DGO (OBGYN)

Assistant Professor

Department of Obstetrics and Gynaecology

Sylhet Womens Medical College & Hospital
Sylhet, Bangladesh.

email: afrozmurshida@gmail.com

Contact: 01711954202

2. Dr. Umme Sayeeda Bilkish

FCPS (Obs & Gynae)

Assistant Professor

Department of Obstetrics and Gynaecology

North East Medical College & Hospital (NEMC)
Sylhet, Bangladesh.

Introduction:

Obesity is an abnormal or excessive build-up of body fat, which is a common metabolic disturbance. A body mass index (BMI) of more than 25 kg/m², 30 kg/m², 40 kg/m² are considered as overweight, obese and severely obese respectively according to the Center for Disease Control and Prevention (CDC) and World Health Organization (WHO) guidelines¹. Obesity is linked to a slew of negative consequences. Metabolic problems, cardiovascular events, malignancies, gastrointestinal diseases, and arthritis are just a few of them². Aside from the cardiometabolic effects of obesity, there is strong confirmation that both female and male obesity increases the chance of subfecundity and infertility. According to

previous studies, more than 40% of females with menstruation abnormalities, infertility, and recurrent abortion are obese or overweight. Anovulatory periods, oligoamenorrhea, hirsutism, infertility, and/or sexual disorders are all more common in women with obesity than in normal weight women³. Obesity interferes with normal endocrine function, resulting in ovulation, endometrial growth, and embryo developmental abnormalities. According to the American Society of Reproductive Medicine Practice Committee⁴, infertility is a disease generally defined as failure to conceive after twelve or more months of attempts of natural fertilization and is a rising problem in our society today. The WHO worldwide estimation suggests that this pathology currently affects up to 50–80 millions of women, with a variable incidence that in several instances may raise up to about 50% of all women⁵. Infertility is a major worldwide health concern, having severe consequences for people's well-being and human rights. Despite the ongoing relationship between obesity and infertility, there is still ambiguity about the specific processes behind this association and the optimal therapeutic techniques. Obese women undergo perturbations of the 'hypothalamic pituitary ovarian (HPO) axis', and frequently suffer of menstrual dysfunction leading to anovulation and infertility⁶. Obesity is now well recognised as a risk factor for type 2 diabetes, hypertension, vascular disease, tumours, and reproductive issues. Obese women had lower levels of gonadotropin hormones (GH), decreased fecundity, greater miscarriage rates, and inferior in vitro fertilisation results, indicating that obesity has an impact on female reproductive system. Moreover, adipose tissue features unique immune cells and obesity-induced inflammation is a chronic, low-grade inflammatory response⁷. Up to date, few single studies been done to determine the types and causative factors behind infertility. The current study will summarize some recent reviews on how obesity is affecting the female infertility. Pathophysiology of infertility in females: Several differential conditions concur to affect the woman fertility. These conditions mainly related to the pathophysiology of reproductive organs. Below are some of the major causes of infertility

belonging to both pathogenic conditions.

1. Deregulated ovarian function – Ovulation is the result of a complex balance and interaction of hormones; any alteration of these mechanisms may influence its physiology. The most common cause of ovulation failure includes the polycystic ovary syndrome (PCOS)⁸. Other cause includes malfunctions of the hypothalamus or pituitary gland leading to the production of immature eggs.

2. Tubal infections and Endometriosis – pelvic inflammatory disease is a major etiologic event of anatomic and functional disorders of tubae and is predominantly associated to infections by Chlamydia Trachomatis and Neisseria Gonorrhoea which can ultimately lead to tubal related infertility. Tubal damage can occur as a result of the chronic inflammation associated to the growing endometrioid tissue and approximately 20–30% of women with endometriosis suffer of subfertility⁹.

3. Cervical Factor - Any conditions modifying the mucosal film of the cervix may concur to prevent the progression of sperms toward the tubae, as provides the passageway for sperms, allowing them to access into the uterine cavity and ultimately into the fallopian tubes.

4. Uterine factors – Dysfunction in uterus such as defect of adhesion molecules, polyps, submucous fibroids, asymptomatic tumors and recurrent miscarriages as well as other endometrial pathologies and infections, may dramatically affect the blastocyst engraftment. Molecular and Endocrinological influence of obesity on woman fertility: Obesity Effect on Hypothalamic–Pituitary–Ovarian (HPO) Axis- The HPO axis in women is disturbed by excess body fat via central and peripheral pathways¹⁰. Clinical investigations show that extreme leanness is linked to delay of puberty whereas overweight or obesity is linked to early puberty. The alterations in the levels of hormone and some substrates cause the HPO axis to deteriorate. Obese females have high luteinizing hormone (LH), androstenedione, estrone, insulin, triglycerides, and very low-density lipoprotein levels and lower lipoprotein of high density¹¹. The HPO axis deteriorates because of these changes, and various gynecological effects occur. The impact of obesity on reproductive function, especially ovulatory disorders, are mainly attributable to endocrine mechanisms, which interfere with neuroendocrine and ovarian functions, and reduce the ovulation omeostatic¹². In obese women, gonadotropin secretion is affected as an effect of the increased peripheral aromatization of androgens to estrogens while the insulin resistance and hyperinsulinemia lead to hyperandrogenemia. Furthermore, the sex hormone-binding globulin (SHBG), growth hormone (GwH), and insulin-like growth factor binding proteins (IGFBP) are decreased and leptin levels are increased. Thus, the neuro-regulation of the HPO axis might severely deranged while the obese condition also increases the risk of miscarriage, poor pregnancy outcomes, and impaired foetal well-being¹³. Obesity Effect on Sex Steroid and Insulin: Obesity is linked to a rise in estrogens (17-estradiol (E2) and estrone (E1)) as well as

androgens (testosterone (T), dihydrotestosterone (DHT), androstenedione, and de-hydroepiandrosterone (DHEA)) because of adipose tissue produces androgens directly and converts them to estrogens¹⁴. Obesity is also linked to lower levels of circulating sex hormone-binding globulin (SHBG), resulting in greater availability of androgens and estrogens to target tissues. These connections can be seen as early as adolescence and are more prominent in central obesity; they all contribute to a disorder known as “relative functional hyperandrogenism,” which might compromise ovarian function and contribute to obesity related infertility^{15, 16}. Obesity notably central obesity is distinguished by resistance to insulin and hyperinsulinemia, which promotes the production of androgens in the ovaries both directly and indirectly by raising the local sensitivity to LH. An excess of intra-ovarian androgen production may cause premature follicular atresia, which favours anovulation¹⁷. Furthermore, hyperinsulinemia causes a decrease in hepatic SHBG synthesis, resulting in an increase in the availability of free androgens¹⁸, exacerbating peripheral hyperandrogenism, which causes an overproduction of acyclic E1 and, as a result, an excessive production of LH. Increased LH secretion can cause follicular growth to be arrested earlier, granulosa cell luteinization to be accelerated, and oocyte quality to be compromised¹⁹. Insulin resistance and compensatory hyperinsulinemia, through all these mechanisms, may contribute to menstrual, ovulatory, and fertility disturbances²⁰. Obesity effect through Adipokines on fertility: The dysfunction of the adipose tissue has been implicated in the pathophysiology of infertility based on recently discovered effects of adipokines. Their normal levels are critical to maintain the integrity of hypothalamus-pituitary-gonadal (HPG) axis. Also, to regulate ovulatory processes, successful embryo implantation, and in general the physiologic pregnancy, as adipose tissue is considered an endocrine organ that plays important roles in the regulation of many physiological events such as reproduction, immune response, glucose and lipid metabolism, through the secretion of a variety of bioactive adipokines⁶. Adipokines or adipocytokines, notably leptin been studied for their role in the body due to their stimulatory influence on gonadotropin releasing hormone (GnRH) pulses. Leptin is proven as a critical gatekeeper of puberty and future fertility in cellular and animal models^{21, 22}. The quantity of body fat is directly connected to peripheral leptin levels². Obese women have higher level of leptin, an adipokine that is produced by fatty tissue, than normal weight²¹. Women with high leptin levels in their blood and high leptin-to-BMI ratios have a reduced success rate with in-vitro fertilization (IVF)¹⁵. In the human ovaries, leptin suppresses the steroidogenesis in both granulosa and thecal cells and disrupts the ovulation process having a direct effect on fertility². Finally, an obesity-related central insulin resistance condition could be involved, the infertility mechanisms identified in obesity through the influence on LH (Luteinizing hormone) secretion pulses' frequency and amplitude²³.

Obesity Effect on Oocyte and Embryo: Obesity has been shown to affect the oocyte in a number of studies. Changes in numerous hormones, particularly those that trigger oocyte maturation, may impact oocyte competence and maturation in obese people²⁴. Because adipose tissue is a key site for production of steroid hormones and metabolism, its overproduction in obesity can change steroid hormone levels²³. Increased BMI in women was linked with lower SHBG and higher insulin, glucose, lactate, triglycerides, and C-reactive protein, an inflammatory marker in follicular fluid^{24,25}. Insulin provokes steroidogenesis in ovaries and increases expression of LH receptor in the theca and granulosa cells. Obesity disrupts the ovulation and maturation of oocytes in women due to LH hyper-secretion and alteration of LH:follicular stimulating hormone (FSH) ratio²³. In addition, greater levels of free fatty acids (FFAs) in circulation lead to an increase in reactive oxygen species (ROS) which causes apoptosis and damage of mitochondria and endoplasmic reticulum²⁶. Furthermore, obese women have greater levels of leptin in their serum and follicular fluid, and as a result of in vitro investigations, leptin reduces estrogen and progesterone synthesis in granulosa cells in a dose dependent manner¹⁵. The effects of obesity on the oocytes might have ramifications for receptivity of endometrium and implantation of embryo. Moreover, obese infertile women who are treated with assisted reproductive technology confront some challenges. Several studies have found that obese women undergoing IVF have a poor ovarian response to regulated ovarian stimulation, reduced oocyte number and quality, bad embryo quality, decrease the number of transferred embryos, decreased intra-follicular human chorionic gonadotrophins and estrogen levels²⁷. Obesity also affects the preimplantation embryo; obese women are expected to produce low-quality embryos in IVF cycles using autologous oocytes²⁸. Increased leptin levels in obese women may have a direct detrimental effect on the developing embryo in addition to acting centrally. Leptin stimulates the formation of human trophoblastic stem cells in vitro, whereas inhibiting it reduces proliferation and drastically increases apoptosis²⁹. In obesity, tonically increased levels of leptin may reduce the trophoblast's susceptibility to its effects¹⁵.

Obesity Effect on Endometrium: Obese women with polycystic ovary syndrome (PCOS) have an inferior endometrial genetic profile and unsatisfactory decidualization when compared to normal-weighted women, according to gene expression investigations performed during the implantation window³⁰. Endometrial decidualization is hindered in mice with diet-induced obesity; these findings were validated in human investigations conducted in vitro and in vivo, where stromal decidualization was found to be reduced in obese women³¹. The pathogenesis of this phenomenon could be traced back to proinflammatory cytokines and ROS that cause endothelial dysfunction³², as well as obese women with recurrent miscarriages had greater endometrial levels of expression of haptoglobulin, an inflammatory marker. Furthermore, the ERK(extracellular signal-regulated kinase) signaling

pathway, which is part of the MAPK/ER(mitogen-activated protein kinase) and is required for invasion of trophoblast into endometrial lining of uterus was demonstrated to be downregulated in obese women during implantation period³³. It has also been proposed that obesity reduce endometrial receptivity due to a variety of reasons including; relative hyperestrogenemia, low level of glycodeilin and insulin growth factor binding protein 1 (IGFBP1) that occurs as a result of insulin resistance and hyper-insulinemia, and dysregulation of leptin level³⁴. Leptin has a regulatory role in modifying the uterine epithelium and activating proliferative and apoptotic cell pathways, in addition to influencing endometrial receptivity³⁵. Furthermore, leukemia inhibitory factor (LIF) has been linked to the regulation of implantation, with a strong negative relationship found between endometrial LIF and BMI. Women with high BMI have been proven to demonstrate elevated pro-inflammatory cytokines interleukin 6 (IL 6) and tumor necrosis factor (TNF) levels, which are likely to have a deleterious impact on implantation³⁶. All these phenomena could be contributing factors to low implantation and increased miscarriage rates in obese women.

Abbreviations:

BMI: Body mass index; CDC: Center for Disease Control and Prevention; DHEA: Dehydro-epiandrosterone; DHT: Dihydrotestosterone; E2: 17-estradiol; E1: Estrone; ERK: extracellular signal-regulated kinase; FT: Free testosterone; FFA: Free fatty acid; FSH: Follicular stimulating hormone; GH: Gonadotropin hormone; GwH: Growth hormone; GnRH: Gonadotropin releasing hormone; HPO: Hypothalamic-pituitary-ovarian; IVF: In-vitro fertilization; IGFBP: Insulin-like growth factor binding proteins; IGF-I: Insulin-like growth factor; LH: Lutenizing hormone; LIF: leukemia inhibitory factor; MAPK: mitogen-activated protein kinase; PKA: Protein kinase A; PCOS: polycystic ovary syndrome; ROS: Reactive oxygen species; SHBG: Sex hormone-binding globulin; T: Testosterone; T2DM: Type 2 diabetes mellitus; TNF: Tumor necrosis factor; WHO: World health Organization.

Conflict of Interest: None.

Conclusion:

There is an increase in obesity worldwide, and its detrimental influence on reproductive function, fertility state, and pregnancy rate is severe for both men and women. Obesity influences the quality and number of oocyte and embryo, receptivity of endometrium and implantation process in both natural and assisted conception. Overweight and obese women need longer time to conceive and undoubtedly are at higher risk of infertility.

References:

1. Chooi YC, Ding C, Magkos F. The epidemiology of obesity. *Metabolism*. 2019; 92:6-10.
<https://doi.org/10.1016/j.metabol.2018.09.005>
PMid:30253139

2. Gambineri A, Laudisio D, Marocco C, Radellini S, Colao A, Savastano S. On behalf of the Obesity Programs of nutrition ER, Assessment g: Female infertility: which role for obesity? *International Journal of Obesity Supplements*. 2019; 9:65-72.
<https://doi.org/10.1038/s41367-019-0009-1>
PMid:31391925 PMCID:PMC6683114
3. Slopian R, Horst N, Jaremek JD, Chinniah D, Spaczynski R. The impact of surgical treatment of obesity on the female fertility. *Gynecol Endocrinol*. 2019; 35:100-102.
<https://doi.org/10.1080/09513590.2018.1500536>
PMid:30599791
4. Habbema JD, Collins J, Leridon H, Evers JL, Lunenfeld B, Te Velde ER. Towards less confusing terminology in reproductive medicine: a proposal. *Hum Reprod*. 2004; 19:1497-1501.
<https://doi.org/10.1093/humrep/deh303>
PMid:15220305
5. Ombelet W, Cooke I, Dyer S, Serour G, Devroey P. Infertility and the provision of infertility medical services in developing countries. *Hum Reprod Update*. 2008; 14:605-621.
<https://doi.org/10.1093/humupd/dmn042>
PMid:18820005 PMCID:PMC2569858
6. Silvestris E, De Pergola G, Rosania R, Loverro G. Obesity as disruptor of the female fertility. *Reprod Biol Endocrinol*. 2018; 16:22.
<https://doi.org/10.1186/s12958-018-0336-z>
PMid:29523133 PMCID:PMC5845358
7. Yong W, Wang J, Leng Y, Li L, Wang H. Role of Obesity in Female Reproduction. *Int J Med Sci*. 2023; 20:366-375.
<https://doi.org/10.7150/ijms.80189>
PMid:36860674 PMCID:PMC9969507
8. Balen AH, Rutherford AJ. Managing anovulatory infertility and polycystic ovary syndrome. *BMJ*. 2007; 335:663-666.
<https://doi.org/10.1136/bmj.39335.462303.80>
PMid:17901517 PMCID:PMC1995495
9. Johnson N, Farquhar C. Endometriosis. *BMJ Clin Evid*. 2007.
<https://doi.org/10.1136/bmj.39073.736829.BE>
PMid:17272567 PMCID:PMC1790744
10. Michalakis K, Mintzioris G, Kaprara A, Tarlatzis BC, Goulis DG. The complex interaction between obesity, metabolic syndrome and reproductive axis: a narrative review. *Metabolism*. 2013; 62:457-478.
<https://doi.org/10.1016/j.metabol.2012.08.012>
PMid:22999785
11. Castellano JM, Bentsen AH, Sánchez-Garrido MA, Ruiz-Pino F, Romero M, García-Galiano D, et al. Early metabolic programming of puberty onset: impact of changes in postnatal feeding and rearing conditions on the timing of puberty and development of the hypothalamic kisspeptin system. *Endocrinology* 2011; 152:3396-3408.
<https://doi.org/10.1210/en.2010-1415>
PMid:21712362
12. Pasquali R, Pelusi C, Genghini S, Cacciari M, Gambineri A. Obesity and reproductive disorders in women. *Hum Reprod Update*. 2003; 9:359-372.
<https://doi.org/10.1093/humupd/dmg024>
PMid:12926529
13. Talmor A, Dunphy B. Female obesity and infertility. *Best Pract Res Clin Obstet Gynaecol*. 2015; 29:498-506.
<https://doi.org/10.1016/j.bpobgyn.2014.10.014>
PMid:25619586
14. Santoro N, Torrens J, Crawford S, Allsworth JE, Finkelstein JS, Gold EB, et al. Correlates of circulating androgens in mid-life women: the study of women's health across the nation. *J Clin Endocrinol Metab*. 2005; 90:4836-4845.
<https://doi.org/10.1210/jc.2004-2063>
PMid:15840738
15. Broughton DE, Moley KH. Obesity and female infertility: potential mediators of obesity's impact. *Fertil Steril*. 2017; 107:840-847.
<https://doi.org/10.1016/j.fertnstert.2017.01.017>
PMid:28292619
16. Pasquali R, Gambineri A. Metabolic effects of obesity on reproduction. *Reprod Biomed Online*. 2006; 12:542-551.
[https://doi.org/10.1016/S1472-6483\(10\)61179-0](https://doi.org/10.1016/S1472-6483(10)61179-0)
PMid:16790096
17. De Leo V, Musacchio MC, Cappelli V, Massaro MG, Morgante G, Petraglia F. Genetic, hormonal and metabolic aspects of PCOS: an update. *Reprod Biol Endocrinol*. 2016; 14:38.
<https://doi.org/10.1186/s12958-016-0173-x>
PMid:27423183 PMCID:PMC4947298
18. Toprak S, Yönm A, Cakir B, Güler S, Azal O, Ozata M, et al. Insulin resistance in nonobese patients with polycystic ovary syndrome. *Horm Res*. 2001; 55:65-70.
<https://doi.org/10.1159/000049972>
PMid:11509861
19. Liu N, Ma Y, Wang S, Zhang X, Zhang Q, Zhang X, et al. Association of the genetic variants of luteinizing hormone, luteinizing hormone receptor and polycystic ovary syndrome. *Reprod Biol Endocrinol*. 2012; 10:36.
<https://doi.org/10.1186/1477-7827-10-36>
PMid:22546001 PMCID:PMC3403896
20. Gambineri A, Laudisio D, Marocco C, Radellini S, Colao A, Savastano S. Female infertility: which role for obesity? *Int J Obes Suppl*. 2019; 9:65-72.
<https://doi.org/10.1038/s41367-019-0009-1>

PMid:31391925 PMCID:PMC6683114

21. Quennell JH, Mulligan AC, Tups A, Liu X, Phipps SJ, Kemp CJ, et al. Leptin indirectly regulates gonadotropin-releasing hormone neuronal function. *Endocrinology*. 2009;150:2805-2812.

<https://doi.org/10.1210/en.2008-1693>

PMid:19179437 PMCID:PMC2732287

22. Quennell JH, Howell CS, Roa J, Augustine RA, Grattan DR, Anderson GM. Leptin deficiency and diet-induced obesity reduce hypothalamic kisspeptin expression in mice. *Endocrinology*. 2011; 152:1541-1550.

<https://doi.org/10.1210/en.2010-1100>

PMid:21325051 PMCID:PMC3206710

23. Jain A, Polotsky AJ, Rochester D, Berga SL, Loucks T, Zeitlian G, et al. Pulsatile luteinizing hormone amplitude and progesterone metabolite excretion are reduced in obese women. *J Clin Endocrinol Metab*. 2007; 92:2468-2473.

<https://doi.org/10.1210/jc.2006-2274>

PMid:17440019

24. Purcell SH, Moley KH. The impact of obesity on egg quality. *J Assist Reprod Genet*. 2011; 28:517-524.

<https://doi.org/10.1007/s10815-011-9592-y>

PMid:21625966 PMCID:PMC3158259

25. Souter I, Baltagi LM, Kuleta D, Meeker JD, Petrozza JC. Women, weight, and fertility: the effect of body mass index on the outcome of superovulation/intrauterine insemination cycles. *Fertil Steril*. 2011; 95:1042-1047.

<https://doi.org/10.1016/j.fertnstert.2010.11.062>

PMid:21195401

26. Broughton DE, Jungheim ES. A Focused Look at Obesity and the Preimplantation Trophoblast. *Semin Reprod Med*. 2016; 34:5-10.

<https://doi.org/10.1055/s-0035-1570032>

PMid:26696274

27. Dağ Z, Dilbaz B. Impact of obesity on infertility in women. *J Turk Ger Gynecol Assoc*. 2015; 16:111-117.

<https://doi.org/10.5152/jtgga.2015.15232>

PMid:26097395 PMCID:PMC4456969

28. Carrell DT, Jones KP, Peterson CM, Aoki V, Emery BR, Campbell BR. Body mass index is inversely related to intrafollicular HCG concentrations, embryo quality and IVF outcome. *Reprod Biomed Online*. 2001; 3:109-111.

[https://doi.org/10.1016/S1472-6483\(10\)61977-3](https://doi.org/10.1016/S1472-6483(10)61977-3)

PMid:12513872

29. Magariños MP, Sánchez-Margalet V, Kotler M, Calvo

JC, Varone CL. Leptin promotes cell proliferation and survival of trophoblastic cells. *Biol Reprod*. 2007; 76:203-210.

<https://doi.org/10.1095/biolreprod.106.051391>

PMid:17021346

30. Bellver J, Melo MA, Bosch E, Serra V, Remohí J, Pellicer A. Obesity and poor reproductive outcome: the potential role of the endometrium. *Fertil Steril*. 2007; 88:446-451.

<https://doi.org/10.1016/j.fertnstert.2006.11.162>

PMid:17418840

31. Rhee JS, Saben JL, Mayer AL, Schulte MB, Asghar Z, Stephens C, et al. Diet-induced obesity impairs endometrial stromal cell decidualization: a potential role for impaired autophagy. *Hum Reprod*. 2016; 31:1315-1326.

<https://doi.org/10.1093/humrep/dew048>

PMid:27052498 PMCID:PMC4871191

32. Palomba S, De Wilde MA, Falbo A, Koster MP, La Sala GB, Fauser BC. Pregnancy complications in women with polycystic ovary syndrome. *Hum Reprod Update*. 2015; 21:575-592.

<https://doi.org/10.1093/humupd/dmv029>

PMid:26117684

33. Knöfler M. Critical growth factors and signalling pathways controlling human trophoblast invasion. *Int J Dev Biol*. 2010; 54:269-280.

<https://doi.org/10.1387/ijdb.082769mk>

PMid:19876833 PMCID:PMC2974212

34. Carrington B, Sacks G, Regan L. Recurrent miscarriage: pathophysiology and outcome. *Curr Opin Obstet Gynecol*. 2005;17:591-597.

<https://doi.org/10.1097/01.gco.0000194112.86051.26>

PMid:16258340

35. Yang YJ, Cao YJ, Bo SM, Peng S, Liu WM, Duan EK. Leptin-directed embryo implantation: leptin regulates adhesion and outgrowth of mouse blastocysts and receptivity of endometrial epithelial cells. *Anim Reprod Sci*. 2006; 92:155-167.

<https://doi.org/10.1016/j.anireprosci.2005.05.019>

PMid:16023802

36. Esinler I, Bozdag G, Yarali H. Impact of isolated obesity on ICSI outcome. *Reprod Biomed Online*. 2008; 17:583-587.

[https://doi.org/10.1016/S1472-6483\(10\)60249-0](https://doi.org/10.1016/S1472-6483(10)60249-0)

PMid:18854116

Adjuvant Zinc Therapy in Young Infants with Sepsis: A Systematic Review

Raisa Enayet Badhan^{*1}, Md. Jahangir Alam²

Abstract

Introduction: Two of the main risk factors for neonatal sepsis are prematurity and low birth weight. Previous researches demonstrated the advantages of zinc supplementation for small-for-gestational age delivery outcomes and during pregnancy. However, there is little data on the possible advantages of supplementing with zinc to cure or prevent serious infections in this age group. Aim of this review is to evaluate the effectiveness of zinc supplementation as a preventative and therapeutic measure in young infants with sepsis. **Materials and Methods:** PubMed, Elsevier Science Direct, Google Scholar, MEDLINE, Cochrane CENTRAL, and additional databases were searched for articles to be reviewed. Included studies were evaluated the effects of therapeutic and preventive zinc supplementation in young infants in relation to the incidence and results of suspected sepsis. Seven randomized controlled trials involving 2,081 infants were included. **Results:** Certain research indicates that zinc supplementation may have a protective effect on the neonatal mortality rate (NMR) of preterm newborns, but it has no influence on the incidence of sepsis. Therapeutic zinc was linked to a considerable decrease in treatment failure in young newborns. There was no discernible impact of therapeutic zinc supplementation on hospital stay or NMR in newborns. **Conclusion:** Supplementing with zinc has no significant effect on hospital stay or sepsis prevention, however it may lower mortality and treatment failure in early newborns. Larger sample numbers and additional research are required to determine the direction and extent of any impacts.

Keywords: Zinc, Neonatal sepsis, Young infant, Treatment, Efficacy, Mortality.

Number of Table: 01; **Number of References:** 30; **Number of Correspondences:** 03.

*1. Corresponding Author:

Dr. Raisa Enayet Badhan

Medical Officer

National Institute of Burn and Plastic Surgery

Dhaka, Bangladesh.

Email: raisabadhan@gmail.com

Orcid: 0000-0002-2000-4995

Phone: +8801797507092

2. Dr. Md. Jahangir Alam

Medical Officer (OSD), DGHS

Department of Ophthalmology

Bangabandhu Sheikh Mujib Medical University

Shahbag, Dhaka, Bangladesh.

Email: drjahangir.alam2014@gmail.com

Orcid: 0009-0004-5557-2038

Introduction:

One of the main causes of morbidity and death in neonates and early infants is sepsis¹. With an estimated 20 million illnesses and 2.9 million deaths in children under five, children accounted for over half of all sepsis cases globally². In high-income nations, the incidence of neonatal sepsis is estimated to be 1–12 per 1,000 live births,

while in low and middle income countries (LMICs), it can reach up to 38 per 1,000 live births³. Depending on when it first manifests, neonatal sepsis can be classified as either early-onset sepsis (EOS) or late-onset sepsis (LOS). While the infection in LOS is typically obtained from the community or in a hospital setting, EOS is typically acquired vertically from a contaminated mother. Neonatal sepsis is primarily associated with preterm birth and low birth weight⁴. Maternal intrapartum infection, numerous gestations, prolonged labor, premature rupture of the membrane, and meconium aspiration syndrome are risk factors for EOS⁵. A number of risk factors, including mechanical ventilation, hospitalization, extended parenteral feeding, intravascular catheterization, and underlying respiratory or cardiovascular disorders, are also associated with LOS⁶. Research indicates that initiating antibiotic therapy at an early age in infants suspected of sepsis can lower their risk of death and morbidity³. The most often prescribed antibiotic classes for neonatal sepsis are beta-lactams (e.g., penicillins, cephalosporins, monobactams, and carbapenems), aminoglycosides (e.g., gentamycin), and glycopeptides (e.g., vancomycin and teicoplanin)⁷. Approximately 85.0% of sepsis-related morbidity and mortality worldwide happened in LMICs², where there is an urgent need for interventions, particularly those that are affordable and easily accessible in low-resource settings. Zinc is an important vitamin having involvement in immunity, growth, and reproduction⁸. The World Health Organization (WHO) has designated zinc as a cost-effective

intervention in the form of supplementation and fortification⁹. There is proof that zinc supports growth, immunity, brain function, and motor function. Zinc has anti-inflammatory and anti-oxidant properties that influence T-cell activity and the adaptive immune system¹⁰. The two most prevalent children infections in the world, pneumonia and diarrhea, can be effectively treated with zinc¹¹. Targeting maternal nutrition is essential to ensuring that babies have an appropriate proportion of zinc. Low birth weight, fetal loss, fetal growth retardation, and preterm deliveries have all been related to lower maternal zinc status¹². Reduced placental zinc transport and, thus, a decreased fetal zinc supply could result from reduced plasma zinc levels. The United Nations Children's Fund (UNICEF) advises all expectant mothers in underdeveloped nations to take numerous micronutrient supplements, including zinc¹³. Every episode of diarrhea in children should be treated with zinc supplementation for 10–14 days, in addition to oral rehydration and feeding, according to the World Health Organization¹⁴. However, because previous research on breastfed children under the age of six months failed to demonstrate any benefit, the significance of zinc in the treatment of diarrhea in young infants under the age of six months is unclear. Other consequences, like severe infections, haven't been thoroughly researched¹⁵. Increased serum zinc levels have been linked to better prognosis and immunity in cases of newborn sepsis¹⁶. To ascertain the effectiveness and safety of therapeutic and preventative zinc supplementation in lowering morbidity and mortality of clinical or blood culture-proven sepsis in newborns and early infants (the first four months after birth), we conducted a comprehensive study. There have been inconsistent conclusions on the benefits of zinc supplementation in neonates from controlled trials and systematic reviews on mortality and morbidity related to sepsis^{17–21}.

Materials and Methods:

Articles to be reviewed were chosen from PubMed, Elsevier Science Direct, Google Scholar, MEDLINE, Cochrane CENTRAL and other databases. Studies assessing preventive and therapeutic zinc supplementation in young infants in relation to incidence and outcomes of suspected sepsis were included. Seven randomized controlled trials involving 2,081 infants were included.

Objectives:

The following research goals will be covered by this review:

1. Compare the safety and efficacy of oral zinc supplementation for prevention and treatment against either no intervention or a placebo in cases of sepsis in newborns and early infants.
2. Identify the newborns and early baby subgroups that would benefit most from zinc supplementation.

Eligibility Criteria:

Randomized controlled trials (RCTs) were included. Non randomized and observational studies were excluded. The target population of the review was young infants (<4 months). There was no restriction applied for birth weight, gestational ages, and underlying comorbidities. This review focused on oral zinc supplementation in any form and dose in addition to standard care. Trials with additional micro-/macronutrient or antibiotics were considered if they were given equally in both intervention and placebo groups. Characteristics of individual studies included in the review article are shown in Table I.

Table I: Characteristics of individual studies included in the review article

Title	First author	Year	Source	Study population (cases/controls)	Conclusion
Zinc as Adjunct Therapy in Neonatal Sepsis	Ali M	2020	Med Today. 2020;32(2):112–6. https://doi.org/10.3329/medtoday.v32i2.48825	144	Oral zinc as adjunct therapy shortens the clinical recovery time
Short Term Oral Zinc Supplementation among Babies with Neonatal Sepsis for Reducing Mortality and Improving Outcome - A Double-Blind Randomized Controlled Trial	Banupriya N	2018	Indian journal of pediatrics, 85(1), 5–9. https://doi.org/10.1007/s12098-017-2444-8	150	Short term zinc supplementation of newborns with sepsis reduces mortality.
Zinc as adjunct treatment in infants aged between 7 and 120 days with probable serious bacterial infection: a randomised, double-blind, placebo-controlled trial	Bhatnagar S	2012	Lancet (London, England), 379(9831), 2072–2078. https://doi.org/10.1016/S0140-7361(12)60477-2	700	Zinc could be given as adjunct treatment to reduce the risk of treatment failure in infants aged 7–120 days with probable serious bacterial infection.
Zinc Supplementation in Preterm Neonates with Late-Onset Sepsis: Is It Beneficial?	El faragry MS	2022	American journal of perinatology, 39(10), 1097–1103. https://doi.org/10.1055/s-0040-1721659	180	Zn supplementation in preterm neonates with LOS is beneficial in improving the clinical and laboratory finding.
Zinc Supplementation in Preterm Neonates and Neurological Development: A Randomized Controlled Trial	Mathur NB	2015	Indian pediatrics, 52(11), 951–955. https://doi.org/10.1007/s13312-015-0751-6	100	Zinc supplementation in 3 month corrected age in preterm breastfed infants improves alertness and attention pattern; and decreases signs of hyperexcitability, and proportion with abnormal reflexes.
Oral zinc supplementation for reducing mortality in probable neonatal sepsis: a double blind randomized placebo controlled trial	Mehta K	2013	Indian pediatrics, 50(4), 390–393. https://doi.org/10.1007/s13312-013-0120-2	614	This study does not report decrease in mortality rates, duration of hospital stay and requirement of higher lines of antibiotic therapy following zinc supplementation in neonatal sepsis.
Zinc supplementation reduces morbidity and mortality in very-low-birth-weight preterm neonates: a hospital-based randomized, placebo-controlled trial in an industrialized country	Terrin G	2013	Am J Clin Nutr. 2013 Dec;98(6):1373–4. doi: 10.3945/ajcn.113.076489.	193	Oral zinc supplementation given at high doses reduces morbidities and mortality in preterm neonates.

Discussion:

The usefulness of zinc supplementation in early newborns is assessed in this review. There are 7 RCTs in this. According to RCTs, treating young infant sepsis with zinc supplementation at a dose of 3 mg/kg twice a day, in addition to antibiotics and supportive care, considerably lowers mortality. However, studies focusing just on neonatal sepsis (<1 month) did not discover this effect. Preventive zinc supplementation has also been linked to a decreased premature neonatal mortality rate. Comparing the effective dose across research should ideally take place inside the same investigation, comparing different doses.

Additionally, the studies revealed varying short-term zinc supplementation durations, highlighting the need for long-term intervention and follow-up research. The majority of research findings came from LMICs. Undernutrition and zinc deficiency continue to be serious public health issues in LMICs²², where a number of factors including inadequate and inconsistent immunization, food insecurity, air pollution, overcrowding, low birth weight deliveries, and poor sanitation and hygiene increase the risk of infection. Developing large-scale intervention frameworks and figuring out the best ways to provide low-cost interventions to the underprivileged population in LMICs is crucial²³. Supplementing and fortifying existing newborn and young child health and nutrition programs with zinc, a low-cost intervention with a favorable safety profile, is an excellent way to add this crucial mineral¹⁸. Moreover, zinc insufficiency is particularly common in premature newborns. The death rate has improved in the two included studies on preventive zinc supplementation in premature neonates. Premature neonates need a sufficient intake of macronutrients and micronutrients for growth and rapidly growing organ systems since they missed a crucial stage of transplacental nutrition transfer during the third trimester of pregnancy. Because preterm infants have a lower ability to absorb zinc from the GI tract than full-term neonates do, they may benefit from a larger intake in order to increase growth and lower their risk of morbidities, which are common in preterm infants²⁴. The majority of reviews that have been published have evaluated zinc's efficacy in treating or preventing common childhood illnesses including pneumonia and diarrhea, as well as those that affect older infants and preschoolers^{25,26}. The effectiveness of zinc as a preventative and therapeutic agent for sepsis in the newborn and early infant age group is poorly supported by research. A more thorough examination of the included studies revealed significant subject overlap despite different study periods. Tang et al.'s previous review of four RCTs in neonates showed a significant reduction in the neonatal mortality rate and improvement in serum zinc levels in neonatal sepsis¹⁷. Moreover, the review presented mortality and patients who passed away as distinct outcomes with overlapping impact sizes. Smucker et al. conducted a recent study that narratively combined information from three RCTs²⁷. The review revealed inconclusive results regarding the effectiveness of zinc supplementation as a therapy to reduce death in newborn sepsis. In comparison to placebo, newborns receiving preventative zinc supplementation had a similar incidence risk of bacterial sepsis, according to a newly published Cochrane analysis of two trials²¹. In order to give solid evidence in favor of zinc being prescribed as an adjuvant therapy to standard care for clinically severe sepsis in young newborns, RCTs with bigger sample sizes are required in the future. A significant trial evaluating the

adjunct therapeutic benefit of zinc for lowering case-related mortality owing to severe bacterial infection in young infants (3–60 days old) was found in the literature search²⁸. The trial is now taking place in India and Nepal. Further randomized controlled trials are required to ascertain whether supplementing pregnant women and/or young children with zinc might reduce the risk of sepsis and any associated mortality. Additional research evaluating the impact of zinc supplementation on brain development is required because zinc shortage raises the possibility of neurological disorders in childhood and adolescence²⁹. Neurological results in newborns with sepsis significantly improved in one of the included trials³⁰. Even though a one-month-old infant is too young to definitively identify any brain abnormalities, the results may have significance for further research.

Conclusion:

When given at a dosage of 3 mg/kg/day, therapeutic zinc supplementation during sepsis may considerably reduce treatment failure in young infants (less than 4 months) and perhaps lower the mortality rate in the same age group; however, caution must be exercised in interpreting this finding. Larger sample sizes are required for studies to offer solid proof in favor of zinc's advice for the treatment or prevention of clinically severe sepsis in young newborns.

Conflict of Interest: None.

References:

1. Seale AC, Blencowe H, Manu AA, Nair H, Bahl R, Qazi SA, et al. Estimates of possible severe bacterial infection in neonates in subSaharan Africa, south Asia, and Latin America for 2012: a systematic review and meta-analysis. *Lancet Infect Dis.* 2014; 14(8):731-41. [https://doi.org/10.1016/S1473-3099\(14\)70804-7](https://doi.org/10.1016/S1473-3099(14)70804-7)
2. Rudd KE, Johnson SC, Agesa KM, Shackelford KA, Tsoi D, Kievlan DR, et al. Global, regional, and national sepsis incidence and mortality, 1990-2017: analysis for the Global Burden of Disease Study. *Lancet.* 2020; 395(10219):200-11. [https://doi.org/10.1016/S0140-6736\(19\)32989-7](https://doi.org/10.1016/S0140-6736(19)32989-7)
3. Bakhuizen SE, De Haan TR, Teune MJ, van Wassenae-Leemhuis AG, Van Der Heyden JL, Van Der Ham DP, et al. Meta-analysis shows that infants who have suffered neonatal sepsis face an increased risk of mortality and severe complications. *Acta Paediatrica.* 2014; 103(12):1211-8. <https://doi.org/10.1111/apa.12764>
4. Stoll BJ, Hansen NI, Sánchez PJ, Faix RG, Poindexter BB, Van Meurs KP, et al. Early onset neonatal sepsis: the burden of group B Streptococcal and E. coli disease continues. *Pediatrics.* 2011; 127(5):817-26. <https://doi.org/10.1542/peds.2010-2217>
5. Naher BS, Mannan MA, Noor K, Shahidullah M. Role of serum procalcitonin and C-reactive protein in the

- diagnosis of neonatal sepsis. *Bangladesh Med Res Counc Bull.* 2011; 37(2):40-6. <https://doi.org/10.3329/bmrcb.v37i2.8432>
6. Leal YA, Álvarez-Nemegyei J, Velázquez JR, Rosado-Quia U, Diego-Rodríguez N, PazBaeza E, et al. Risk factors and prognosis for neonatal sepsis in southeastern Mexico: analysis of a four-year historic cohort follow-up. *BMC Pregnancy Childbirth.* 2012; 12(1):48. <https://doi.org/10.1186/1471-2393-12-48>
 7. National Institute for Health and Care Excellence. Neonatal infection (early onset): antibiotics for prevention and treatment. 2014. Available from: <https://www.nice.org.uk/guidance/cg149/evidence/evidence-updatepdf-188168797>.
 8. Roohani N, Hurrell R, Kelishadi R, Schulin R. Zinc and its importance for human health: an integrative review. *J Res Med Sci.* 2013;18(2): 144.
 9. Hutubessy RC, Baltussen R, Torres-Edejer T, Evans D. WHO-CHOICE: choosing interventions that are cost-effective. In: *Health systems performance assessment: debates, methods and empiricism.* Geneva: WHO; 2003. p. 823-35.
 10. Jarosz M, Olbert M, Wyszogrodzka G, Młyniec K, Librowski T. Antioxidant and anti-inflammatory effects of zinc. Zinc-dependent NF-κB signaling. *Inflammopharmacology.* 2017; 25(1):11-24. <https://doi.org/10.1007/s10787-017-0309-4>
 11. Wang L, Song Y. Efficacy of zinc given as an adjunct to the treatment of severe pneumonia: a meta-analysis of randomized, doubleblind and placebo-controlled trials. *Clin Respir J.* 2018; 12(3):857-64. <https://doi.org/10.1111/crj.12646>
 12. Chaffee BW, King JC. Effect of zinc supplementation on pregnancy and infant outcomes: a systematic review. *Paediatr Perinat Epidemiol.* 2012;26 Suppl 1:118-37. <https://doi.org/10.1111/j.1365-3016.2012.01289.x>
 13. Ramakrishnan U. Nutrition and low birth weight: from research to practice. *Am J Clin Nutr.* 2004; 79(1):17-21. <https://doi.org/10.1093/ajcn/79.1.17>
 14. WHO. Zinc supplementation in the management of diarrhoea [Internet]. 2016 [cited 2021 Jun 22]. Available from: https://www.who.int/elena/titles/bbc/zinc_diarrhoea/en/.
 15. Walker C, Bhutta Z, Bhandari N, Teka T, Shahid F, Taneja S, et al. Zinc supplementation for the treatment of diarrhea in infants in Pakistan, India and Ethiopia. *J Pediatr Gastroenterol Nutr.* 2006; 43(3):357-63. <https://doi.org/10.1097/01.mpg.0000232018.40907.00>
 16. Banupriya N, Bhat BV, Vickneshwaran V, Sridhar MG. Effect of zinc supplementation on relative expression of immune response genes in neonates with sepsis: a preliminary study. *Indian J Med Res.* 2020; 152 (3):296. https://doi.org/10.4103/ijmr.IJMR_557_18
 17. Tang Z, Wei Z, Wen F, Wu Y. Efficacy of zinc supplementation for neonatal sepsis: a systematic review and meta-analysis. *J Matern Fetal Neonatal Med.* 2019; 32 (7):1213-8. <https://doi.org/10.1080/14767058.2017.1402001>
 18. Newton B, Bhat BV, Dhas BB, Mondal N, Gopalakrishna SM. Effect of zinc supplementation on early outcome of neonatal sepsis: a randomized controlled trial. *Indian J Pediatr.* 2016;83 (4):289-93. <https://doi.org/10.1007/s12098-015-1939-4>
 19. Banupriya N, Vishnu Bhat B, Benet BD, Sridhar MG, Parija SC. Efficacy of zinc supplementation on serum calprotectin, inflammatory cytokines and outcome in neonatal sepsis: a randomized controlled trial. *J Matern Fetal Neonatal Med.* 2017;30 (13):1627-31. <https://doi.org/10.1080/14767058.2016.1220524>
 20. Schüller SS, Kramer BW, Villamor E, Spittler A, Berger A, Levy O. Immunomodulation to prevent or treat neonatal sepsis: past, present, and future. *Front Pediatr.* 2018;6: 199. <https://doi.org/10.3389/fped.2018.00199>
 21. Staub E, Evers K, Askie LM. Enteral zinc supplementation for prevention of morbidity and mortality in preterm neonates. *Cochrane Database Syst Rev.* 2021 Mar 12;3(3):CD01279
 22. Gupta S, Brazier A, Lowe N. Zinc deficiency in low and middle income countries: prevalence and approaches for mitigation. *J Hum Nutr Diet.* 2020; 33(5):624-43. <https://doi.org/10.1111/jhn.12791>
 23. Wazny K, Zipursky A, Black R, Curtis V, Duggan C, Guerrant R, et al. Setting research priorities to reduce mortality and morbidity of childhood diarrhoeal disease in the next 15 years. *PLoS Med.* 2013;10 (5):e1001446. <https://doi.org/10.1371/journal.pmed.1001446>
 24. King JC, Shames DM, Woodhouse LR. Zinc homeostasis in humans. *J Nutr.* 2000;130 (5): 1360S-6S. <https://doi.org/10.1093/jn/130.5.1360S>
 25. Lassi ZS, Moin A, Bhutta ZA. Zinc supplementation for the prevention of pneumonia in children aged 2 months to 59 months. *Cochrane Database Syst Rev.* 2016; 12(12): CD005978. <https://doi.org/10.1002/14651858.CD005978.pub3>
 26. Fu W, Ding LR, Zhuang C, Zhou YH. Effects of zinc supplementation on the incidence of mortality in preschool children: a meta-analysis of randomized controlled trials. *PLoS One.* 2013; 8(11):e79998. <https://doi.org/10.1371/journal.pone.0079998>
 27. Smucker AR. "Is oral zinc supplementation effective in reducing mortality rate in neonatal sepsis?" PCOM

Physician Assistant Studies Student Scholarship. 2020. 533. Available from: https://digitalcommons.pcom.edu/pa_systematic_reviews/533.

28. Wadhwa N, Basnet S, Natchu UCM, Shrestha LP, Bhatnagar S, Sommerfelt H, et al. Zinc as an adjunct treatment for reducing case fatality due to clinical severe infection in young infants: study protocol for a randomized controlled trial. *BMC Pharmacol Toxicol*. 2017; 18(1):1-10
<https://doi.org/10.1186/s40360-017-0162-5>

29. Black MM. Zinc deficiency and child development. *Am J Clin Nutr*. 1998;68(2):464
<https://doi.org/10.1093/ajcn/68.2.464S>

30. Banupriya N, Bhat BV, Benet BD, Catherine C, Sridhar MG, Parija SC. Short term oral zinc supplementation among babies with neonatal sepsis for reducing mortality and improving outcome: a double-blind randomized controlled trial. *Indian J Pediatr*. 2018;85(1):5-9
<https://doi.org/10.1007/s12098-017-2444-8>

A Case Report of a 10-Month-Old Child Diagnosed with Tricuspid Valve Atresia

Golam Mahfuz Rabbani*¹

Abstract

Introduction: Tricuspid atresia (TA), a cyanotic form of congenital heart disease, is the absence of real or potential joining of the right atrium and right ventricle. This total absence of the right atrioventricular junction is typically caused by the regular position of the tricuspid valve, which forms a dimple close to the right atrium's floor exactly over the right ventricle. **Case history:** A 10-month-old male patient came to us with complaints of fever and respiratory distress. His oxygen saturation in room air was 76% with a heart rate of 130 and body temperature of 101 F. At first, he was diagnosed with pneumonia by a pediatrician. Then he came to me after not receiving any response from treatment. On examination I found rhonchi and systolic murmur. So, our initial assessment involved taking CBC, x-ray and echocardiography of the patient's chest. The data from his echocardiography reveals that he has a tricuspid valve atresia. **Conclusion:** We decided to continue the conservative treatment for TVA with pneumonia (Paracetamol sos, Agoxin, Vitamin B complex for 6 months, and injectable antibiotic for 10 days) that started on him. After 11 months, the patient returned to us with RTI again. We treated his RTI with antibiotics. At the follow-up of the 12th month, his symptoms showed improvement.

Keywords: Diagnosis, Management, Tricuspid Valve Atresia.

Number of Figures: 02; Number of References: 17; Number of Correspondences: 03.

*1. Corresponding Author:

Dr. Golam Mahfuz Rabbani

MBBS, BCS, MD

Department of Cardiology

Interventional Cardiologist

Jashore Medical College, Jashore, Bangladesh.

E-mail:mahfuz123098@gmail.com

Introduction:

Tricuspid atresia (TA), a cyanotic form of congenital heart disease, is the absence of real or potential joining of the right atrium and right ventricle. This total absence of the right atrioventricular junction is typically caused by the regular position of the tricuspid valve, which forms a dimple close to the right atrium's floor exactly over the right ventricle¹. Through the foramen ovale, every venous return from the systemic veins goes to the left side of the heart¹. Atrial septal defect (ASD) of variable size is typically present¹. According to the majority of reports, the prevalence of congenital cardiac anomalies, including tricuspid atresia, ranges from 1.5% to 2.5%¹. The estimated incidence of this uncommon cyanotic congenital heart disease (CHD) is 79 per million live births². According to the modified Edward-Burchells classification, tricuspid atresia can be divided into three categories depending on the degree of

pulmonary stenosis and the relationship between the great arteries³. If paired with an unroofed coronary sinus, a persistent left superior vena cava (LSVC) may be linked to TA and result in persistent arterial desaturation even following curative surgery⁴. Prenatal diagnostics suggest that these types of treatment are more appropriate for infants who need surgery. Although the prenatal diagnosis of tricuspid atresia has been recorded several times, the prenatal sonographic components of this condition have not received much attention in the literature⁵⁻¹⁰. In our case report, we are presenting the echocardiographic images of a cyanosed ten-month-old child who presented with failure to thrive and fatigue on feeding.

Case History:

A 10-month-old male patient came to us with complaints of fever and respiratory distress. His oxygen saturation in room air was 76% with a heart rate of 130 and body temperature of 101 F. At first, he was diagnosed with pneumonia by a pediatrician. Then he came to me after not receiving any response from treatment. On examination I found rhonchi and systolic murmur. Our initial assessment involved taking CBC, x-ray and echocardiography of the patient's chest [Fig.1&2]. The data from his echocardiography reveals that he has a tricuspid valve atresia. Echocardiography showed tricuspid valve atresia, large ASD (Like Single Atrium), rudimentary RV, small VSD, large LV, pulmonary stenosis, and narrow PA arising from rudimentary RV.

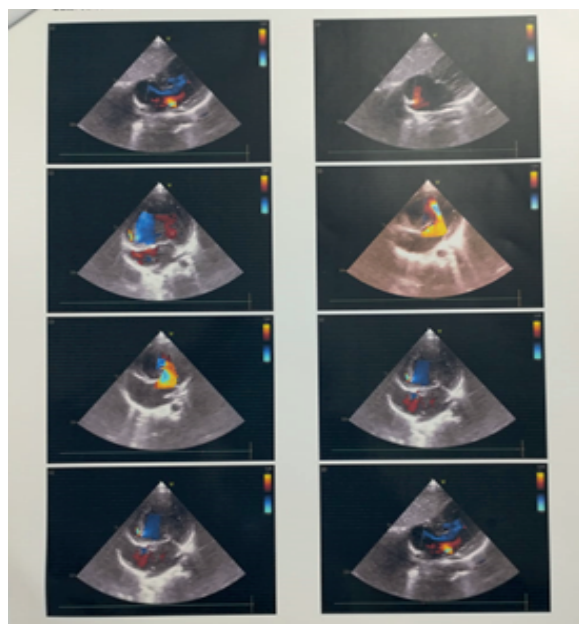
We recommended conservative treatment for the patient. He was treated with injectable antibiotics, Paracetamol, Agoxin, and Vitamin B complex. In the second week of his follow-up, he

improved. After treatment, his oxygen saturation in room air was 92% with a normal body temperature of 98 F. We continued the conservative treatment with Agoxin, Vitamin B, and Zinc on the patient.

After that, the patient was taken to India for further treatment. They also suggested the same conservative treatment as we did. After receiving the treatment for 11 months, the patient returned to us with RTI again. We treated his RTI with antibiotics. At the follow-up of the 12th month, his symptoms showed improvement.

NON-INVASIVE CARDIAC LAB REPORT			
Invoice No: J230506026	Invoice Date: 06/05/23	Delivery Date: 06/05/23	Report No: 182305150206
Patient Name: LABIS	Age: 10M	Gender: MALE	
Ref. Doctor: DR. GOLAM MAHFUZ RABBANI MBBS, BCS(HEALTH), MD(CARDIOLOGY)			
Test Name: Echo Cardiography + Color Doppler			
Film No: _____			
M Mode & 2D Findings:			
LA : 22 mm	IVS : 05 mm	LVIDs : 21 mm	
AO : 16 mm	PW : 06 mm	EF : 51 %	
Acs : 11 mm	LVIDd : 28 mm	MVA : _____	
Doppler & Colour flow measurement :			
MV : Vp : 0.99 m/sec	PPG : 3.96 mm Hg	MR : (-)	
AV : Vp : 1.00 m/sec	PPG : 3.98 mm Hg	AR : (-)	
PV : Vp : 4.29 m/sec	PPG : 73.63 mm Hg	PR : (-)	
TV : Vp : 0.74 m/sec	PPG : 2.21 mm Hg	TR : (-)	
IAS - Large ASD (Like single atrium). IVS- Small VSD. LV- Large LV (Like single ventricle). RV- Rudimentary RV. Atrium -large ASD (Like single atrium). LV wall motion: Normal. Narrow PA arising from Rudimentary RV. Pulmonary stenosis. Tricuspid valve atresia.			
1. Tricuspid valve atresia. 2. Large ASD (Like single atrium). 3. Rudimentary RV. 4. Small VSD. 5. Large LV (Like single ventricle). 6. Pulmonary stenosis. 7. Narrow PA arising from Rudimentary RV.			
Advice : _____			
DR. GOLAM MAHFUZ RABBANI MBBS, BCS(HEALTH), MD(CARDIOLOGY) Assistant Professor, Jashore Medical College, Jashore.			
Prepared By : Rehana Sultana Print Date : 06/05/2023 5:51:23 PM			

A



B

Figure 1: A) & B) Echocardiography of the patient



Figure 2: X-ray of the patient

Discussion:

Tricuspid atresia has been categorized using the modified Edwards-Burchells classification system³. Three varieties are known to exist: type I features big vessels that are ordinarily connected, type II features great vessels that are transposed, and type III has a persisting truncus arteriosus³. Three subtypes can be distinguished from each type: subtype A has pulmonary atresia, subtype B has pulmonary or sub-pulmonary stenosis, and subtype C is not associated with pulmonary or subpulmonary stenosis³. One of the rare congenital disorders identified during pregnancy is TA. Still, screening during standard obstetric sonographic scans may be able to recognize it, as it is typically linked to an aberrant 4-chamber image⁵. The present case is of a 10-month-old with tricuspid valve atresia associated with large ASD (Like Single Atrium), rudimentary RV, small VSD, large LV, pulmonary stenosis, and narrow PA arising from rudimentary RV. A persistent LSVC was present in 88 out of 2663 children (3.3%) in the biggest series on the presence of persistent LSVC with congenital cardiac disease¹¹. 53 TA patients in the same series included three (5.6%) with an LSVC. A surgical repair may eventually need the identification of an LSVC. For those with TA, the Fontan's operation is the preferred course of care. It was necessary to carry out the Fontan operation in phases. The Glenn's shunt—a connection between the right pulmonary artery and the superior vena cava (SVC)—was made in the first step. After that, a four-step treatment was carried out in stages: the inferior vena cava (IVC) was connected to the PA through the right atrium (RA), a valve was inserted into the IVC, the ASD was closed, and the right ventricle (RV)

to PA link was obliterated¹². The current recommended method involves modifying this to include an extra-cardiac conduit connected to the RA through a fenestration. The drawback of RA dilation, as shown in the atrio-pulmonary Fontan operation, is eliminated by the extra-cardiac conduit¹². The fundamental idea behind the Fontan technique is to avoid the hypoplastic right ventricle by rerouting the systemic venous drainage directly to the pulmonary arteries. In a classical series, 90% of TA patients with cyanosis who were not operated on had died within a year¹². However, survival rates were 90%, 81%, 70%, and 60%, respectively, at one month, one year, ten years, and twenty years following a large series of 225 patients who received the Fontan operation¹³. Most of the time, having an LSVC does not affect the treatment strategy or the likelihood of problems following surgery. Deoxygenated blood from the LSVC enters the left atrium through the unroofed coronary sinus and which can lead to prolonged arterial desaturation even after shunt surgery if the CS is unroofed and there is a persistent LSVC¹⁴. Contrast echocardiography makes it simple to diagnose CS unroofing. A cardiac computed tomography scan could support the same findings as well. Therefore, it is essential to determine whether a dilated CS and a persistent LSVC exist in children with TA or single ventricle physiology before surgery¹⁵. The most prevalent variant is a missing right atrioventricular connection with concordant ventriculoarterial connections, as observed in postnatal life. In contrast, discordant connections (transposed great arteries) and other abnormalities of arterial connections occur in around 20% of instances, though they are less common¹⁶. The neonate's cyanosis will increase if the major arteries are joined normally. The systemic venous return crosses over to the left side of the heart at the atrial level, resulting in a right-to-left shunt. Palliation may not be necessary if the atrial septum is unrestrictive and the VSD is of a reasonable size. However, because the VSD tends to contract with growing, surgical shunt creation might be necessary. In case the major arteries are transposed, the newborn may show signs of unrestricted pulmonary blood flow or a coarctation lesion. If there is not enough VSD and the aorta comes out of the right ventricle, there is a failure to thrive¹⁷. The presence of a tiny right ventricle and associated VSD, together with the lack of a patent tricuspid valve on the 4-chamber imaging and no flow across the valve on pulsed or color Doppler flow mapping, can be the primary findings for diagnosing various cases.

Conclusion and recommendations:

In our case report, we decided to continue the conservative treatment for TVA with pneumonia (Paracetamol sos, Agoxin, Vitamin B complex for 6 months, and injectable antibiotic for 10 days) that started on him. After 11 months, the patient returned to us with RTI again. We treated his RTI with antibiotics. At the follow-up of the 12th month, his symptoms showed

improvement. The patients who came to us with recurrent pneumonia or respiratory tract infection, careful auscultation and echocardiogram needs to be done on them. If systolic murmur is found in auscultation, we recommend to do an echocardiography. It is necessary to obtain additional data from case series and case-control studies to elucidate the late complications and re-intervention rate after a 5-year follow-up.

Conflict of Interest: None.

Ethical approval: The study was approved by the Institutional Ethics Committee.

References:

1. Sharland G. Tricuspid valve abnormalities. In: Allan L, Hornberger KL, Sharland G (eds). Textbook of Fetal Cardiology. London, England: Greenwich Medical Media; 2000:133-138.
2. Hoffman JI, Kaplan S: The incidence of congenital heart disease. J Am Coll Cardiol. 2002; 39:1890-1900.
[https://doi.org/10.1016/S0735-1097\(02\)01886-7](https://doi.org/10.1016/S0735-1097(02)01886-7)
PMid:12084585
3. Tandon R, Edwards JE: Tricuspid atresia. A re-evaluation and classification. J Thorac Cardiovasc Surg. 1974; 67:530-542.
[https://doi.org/10.1016/S0022-5223\(19\)40483-2](https://doi.org/10.1016/S0022-5223(19)40483-2)
PMid:4818528
4. Gupta MD, Girish MP, Ramakrishnan S: Persistent left superior vena cava draining into an unroofed coronary sinus in tricuspid atresia: an uncommon anomaly. Pediatr Cardiol. 2011; 32:530-531.
<https://doi.org/10.1007/s00246-011-9922-y>
PMid:21360004
5. Sharland GK, Allan LD. Screening for congenital heart disease prenatally: results of a 21 / 2-year study in the South East Thames Region. Br J Obstet Gynaecol. 1992; 99:220-225.
<https://doi.org/10.1111/j.1471-0528.1992.tb14503.x>
PMid:1606121
6. Zielinsky P, Pilla CB. Ebstein's anomaly with imperforate tricuspid valve: prenatal diagnosis. Arq Bras Cardiol. 2000; 75:59-64.
<https://doi.org/10.1590/S0066-782X2000000700006>
PMid:10983020
7. Wang JN, Wu MH, Wang JK, Lue HC. Tricuspid atresia with persistent truncus arteriosus. J Formos Med Assoc. 1999; 98:290-291.
8. Hecher K, Sullivan ID, Nicolaides KH. Temporary iatrogenic fetal tricuspid valve atresia in a case of twin to twin transfusion syndrome. Br Heart J. 1994; 72:457-460.
<https://doi.org/10.1136/hrt.72.5.457>
PMid:7818963 PMCID:PMC1025614

9. McGahan JP, Choy M, Parrish MD, Brant WE. Sonographic spectrum of fetal cardiac hypoplasia. *J Ultrasound Med.* 1991; 10:539-546.
<https://doi.org/10.7863/jum.1991.10.10.539>
PMid:1942219
10. De Vore GR, Siassi B, Platt LD. Fetal echocardiography: the prenatal diagnosis of tricuspid atresia (type Ic) during the second trimester of pregnancy. *J Clin Ultrasound.* 1987; 15:317-324.
<https://doi.org/10.1002/jcu.1870150505>
PMid:3149959
11. Ari ME, Doğan V, Özgür S, et al. Persistent left superior vena cava accompanying congenital heart disease in children: experience of a tertiary care center. *Echocardiography.* 2017; 34:436-440.
<https://doi.org/10.1111/echo.13447>
PMid:28052532
12. Allen HD, Shaddy RE, Penny DJ, Feltes TF, Cetta F. Moss & Adams' Heart Disease in Infants, Children, and Adolescents, Including the Fetus and Young Adult, 9th ed. Lippincott Williams & Wilkins, Philadelphia; 2016.
13. Sittiwangkul R, Azakie A, Van Arsdel GS, Williams WG, McCrindle BW: Outcomes of tricuspid atresia in the Fontan era. *Ann Thorac Surg.* 2004; 77:889-894.
<https://doi.org/10.1016/j.athoracsur.2003.09.027>
PMid:14992893
14. Burch M, Stark J, Sullivan I. Unexpected oxygen desaturation after cardiopulmonary bypass: rapid confirmation of unroofing of the coronary sinus by intraoperative epicardial echocardiography. *Pediatr Cardiol.* 1995; 16:197-200.
<https://doi.org/10.1007/BF00794195>
PMid:7567668
15. Velamakanni SM, Patel A, Khadkikar G, Shah SC, Patel T. Tricuspid Atresia Type 1B With Persistent Left Superior Vena Cava in a Four-Month-Old Child: An Unusual Combination. *Cureus.* 2021 Apr 13;13(4):e14450.
<https://doi.org/10.22541/au.161505562.25082017/v1>
16. Allan LD, Sharland GK, Milburn A, et al. Prospective diagnosis of 1006 consecutive cases of congenital heart disease in the fetus. *J Am Coll Cardiol.* 1994; 23:1452-1458.
[https://doi.org/10.1016/0735-1097\(94\)90391-3](https://doi.org/10.1016/0735-1097(94)90391-3)
PMid:8176106
17. Tongsong T, Sittiwangkul R, Wanapirak C, Chanprapaph P. Prenatal diagnosis of isolated tricuspid valve atresia: report of 4 cases and review of the literature. *Journal of ultrasound in medicine.* 2004 Jul;23(7):945-50.
<https://doi.org/10.7863/jum.2004.23.7.945>
PMid:15292563

Antibacterial (Antibiotic) Product List

BESTCEF
Cefixime Trihydrate

- 200 mg Capsule
- 400 mg Capsule
- 37.5 ml PFS
- 50 ml PFS
- 50 ml Forte PFS
- 21 ml PD

Mex^{til}

Cefuroxime

- 250 mg Tablet
- 500 mg Tablet
- 750 mg IV/IM Injection
- 70 ml PFS
- 50 ml DS PFS

Winner

Ceftriaxone

- 500 mg IM Injection
- 1 gm IM Injection
- 500 mg IV Injection
- 1 gm IV Injection
- 2 gm IV Injection

Revistar
Flucloxacillin

- 250 mg Capsule
- 500 mg Capsule
- 100 ml PFS

Cipcin

Ciprofloxacin

- 250 mg Tablet
- 500 mg Tablet
- 750 mg Tablet
- 60 ml GFS
- 100 ml IV Infusion

Amotid

Amoxicillin

- 250 mg Capsule
- 500 mg Capsule
- 15 ml PD
- 100 ml PFS
- 100 ml Forte PFS

Erosa

Erythromycin

- 250 mg Tablet
- 500 mg Tablet
- 100 ml PFS

Biopen vk

Phenoxymethyl Penicillin

- 250 mg Tablet
- 100 ml PFS

Riboclin

Clindamycin

- 300 mg Capsule

Amotid-CL

Amoxicillin & Clavulanic acid

- 625 mg Tablet
- 100 ml PFS

Mexclav

Cefuroxime+Clavulanic Acid

- 250 mg Tablet
- 500 mg Tablet
- 70 ml PFS

Maczith
Azithromycin

- 250 mg Capsule
- 500 mg Tablet
- 15 ml PFS
- 35 ml PFS
- 50 ml PFS

Mepen

Meropenem

- 500 mg IV Injection
- 1 gm IV Injection

Supracef

Cephadrine

- 250 mg Capsule
- 500 mg Capsule
- 15 ml PD
- 100 ml PFS
- 100 ml Forte PFS

Lifcin

Levofloxacin

- 500 mg Tablet
- 100 ml Oral Solution

Gefcin

Gemifloxacin

- 320 mg Tablet

Biocap

Doxycycline

- 100 mg Capsule

Zidimax

Ceftazidime

- 250 mg IV/IM Injection
- 500 mg IV/IM Injection

Clamycin

Clarithromycin

- 500 mg Tablet

Moxif 400

Moxifloxacin HCl Tablet

- 400 mg Tablet

BIOPHARMA
LIMITED

Committed to Serving Mankind

www.biopharmabd.com

www.facebook.com/biopharmabd

Biopharma Products



Bone Nutrient

Glucum-D
Glucosamine Sulphate 750 mg & Glucosamin 50 mg Tablet

Orthocal-D
Calcium + Vit D₃ Tablet

Ortho-D₃
Cholecalciferol

Neurép
Vitamin B1, B6 & B12 Tablet

Orthorate
Calcium Orotate 400 mg Tablet

NSAIDs

Clof
Aceclofenac 100 mg Tablet

Napgin+
Naproxen 500 mg +
Esomeprazole 20 mg Tablet

VOLCAN
Diclofenac Sodium

Tolpa
Tolperison HCl 50 mg Tab

Perilac
Ketorolac Tromethamine Tablet & Injection

Antiulcerant

Esocon
Esomeprazole 20 mg, 40 mg cap. & 40 mg inj.

Panpro
Pantoprazol

Gastisol cool
Sodium Alginate
Sodium Bicarbonate
Calcium Carbonate

Rabecon
Rabeprazole sodium

Lasocon D
Dexlansoprazole 30 mg Capsule

Cardiovascular Products

Lopo+
Losartan Potassium +
Hydrochlorothiazide

Trova
Atorvastatin 10 & 20 mg tablet

BESTCOL
Rosuvastatin 5mg & 10mg Tablet

Olvance-AM
Fixed-dose combination
Olmesartan 20 mg + Amlodipine 5 mg Tablet

Myoclop
Clopidogrel 75mg Tablet

Gynae Products

Lactu
Lactulose Solution

Onstar
Ondisatran 8 mg OD Tablet & 100 ml Syrup

Relvis
Tienonium Methylsulphate Tab. & Inj.

Biron plus
Iron, Folic acid & Zinc Capsule

Formet 500
Metformin HCl 500mg Tablet

Gastrointestinal & BPH Products

Ocaliva
Obeticholic Acid 5 mg & 10 mg Tablet

UDCA
Ursodeoxycholic acid 300 mg Tablet

Eziflo-D
Tamsulosin Hydrochloride USP 0.4 mg &
Dutasteride BP 0.5 mg Capsule

Urospin
Furosemide & Spironolactone

EZIFLO
ONCE-A-DAY
Tamsulosin HCl 0.4 mg

Pediatric Products

Zinga B
Zinc Sulphate & Vitamin B Complex

Cevalin
Vitamin C chewable tablet

Aceta
Paracetamol Tablet,
Suspension & PD

Biovit Gold
High Potency 32 Vitamins-Minerals

Kidsgro
Cod liver Oil with Multivitamin

Eye Products

Moxif
Sterile Eye Drops
Moxifloxacin 0.5%

I-fort
Lubricant Eye Drops
Polyethylene Glycol 0.4%
& Propylene Glycol 0.3%

Infladex-TN
Dexamethasone 0.1% + Tobramycin 0.3%

Olarif DS
Double Strength Eye Drops
Olopatadine 0.2%

Biovit - i
Vitamin-C, Vitamin-E
Lutein, Copper & Zinc



www.biopharmabd.com



www.facebook.com/biopharmalimited

Crescent Gastro-liver & General Hospital

24 **HO** **urs**
2 4 H o u r s

Gastro-Intestinal & Liver Emergency Service



Cyanoacrylate Glue Injection
in Fundic Varix



Any kind of GI Bleeding

Haematemesis, melaena &
P/R bleeding



Fulminant Hepatic failure



Acute Pancreatitis



Acute Abdomen



Intestinal Obstruction



Gastrointestinal Perforation



Acute Appendicitis



Crescent & Gastroliver
General Hospital

25/i, Green Road, Dhanmondi, Dhaka-1205
[Eastern end of Dhanmondi Road # 7]
Phone : 8621612, 8611936, Mobile : 01713-033326

MEDICINE today

a professional medical journal

Now available in ADL (Asian Digital Library)

Dear N.A. Kamrul Ahsan

It's a great pleasure for us to inform you that Medicine Today has been selected for coverage in the Asian Digital Library.

Please visit the following link to search the journal in The ADL Database:

<https://theadl.com/journal.php?search=Medicine Today>

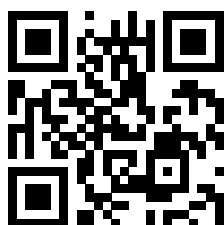
Asian Digital Library - Asia's largest abstracting database. The ADL is dedicated to providing unrestricted access to the peer-reviewed contents through a searchable database to meet the needs of the scientific and scholarly research community. Currently, The Asian Digital Library indexed more than 4000 peer-reviewed journals. Indexation in The ADL will not only increase the visibility of your title immensely, but it will also open the doors to a growing global audience.

If possible, please mention on the journal's website that now it is covered in the Asian Digital Library.

For further information about the Asian Digital Library, please visit <https://theadl.com>

Regard

Director, Publisher Relations



ADL

ASIAN DIGITAL LIBRARY

2nd Floor, Emirates Tower, M-13,
F-7 Markaz, Islamabad, Pakistan

librarian@theadl.com | +92 336 336 00 00

BIOPHARMA *Manufactures* **BIOEQUIVALENT** *Products*

Biopharma Limited has been practising its quality policy from the inception in 1999 in order to provide finest quality medicines for the patients in home and abroad. Recently, 11 products have been undergone Bioequivalence (BE) Study in US-FDA approved, renowned Contract Research Organization (CRO) and compared with innovator company's products. These BE studies have shown and proven that Biopharma's Products comply with Pharmaceutical and Pharmacological parameters and Bioequivalent to the Originator Brands.

Maczith
Azithromycin

equivalent to **Zithromax (Pfizer)**

Inpro
Omeprazole

equivalent to **Losec (AstraZeneca)**

MeXtil
Cefuroxime

equivalent to **Zinacef (GlaxoSmithKline)**

BESTCEF
Cefixime trihydrate

equivalent to **Tergecef (Unilab)**

Clamycin
Clarithromycin

equivalent to **Klaricid (Abbot)**

Glucostat MR
Gliclazide Modified Release

equivalent to **Diamicron MR (SERVIER)**

Vasofex XR
Prazosin extended release tablet

equivalent to **Minipress XL (Pfizer)**



We are Exporting to 29 Countries

BIOPHARMA
LIMITED

