ISSN: 2959-9474

President Abdul Hamid Medical College Journal

Volume-03 **Number-01** **January 2026**

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The Official Journal of President Abdul Hamid Medical College

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(*A Peer-reviewed Journal*)

Volume 03, Number 01, January 2026

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4. Materials and Methods
5. Results (With tables and figures)
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Editorial
DOI:https://doi.org/10.70945/pahmc.v03i01.01 ISSN-2959-9474

Medical education curriculum reform for MBBS students

***Begum T**

PAH Med Col J. Jan 2026; 3(1): 1-2

Medical education curriculum reform for MBBS students: Need of the present time medical education is the foundation of a strong health care system. The quality of future doctors depends largely on the curriculum followed during their undergraduate training. In recent years rapid advancement in medical science technology patient care and public health challenges have made it necessary to reform the traditional MBBS curriculum. A modern student centered and competency based curriculum is now the need of the Present Time The conventional MBBS curriculum in many developing countries remains heavily theory-based and examination-oriented. Students often focus on memorization rather than understanding clinical relevance and practical application. This creates a gap between academic learning and real-life patient care.

Graduates may possess theoretical knowledge but lack confidence in clinical decision-making, communication skills, and professional behavior.
The emergence of new healthcare challenges such as antimicrobial resistance, pandemics, mental health Disorders, climate-related diseases, and the use of artificial intelligence in medicine demand curriculum updates. Future doctors must be prepared not only to diagnose and treat diseases but also to work in multidisciplinary teams, use digital health technologies, and respond effectively to public health emergencies.
Competency-based medical education (CBME) offers an effective solution. It emphasizes clinical skills, communication, professionalism, ethics, leadership, and lifelong learning rather than only academic knowledge. Early clinical exposure, problem-based learning (PBL), simulation-based teaching, integrated assessment, and community-based education should become essential
Parts of Undergraduate Medical Training Research methodology and scientific writing should also be included in the curriculum. Medical students should learn how to critically appraise literature, conduct basic research, and contribute to evidence-based practice. This will strengthen academic development and improve healthcare outcomes in the long term. Mental health support for students is another important issue. The pressure of medical education is often associated with stress, anxiety, and burnout. A supportive academic environment and proper mentoring system necessary to ensure student well-being and professional growth.

Curriculum reform requires collaboration among medical universities, regulatory authorities, teachers, student and healthcare institution continuous feedback and regular evaluation are essential to maintain relevance and quality.
The goal of medical education is not only to produce graduate who pass examination but to develop competent compassion rate and ethical physician who can serve society effectively reforming MBBS curriculum is therefore not an option it is a necessity for the future of health care.

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Original Article
DOI:https://doi.org/10.70945/pahmc.v03i01.02 ISSN-2959-9474

Survival and mortality among patients admitted to intensive care unit of a tertiary level hospital of Bangladesh

***Khan ANMN[1], Hallaz M[2], Begum T[3], Tripura KK[4], Akter MR[5]**

Abstract

Background: *Seriously ill patients are admitted to the Intensive Care Unit (ICU) for many reasons including respiratory failure, severe infectious diseases, multiple trauma and shock, myocardial infarction, heart failure, renal failure, poisoning, postoperative care and therapeutic interventions. The rate of ICU survival or mortality varies from country to country and even from region to region within a country.*

Objective: *This study was designed to estimate survival and mortality rates among patients admitted to an ICU of Bangladesh.*

Method: *This was a cross-sectional descriptive observational study conducted among 237 patients admitted to the ICU of a non-government tertiary hospital, namely President Abdul Hamid Medical College Hospital, Bangladesh. The study was carried out from March 2020 to December 2022. Data were recorded in a case record form and statistical analysis was performed using SPSS version 25.0.*

Result: *The majority of patients (88.2%, n=209) were in the age group of 21–80 years. The mean age (±SD) of the 237 respondents was 49.83±19.65 years. More than half (53.6%, n=127) of the patients were female, while males comprised 46.4% (n=110). The majority (94.5%, n=224) were from Kishoreganj district. The average duration of hospital stay was 2.52±4.50 days. Among 237 ICU patients, 97 (40.9%) were cured after treatment, 76 (32.1%) died in the ICU, 56 (23.6%) were discharged on request bond, and 8 (3.4%) were referred to the high dependency unit (HDU) of other hospitals. The overall survival rate (cured) was 40.9%, while patients discharged on request bond (23.6%) and those referred (3.4%) are not included in the survival count.*

Conclusion: *The overall mortality rate at the ICU of President Abdul Hamid Medical College Hospital was 32.1%, which was lower than several other studies conducted around the world.*

PAH Med Col J. Jan 2026; 3(1): 3-7

Keywords: *Mortality, Intensive Care Unit, Tertiary Hospital, Postoperative Care, Survival Rate.*

Introduction

Intensive care unit (ICU) is a special treatment unit of a hospital, maintained by specially trained and equipped health personnel. It is designed for the monitoring and treatment of life-threatening conditions during the course of different acute and chronic diseases.[1] Modern intensive care medicine was introduced during the Polio epidemics in the 1950s, pioneered by the Danish anaesthetist Bjorn Ibsen in 1953 at the Kommune Hospital of Copenhagen.[2,3] Management in the intensive care unit has been increasingly demanded over the decades due to motorisation, urbanisation, hospital expansion and the emerging COVID-19 pandemic.[4,5,6] Seriously ill patients are admitted to the ICU for many

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Article History: Received: 02-02-2025 **Revised:** 28-04-2025 **Accepted:** 07-05-2025
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reasons, including respiratory failure, severe infectious diseases, multiple trauma and shock, myocardial infarction, heart failure, renal failure, poisoning, postoperative care and therapeutic interventions.[5,7] Advancement of ICU care is very limited in low-income countries. This is due to the high cost of infrastructure, lack of trained medical staff and frequent failure to incorporate international guidelines for evidence-based care and difficulties in procuring medical supplies.[6,8] All-cause mortality rates are higher in intensive care units compared to other hospital services. Primary disease severity, age of the patients and complications are the main reasons for this.[9] The rate of ICU survival or mortality varies from country to country and even from region to region within a country. The prevalence of mortality in the ICU was found to range from 9 to 61% worldwide. An international study conducted among 13,796 patients from Africa, Asia, America, Europe and Oceania showed that the prevalence of mortality in ICU was 18.2%.[10] This study was designed to estimate survival and mortality rates among patients admitted to the ICU of President Abdul Hamid Medical College Hospital, a non-government tertiary level hospital of Bangladesh.

Methodology

This cross-sectional descriptive observational study was conducted in the ICU of President Abdul Hamid Medical College Hospital, Bangladesh, among 237 purposively selected admitted patients during the period from March 2020 to December 2022. Data on socio-demographic characteristics and in-hospital outcomes of the patients were recorded in a pretested, pre-designed semi-structured case record form. Collected data were entered into the Statistical Package for Social Sciences (SPSS) version 25.0 for analysis. Qualitative variables were summarized as percentages and quantitative variables as means with standard deviations. Data were presented using tables and graphs.

Ethical Considerations: Ethical approval for this study was obtained from the Institutional Ethics Review Board (IERB) of President Abdul Hamid Medical College, Kishoreganj, Bangladesh Approval No. : **PAHMC/ERB/2023/09**. Written informed consent was obtained from all participants or their legally authorized representatives before enrollment. Confidentiality and anonymity of the participants were strictly maintained throughout the study.

Results

Socio-demographic Characteristics

This study was carried out among 237 respondents with ages ranging from 2 to 100 years. Among them, 22 (9.3%) were in the age group of 2–20 years; 60 (25.3%) in 21–40 years; 72 (30.4%) in 41–60 years; 77 (32.5%) in 61–80 years; and 6 (2.5%) in the age group of 81–100 years. The majority of them, 209 (88.2%), were in the age group of 21–80 years. The mean age (±SD) of the 237 respondents was 49.83±19.65 years (Table I). More than half, 127 (53.6%), of the patients were female, while males comprised 110 (46.4%) (Figure 1). The majority of patients, 224 (94.5%), were from Kishoreganj district; 7 (3.0%) were from Netrokona; 5 (2.1%) from Mymensingh; and 1 (0.4%) patient was from Brahmanbaria (Table II).

Table I: Age distribution of the respondents (n=237)

Age in years	Frequency (n)	Percentage (%)
2–20	22	9.3
21–40	60	25.3
41–60	72	30.4
61–80	77	32.5
81–100	6	2.5

Total	237	100.0

*Mean±SD = 49.83±19.65 years

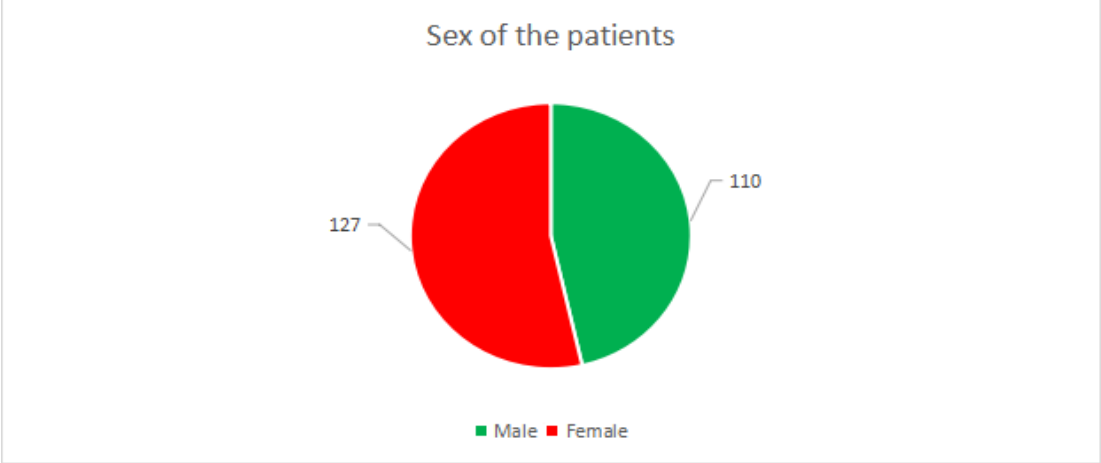

Figure 1: Sex distribution of the respondents (n=237)

Table II: Home district of the respondents (n=237)

Name of the district	Frequency (n)	Percentage (%)
Kishoreganj	224	94.5
Netrokona	7	3.0
Mymensingh	5	2.1
Brahmanbaria	1	0.4
Total	237	100.0

Duration of Hospital Stay

The majority of patients, 221 (93.2%), stayed in the hospital for 1 week, followed by 11 (4.6%) for 2 weeks, 4 (1.7%) for 3 weeks, and 1 (0.4%) for 7 weeks. The average duration of hospital stay was 2.52±4.50 days (Table III).

Table III: Duration of hospital stay of the respondents (n=237)

Duration in days	Frequency (n)	Percentage (%)
0–7	221	93.2
8–14	11	4.6
15–21	4	1.7
42–49†	1	0.4
Total	237	100.0

*Mean±SD = 2.52±4.50 days

†No patients were admitted for 22–41 days.

Outcomes of ICU Patients

Among 237 ICU patients, 97 (40.9%) were cured after treatment and 76 (32.1%) died in the ICU. Fifty-six (23.6%) patients were discharged on request bond (DORB) and 8 (3.4%) were referred to the HDU of other hospitals. The survival rate (cured pa-

tients only) was 40.9% and the mortality rate was 32.1% (Table IV).

Table IV: Survival and mortality of ICU patients (n=237)

Outcomes	Frequency (n)	Percentage (%)
Cure	97	40.9
Death	76	32.1
Discharged on Request Bond (DORB)	56	23.6
Referred	8	3.4
Total	237	100.0

Discussion

This cross-sectional descriptive observational study was carried out among 237 ICU-admitted patients with ages ranging from 2 to 100 years. In an Ethiopian study, the majority of patients were in the age range of 19–39 years.[11] In the present study, 22 (9.3%) patients were in the age group of 2–20 years; 60 (25.3%) in 21–40 years; 72 (30.4%) in 41–60 years; 77 (32.5%) in 61–80 years; and 6 (2.5%) in the age group of 81–100 years. The majority, 209 (88.2%), were in the age group of 21–80 years. The mean age (±SD) was 49.83±19.65 years. In a study from Turkey, the mean age of participants was 73.79±14.73 years (min-max: 21–93).[12]

In the present study, more than half, 127 (53.6%), of the patients were female, while males comprised 110 (46.4%). In the Turkish study, females comprised 47.7% and males 52.3%.[12] The majority of patients, 224 (94.5%), were from Kishoreganj district, which is expected given the hospital's location.

In the Turkish study, the median duration of hospitalisation was 9.1 days (min-max: 1–49 days).[12] In this study, the majority of patients, 221 (93.2%), stayed for 1 week, followed by 11 (4.6%) for 2 weeks, 4 (1.7%) for 3 weeks and 1 (0.4%) for 7 weeks. The average duration of hospital stay was 2.52±4.50 days. Among 237 ICU patients, 97 (40.9%) were cured, 76 (32.1%) died, 56 (23.6%) were discharged on request bond, and 8 (3.4%) were referred. All-cause mortality among ICU-admitted patients was 47.7% in the Turkish study,[12] markedly higher than this study (32.1%). Uysal et al. reported an ICU mortality rate higher than that observed in the present study.[9] In an Ethiopian study, the overall ICU mortality rate was 46.8%,[11] also higher than the present study. ICU mortality in low-income countries can be as high as 61%, compared to 9–18% in developed countries.[11] The mortality rate in this study (32.1%) was higher than that of developed countries but lower than several other low- and middle-income country studies. The study was limited to a single hospital with a relatively small sample size. Further studies across multiple hospitals with larger sample sizes would provide a more representative picture of Bangladesh.

Conclusion

Mortality of patients in ICU varies from country to country and even from region to region within a country. The overall mortality rate at the ICU of President Abdul Hamid Medical College Hospital was 32.1%, which was lower than several other studies conducted around the world.

Acknowledgement

The authors sincerely acknowledge the ICU staff of President Abdul Hamid Medical College Hospital for their invaluable cooperation and support during the data collection process. Their assistance and dedication greatly contributed to the successful completion of this study.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

Author Contribution

Author Contribution: Khan ANMN-study design, supervision; Begum T-data collection, manuscript writing; Hallaz M-data collection, analysis; Tripura KK-literature review, manuscript revision; Akter

MR- statistical analysis, manuscript revision. All authors read and approved the final manuscript.

Funding Source
No external funding was received for this study.

Data Availability
The data that support the findings of this study are available from the corresponding author upon reasonable request.

AI Disclosure
No artificial intelligence (AI) tools were used in the preparation of this manuscript.

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Original Article
DOI:https://doi.org/10.70945/pahmc.v03i01.03 ISSN-2959-9474

Evaluation of Changes in Serum Uric Acid in a Patient with Acute Myocardial Infarction

***Diluara K[1], Alam MTU[2], Mia MAR[3], Samsun N[4]**

Abstract

Background: *Acute myocardial infarction (AMI), more commonly known as heart attack, is a medical emergency and the leading cause of death for both men and women all over the world. There is a correlation between changes in the serum uric acid and acute myocardial infarction.*

Objectives: *This study was undertaken to evaluate the changes in serum uric acid status in patients with acute myocardial infarction.*

Methods: *The present cross sectional study was carried out in the Department of Biochemistry, Mymensingh Medical College, Mymensingh with the collaboration of the Department of Cardiology, Mymensingh Medical College Hospital, Mymensingh, during the period of July-2021 to June -2022. A total of 100 subjects were included in this study among them, 50 were diagnosed AMI patients denoted as case group & 50 were normal healthy individuals denoted as control group. Serum uric acid was determined by colorimetric method by using test kit for each sample. All statistical analysis was done by using SPSS (statistical package for social science) windows package version 21.*

Results: *The mean ± SD values of serum uric acid were 7.91 ± 0.09 mg/dl and 3.68 ± 0.72 mg/dl in case group and control group respectively. The analysis showed that, there was highly significant increase in mean serum uric acid levels between two groups were highly significant ($p<0.001$).*

Conclusion: *This was a cross sectional study. Analyzing the findings of the present study, highly significant increase in serum uric acid level were observed in AMI patients.*

PAH Med Col J. Jan 2026; 3(1): 8-12

Keywords: *Serum uric acid, Acute myocardial infarction, Cardiovascular disease, Hyperuricemia, Cross-sectional study*

Introduction

Coronary artery disease (CAD) is the commonest cause of angina and acute coronary syndrome and the leading cause of death worldwide. Cardiovascular disease will soon become the leading cause of death on all continents[1]. Acute myocardial infarction (AMI) is defined as death of cardiac muscle due to prolonged severe ischemia. Myocardial ischemia occurs when there is an imbalance between the supply (perfusion) and demand of the heart for oxygenated blood. Ischemia is characterized by not only an insufficiency of oxygen but also reduced availability of nutrients and inadequate removal of metabolites. It is the most important form of ischemic heart disease (IHD). IHD is often termed as coronary artery disease[2]. Uric acid is produced by the enzymatic activity of xanthine oxidase and is the final product of purine metabolism[3]. Increased Serum Uric Acid concentrations are associated with hypertension, atherogenic dyslipidemia, diabetes, age, alcohol consumption and renal failure. Xanthine oxidase activity and uric acid synthesis are increased in vivo under ischemic conditions, and therefore elevated serum uric acid may act as a marker of underlying tissue ischemia[4]. Hyperuricemia is associated with deleterious effects on endothelial

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Article History: Received: 07-05-2025 **Revised:** 28-09-2025 **Accepted:** 07-10-2025

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dysfunction, oxidative metabolism, platelet adhesiveness and aggregation. All of these conditions atherosclerosis. Previous studies have reported positive associations of increase serum uric acid levels with a greater risk of ischemic heart disease, high blood pressure, and an overall adverse cardiovascular risk profile[5].

Materials and Methods:

After obtaining the clearance from the Institutional Review Committee of the institute the study was conducted **Approval No. : MMC/IRB/2022/448.** The present study was a cross sectional analytical study. It was carried out in out in the Department of Biochemistry, Mymensingh Medical College & sample were collected from the Department of cardiology, Mymensingh Medical College & Hospital, Mymensingh, Bangladesh during the period from July 2021 June 2022. The subjects were selected on the basis of inclusion & exclusion criteria by purposive (non- random) sampling method. A total of 100 subjects were included in this study. Out of them 50 were case (patients with acute myocardial infarction) and 50 were control (apparently healthy volunteers). The diagnosis was based on history taking, clinical examination ECG findings & changes of cardiac biomarkers.

Inclusion criteria:

1. Group-I (case) diagnosed AMI patients and age ranging from 40-65 years.
2. Group- II (control) apparently healthy people of same age group.

predispose to

Exclusion criteria:

1. Patients suffering from organic (Heart failure, cardiomyopathy) heart disease other than AMI.
2. Patients having history of chronic diuretic therapy.
3. Subjects taking any drugs interfering uric acid.

All the subjects were clinically examined. Their age, sex, pulse and blood pressure were recorded. Everyone completed questionnaire concerning their occupation, educational status, drug history, personal history, history of recent or chronic illness etc. Data were collected by direct interview from study subjects or from their attendants. Informed written consent was taken from them. Serum Uric Acid was determined by colorimetric method by using test kit. All statistical analysis was done by using SPSS (statistical package for social science) windows package version 21. P value <0.05 was considered.

Result:

Total study subjects were 100 which were divided into two groups. Group-I consists of 50 Hospital admitted AMI patients above 40 years of both gender and group-II consists of 50 healthy subjects of same age group. Out of 100, 84 (84%) subjects were male and 16 (16%) were female. In group- I, 41 (82%) were male and 9 (18%) were female. In group- II, 43 (86%) were male and 7 (14%) were female. The age of the subjects was ranged from 40 to 65 years, with a mean age of 52.65 ± 4.93 for group- I and 51.15 ± 6.32 for group- II. Some clinical parameters are shown in table 1.

Table-I: Shows Mean ± SD of different clinical characteristics of the study subjects

Variable	Group I (case) Mean ± SD	Group II (control) Mean ± SD
Age(years)	52.65±4.93	51.15±6.32
BMI (kg/m^2)	24.31 ± 1.14	24.23 ± 1.20

Serum Uric Acid were estimated. Statistical analysis were done according to data. Results were presented by tables and figures. Serum Uric Acid were expressed in mg/dl. The study revealed that the serum Uric Acid level were higher in case (group I) when compared to (group II). The mean ± SD values of serum Uric Acid were 7.91 ± 0.09 mg/dl and 3.68 ± 0.72 mg/dl in case group and control group respectively. The analysis showed that, the difference in mean serum Uric Acid levels between two groups were highly significant (p<0.001). Analysis of mean serum uric acid levels were presented in table II.

Table-II: Comparison of mean serum Uric Acid in the study population

Variable	Group I (case) Mean ± SD	Group II (control) Mean ± SD	P value
Age(years)	7.91 ± 0.09	3.68 ± 0.72	<0.001**

P<0.001 considered as highly significant result. P value less than 0.05 taken as level of significance.

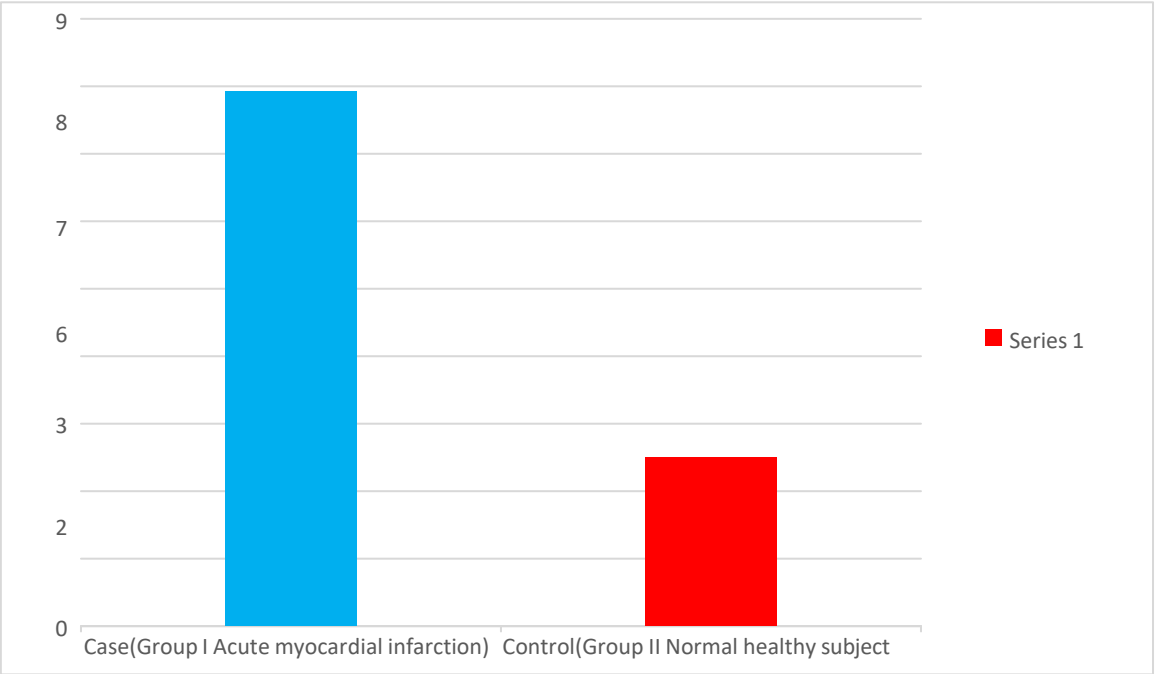

Fig-1: Comparison of mean serum uric acid levels in the study population.

Discussion:

Myocardial infarction (MI) is one of the dangerous manifestation of coronary artery disease and one of the commonest cause of mortality. MI is defined as myocardial necrosis in a clinical setting consistent with myocardial ischemia. Acute ischemia is usually, but not always caused by atherosclerotic plaque rupture, fissuring, erosion or a combination superimposed intra coronary thrombosis and is associated increase risk of cardiac death and myonecrosis[6].Myocardial necrosis following infarction is followed by heart failure, myocardial rupture or arrhythmia. Early treatment of myocardial infarction to prevent necrosis such as fibrinolysis, coronary artery bypass grafting and percutaneous coronary intervention have improved outcome[7].

In the present study, the mean values of serum uric acid levels were 7.91 ± 0.09 mg/dl and 3.68 ±0.72 mg/dl in case group and control group respectively. The level of significant was between two groups were highly significant (p<0.001). The analysis showed a significant higher level of serum uric acid in AMI patients when compared that of control group.This

finding was in agreement with the result of Padma & Banupriya (2017), Amrut et al. (2016), Uric acid promotes development of atherosclerosis. The high level of uric acid causes oxidation of LDL-C and peroxidation of lipid, formation of oxygen radicals in inflammatory reaction, increases platelet aggregation and formation of uric acid crystals in the arterial wall which damage the tunica intima of arteries and promotes coronary thrombosis[10]. Adenosine synthesized by vascular smooth muscle in cardiac tissue is rapidly degraded by the endothelium to uric acid, which undergoes rapid efflux to the vascular lumen due to low intracellular pH and negative membrane potential. Xanthine oxidase activity and uric acid synthesis are increased in vivo under ischaemic conditions, and hence elevated serum uric acid may act as a marker of underlying tissue ischemia[11].

Conclusion:

Acute myocardial infarction (MI) continues to be a major public health problem in the industrialized world and is becoming an increasingly important problem in developing world. Acute myocardial infarction (AMI) is the most important consequence of coronary artery disease and it can lead to complications such as ventricular arrhythmia and congestive heart failure. The purpose of the study was to evaluate the serum uric acid level in AMI and compare with healthy volunteer. Mean ± SD of serum uric acid level of the case group were increased significantly while compared with that of the control group. Analyzing the findings of the present study, significant increase in serum uric acid level were observed in AMI patients. Therefore it may be recommended that estimation of serum uric acid may help the clinicians of for better management of the patient of AMI.

Acknowledgement

The authors sincerely acknowledge the staff of the Department of Cardiology, Mymensingh Medical College Hospital, for their cooperation and support during the data collection process.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

Author Contribution

Diluara K - study design, supervision; Alam MTU - data collection, manuscript writing; Mia MAR - data collection, analysis; Samsun N - literature review, manuscript revision. All authors read and approved the final manuscript.

Funding Source

No external funding was received for this study.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

AI Disclosure

No artificial intelligence (AI) tools were used in the preparation of this manuscript.

Plagiarism Statement

This manuscript was checked for plagiarism using standard software, and the report was submitted to the editorial board along with the manuscript.

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Original Article
DOI:https://doi.org/10.70945/pahmc.v03i01.04 ISSN-2959-9474

Relation of serum C3 level and ASO titre with clinical profile and immediate outcome of Children with Acute Glomerulonephritis

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Abstract

Background

Acute glomerulonephritis (AGN) is a common pediatric renal disease in developing countries. Reduced serum complement C3 levels and elevated antistreptolysin O (ASO) titres are frequently observed in post-streptococcal AGN and may aid in diagnosis and assessment of disease severity.

Methods

This cross-sectional study was conducted in the Department of Pediatrics, Mymensingh Medical College Hospital, from April 2019 to March 2020. A total of 36 children diagnosed with AGN and fulfilling the inclusion criteria were enrolled. Clinical features, serum C3 levels, and ASO titres were evaluated, and their relationship with short-term outcomes was analyzed.

Results

Most patients (63.9%) were aged 6–12 years, predominantly male, and from rural areas. A preceding streptococcal infection was present in 83.1% of cases. Common clinical features included periorbital puffiness, oliguria, hematuria, and edema. Elevated ASO titres were found in 77.8% of patients, while low serum C3 levels were observed in 52.8%. Complete recovery occurred in 66.7% of cases, whereas 30.6% developed complications and 2.8% died. Elevated ASO titre was significantly associated with oliguria and hematuria, while low C3 levels were significantly associated with ascites. However, neither ASO titre nor C3 levels showed a significant association with short-term outcomes.

Conclusion

Serum C3 levels and ASO titres are useful supportive diagnostic markers and may reflect disease severity in children with AGN. However, their role in predicting short-term outcomes appears limited. Larger multicenter studies are recommended for further validation.

PAH Med Col J. January 2026; 3(1):13-19

Keywords: *Acute glomerulonephritis, Serum C3,Antistreptolysin O titre, Children, Post-streptococcal infection, Outcome.*

Introduction

Acute glomerulonephritis (AGN), predominantly post-streptococcal glomerulonephritis (PSGN), remains a major cause of pediatric renal morbidity and mortality in developing countries. In a pediatric cohort from Kashmir, PSGN accounted for 83.3% of AGN cases, with most patients under 10 years and a male predominance.[1] Clinically, AGN presents with hematuria, oliguria, edema, and

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Article History: Received: 03-04-2025 Revised: 23-06-2025 Accepted: 08-07-2025
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Hypertension, sometimes progressing to acute renal failure, hypertensive encephalopathy, or congestive heart failure .[2] Laboratory evaluation plays a key role: serum complement C3 is reduced in over 90% of PSGN cases during the acute phase but usually normalizes within 6–8 weeks. [3,4] Elevated antistreptolysin O (ASO) titre serves as a marker of recent streptococcal infection, although sensitivity varies with infection type .[3] However, the relationship of these markers with clinical presentation and short-term outcomes in children, particularly in resource-limited settings, remains inadequately explored. So. this study was done to see the relationship of serum C3 level and ASO titre with clinical profile and immediate outcome of children with acute glomerulonephritis.

Materials and Methods

This cross-sectional observational study was conducted in the Department of Pediatrics, Mymensingh Medical College Hospital, Mymensingh, over a 12-month period from April 2019 to March 2020. The study population comprised children admitted with a diagnosis of acute glomerulonephritis (AGN). A purposive sampling method was employed, and a total of 36 patients were included.

Children aged between 2 and 12 years presenting with clinical features of AGN were eligible for inclusion. Patients with recurrent episodes of similar illness or with concomitant renal diseases were excluded. During the study period, 44 cases of AGN were admitted; of these, 36 met the inclusion criteria, while 8 were excluded.

Data Collection and Clinical Management:

After enrollment, a detailed clinical evaluation was performed, and relevant laboratory investigations—including serum C3 level and antistreptolysin O (ASO) titre—were obtained. Management consisted of bed rest, fluid and salt restriction, and administration of frusemide in all patients with edema and hypertension. Nifedipine was used as a second-line antihypertensive agent when required. Patients were monitored daily through clinical examinations, including assessment of consciousness level, respiratory rate, heart rate, blood pressure, urine color, and urine output. Laboratory monitoring included urine routine and microscopic examination (R/M/E), serum creatinine, and blood urea, performed as per protocol. Clinical features and outcomes were recorded and analyzed in relation to serum C3 level and ASO titre.

Ethical Considerations and Statistical Analysis:

Written informed consent was obtained from the parents or guardians of all participants. Confidentiality was strictly maintained, and all interviews were conducted in Bangla to ensure comprehension. Ethical approval for the study was obtained from the Institutional Review Board (IRB) of Mymensingh Medical College Hospital (MMCH).

Data were entered into SPSS version 22.0 for analysis. Qualitative variables were summarized using frequencies and percentages, while quantitative variables were expressed as mean ± standard deviation. Appropriate bivariate and multivariate analyses were performed as required, and a p-value of <0.05 was considered statistically significant.

Results:

This cross-sectional study was conducted in the Department of Pediatrics, Mymensingh Medical College Hospital, from April 2019 to March 2020 to assess the relationship of serum C3 level and ASO titre with the clinical profile and immediate outcomes of children with acute glomerulonephritis (AGN). A total of 44 cases of AGN were evaluated during the study period. Of these, 36 patients were included in the analysis, while 4 were excluded due to a previous history of similar illness and the presence of concomitant other renal disease.

Table I: Distribution of study population by demographic characteristics (n=36)

Table I showed most of the patients age was in between 6-12 years, were male predominant and most of them came from rural area.

Demographic characteristics	Frequency (n)	Percentages %
Age in years		
2-6 years	13	36.1
6-12	23	63.9
Sex		
Male	22	61.1
Female	14	38.9
Residence		
Rural	24	66.7
Urban	12	33.3

Table II: Distribution of study population by history of infections (n=36)

Previous history of streptococcal infection	Frequency n	Percentage%
Sore throat	08	22.2
Skin infection	22	61.1
Both sore throat and skin infection	01	2.8
No history of infection	05	13.9

Table II showed distribution of study population by previous history of infections. 83.1% children had history of streptococcal infections. Only 13.9% children had no history of streptococcal infection.

Table III: Clinical Features (Symptoms and Signs)

Feature	Frequency(n)	Percentage%
Puffiness of face	32	88.9%
Oliguria	31	86.1%
Hematuria	30	83.3%
Pedal edema	25	69.4%
Fever	21	58.3%
Hypertension	36	100%
Ascites	12	33.3%
Tachycardia	21	58.3%

Table III showed puffiness of face,oliguria, gross hematuria were more frequently found symptoms of AGN and hypertension, ascites, tachycardia were more frequently signs of AGN in children.

Table IV: Laboratory Findings

Parameter	Frequency(n)	Percentage%
Proteinuria	36	100%
Microscopic hematuria	35	97.2%
RBC casts	19	52.8%
High ESR	28	77.8%
Raised ASO titre	28	77.8%
Low serum C3	19	52.8%
Raised blood urea	9	25.0%

Table IV demonstrates that all patients presented with proteinuria, and the majority (97.2%) had microscopic hematuria on urine examination. RBC casts were detected in 52.8% of cases, elevated ESR was observed in 77.8% of patients. Raised ASO titre and low serum C3 level were found in 77.8% and 52.8% of patients, respectively. Raised blood urea was noted in 25.0% of cases.

Table V: Complications and Outcomes

Category	Frequency(n)	Percentage%
Congestive cardiac failure	5	13.9%
Hypertensive encephalopathy	4	11.1%
Acute renal failure	2	5.6%
Recovery without complications	24	66.7%
Recovery with complications	11	30.6%
Death	1	2.8%

Table V shows most common complication was congestive cardiac failure (13.9%), followed by hypertensive encephalopathy (11.1%) and acute renal failure (5.6%). Among 36 patients, 66.7% recovered completely, 30.6% developed complications and only 2.8% patient died during the course of treatment.

Table VI: Significant Associations

Variable	Association	p-value
ASO titre	Oliguria	0.028
ASO titre	Hematuria	0.004
ASO titre	Fever	0.003
ASO titre	Post-streptococcal AGN	<0.001
Low C3	Ascites	<0.05

Table VI shows Raised ASO titre showed significant associations with oliguria ($p=0.028$), gross hematuria ($p=0.004$), fever ($p=0.003$), and post-streptococcal AGN ($p<0.001$). Low serum C3 level was significantly associated with ascites ($p<0.05$). These findings suggest that ASO titre correlates with streptococcal etiology and key clinical manifestations, while low C3 may indicate disease severity.

Discussion:

This cross-sectional study was conducted at the Department of Pediatrics, Mymensingh Medical College Hospital, from April 2019 to March 2020, including 36 children aged 2–12 years diagnosed with acute glomerulonephritis (AGN). Clinical evaluation and laboratory tests, including serum ASO titre and C3 levels, were performed to assess their associations with clinical features and short-term outcomes. The peak incidence was noted between 6–12 years (63.9%), consistent with previous studies.[5] Kumar et al. also reported a predominance during school age, likely due to greater exposure to hemolytic streptococcus. [4]Earlier reports indicated that AGN rarely occurs below 2 years, attributed to immaturity of the immune complex system and lower incidence of pharyngitis in this age .[6,7]

Of the 36 children, 22 were male and 14 were female, showing a male predominance (61.1%). Similar findings have been reported in previous studies, where boys were more frequently affected by AGN. [8-10] This predominance may be related to greater environmental exposure and higher susceptibility to infections among males. In this study, 66.7% of the children were from rural areas, while 33.3% were from urban areas. Comparable results were reported by Khyber et al. [11]

Acute glomerulonephritis in children is attributable to streptococcal infection in about 80–98% of cases. A history of preceding streptococcal infection is considered an established risk factor, illustrating the causal link with AGN. In the present study, 61.1% of children had a history of skin infections, 22.2% had a history of sore throat, while 16.7% reported no history of either. These

findings are consistent with earlier studies. Hannan et al. reported a history of skin infection in 50% of cases and sore throat in 11.1%[5], whereas Bhuiyan reported skin infection in 42.1% and sore throat in 42% .[12]

The most frequently observed symptoms of AGN in this study were scanty urine (86.1%), puffy face (88.9%), and gross hematuria (83.3%). Other symptoms included fever (58.3%), headache (25.0%), respiratory distress (8.3%), and convulsion (5.6%). On physical examination, common findings were edema (88.9%) and hypertension (86.1%). Less frequent findings included pallor (19.4%), tachycardia (36.1%), ascites (27.8%), hepatomegaly (8.3%), and anuria (2.8%). Similar clinical features have been reported in several previous studies. [5,13]

In clinical practice, the diagnosis of AGN is usually straightforward when patients present with the cardinal manifestations of hematuria, edema, and hypertension. Collectively, these features are referred to as the nephritic clinical presentation. Papangnou and Known (2008) reported hematuria as a universal finding, even if only microscopic .[14]In the present study, hypertension was observed in 88.3% of patients, comparable to the findings of other studies .[4,5,12]The high prevalence of hypertension may be attributed to delays in seeking early treatment, resulting in advanced sequelae of the disease.

Routine urine microscopy in AGN commonly shows hematuria and urinary casts. In this study, RBCs were detected in 97.2% of cases, pus cells in 44.4%, and RBC casts in 52.8%, making them the most frequent cast type. Similar findings have been reported in previous studies, where microscopic hematuria was observed in over 90% of patients and RBC casts in 70–80% of cases, supporting the diagnostic value of urinary microscopy in AGN .[15-17]

In the present study, patients presented with varying grades of proteinuria. Among them, 63.9% had protein content (+), 30.6% had (++), and 5.6% had (+++). The proportion of subjects with proteinuria in this study is comparable to previous findings .[18] However, Rashid et al. reported proteinuria in more than 95% of cases. [19]

Raised ASO titre (>200 IU) was observed in 77.8% of cases in this study. Similar findings have been reported in previous studies, although the specificity and sensitivity of ASO titre remain relatively low. [19]

Regarding complications, hypertensive encephalopathy was the most common (11.1%), followed by heart failure (8.3%) and acute renal failure (2.8%). One patient (2.8%) presented with both heart failure and hypertensive encephalopathy. In contrast, Khyber et al. reported that 30.65% of patients were uncomplicated, while 9.6% had urinary tract infection (UTI), 8.06% had heart failure, and 1.61% had hypertensive encephalopathy. [11]The higher incidence of complications in the present study may be explained by the fact that less severe cases often do not present to hospitals; patients usually seek hospital care only when their condition worsens and is no longer manageable with treatment from local practitioners.

The prognosis of AGN is generally better in children than in adults. Previous studies have reported complete recovery rates ranging from 60% to 100% ,[19] while case fatality rates vary from 0% to 13%. [11] Mortality in the acute stage is usually attributed to circulatory congestion, cardiac failure, acute renal failure, and hypertensive complications. In the present study, 97.2% of patients achieved complete recovery at discharge, while case fatality occurred in 2.8% of cases due to heart failure. This fatality rate is comparable to findings from other studies.[19]

In this study, raised ASO titre was not significantly associated with clinical symptoms, signs, or overall outcomes of AGN. However, oliguria and gross hematuria showed a significant association with elevated ASO titre. Post-streptococcal glomerulonephritis (PSGN) was also significantly associated with raised ASO titre ($p < 0.05$). In our study, ASO titre was elevated in 87.1% of subjects in the PSGN group compared to 20.0% in the NSGN group at clinical onset. A previous study reported higher frequencies, with ASO titre

elevated in 96% of PSGN cases and 51.7% of NSGN cases at onset.[20] This suggests that sole reliance on elevated ASO titre as a diagnostic marker in acute nephritic illness may be misleading.

Serum C3 level was found to be low in 54.8% of patients with a history of post-streptococcal infection, consistent with findings from several other studies.[21] In contrast, among patients without such a history, 38% had low C3 levels. A similar observation was reported by Schroff, Ravichandran, and Acharya.[20]

Conclusion:

From this study, it can be concluded that 77.8% of children had a raised ASO titre, while 52.8% had low serum C3 levels. Oliguria and hematuria were found to be significantly associated with raised ASO titre. Low C3 levels were significantly associated with the presence of ascites. However, serum C3 levels and ASO titres were not significantly associated with the immediate outcome of AGN.

Limitations of the Study:

This study was conducted on a relatively small sample size, which may limit the generalizability of the findings. Being a single-center, hospital-based study, the results may not fully represent the broader community population. In addition, the cross-sectional design did not allow for long-term follow-up to assess delayed complications or recovery patterns. Some laboratory parameters and potential confounding factors could not be evaluated due to resource constraints.

Acknowledgement

The authors sincerely acknowledge the staff of the Department of Pediatrics, Mymensingh Medical College Hospital, for their cooperation and support during the data collection process.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

Author Contribution

Begum R-study design, supervision, manuscript writing; Ali MA- clinical evaluation, manuscript revision; Khatun S - ethical oversight, manuscript review; Rahman M-data analysis, literature review; Nuruzzaman M - patient management, data collection; Das K - clinical assessment, manuscript review; Bari MA - data collection, follow-up; Rabeya T - statistical analysis, manuscript preparation; Ahammad AN - data entry, literature search; Alam N - laboratory coordination, manuscript review. All authors read and approved the final manuscript.

Funding Source

No external funding was received for this study.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

AI Disclosure

No artificial intelligence (AI) tools were used in the preparation of this manuscript.

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Case Report
DOI:https://doi.org/10.70945/pahmc.v03i01.05 ISSN-2959-9474

Revision with metaphyseal locking compression plate (MLCP) by compression technique for aseptic non-union of the shaft of femur combined with corticocancellous autogenus bone graft

***Mustofa MG[1], Bhadra A[2], Saha S[3]**

Abstract

Background: *Non-union of femoral shaft represents a significant socio-economic burden due to prolonged patient morbidity, inability to return to prior function, gait abnormality, re-operation and psycho-emotional impairment. Despite advances in trauma care, improved surgical techniques and latest implants, non-union still persists.*

Objective: *To evaluate the outcomes of revision with metaphyseal locking compression plate (MLCP) by compression technique combined with corticocancellous autogenous bone graft in the treatment of aseptic non-union of the shaft of femur.*

Case Summary: *A 55-year-old female patient had a history of trauma due to fall from a CNG auto-rickshaw (high velocity road traffic accident), sustaining a closed fracture of the mid-shaft of the right femur, previously treated by interlocking intramedullary (ILIM) nailing. She presented one year later with confirmed non-union. She was admitted to President Abdul Hamid Medical College Hospital and treated by revision with MLCP and corticocancellous autogenous bone graft.*

Results: *MLCP combined with autologous corticocancellous bone graft showed good functional results at the end of ten months postoperatively, following prior repetitive failure of implants due to non-union. ASAMI bone and functional scores were Excellent.*

Conclusion: *Revision with MLCP by compression technique combined with corticocancellous autogenous bone graft is an effective treatment for aseptic non-union of the femoral shaft.*

PAH Med Col J. Jan 2026; 3(1): 20-29

Keywords: *Non-union, Femoral shaft fracture, Metaphyseal locking compression plate, MLCP, Bone graft, Compression technique.*

Introduction

Femoral fracture is one of the most common disease of the traumatic orthopaedics. The incidence rate is about 10-26.7 per 100000 persons per year and is often caused by high energy mechanism such as motor vehicles, high altitude fall injuries and padestrain accidents. Non-union is one of the most common complications (about 1.9%-11.3%)[4]. It is often related to surgeon's lack of understanding of different fracture types and inappropriate treatment plans that leads to differences in the etiology of iatrogenic bone non union[5]. Long bone non-unions have a devastating impact on patient's quality of life and cause a high socio-economic burden.[6]The occurrence of non-union is multifactorial and the mechanical and biological factors include inadequate immobilization, comminuation, bone defects, poor vascularity of the fracture fragments, poor soft tissue envelop and local infection [7]Fracture personalities and patient backgrounds also play important roles in the development of non-unions[8]. Now days, with rapid development of implants and surgical techniques, more fractures are being caused by surgeryy when reliable stability and early mobilization are achived. However, diaphyseal long bone non-union of femur still

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Article History: Received: 05-03-2025 **Revised:** 28-04-2025 **Accepted:** 17-05-2025
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remain a common complications[9] and are difficult to treat currently, several techniques have been used to treat diaphyseal long bone non unions including but not limited to nail dynamization, exchange nailing, augmention plating, bone transportation with external fixation [8].Among these techniques, exchange nailing has been considered as a preferred choice with biological and mechanical advantage. However, there were conflicting reports on it's success[10] and its use also has limitations [11]. Although compression plating has been described as a successful treatment of non union [12] , it is rarely mentioned in the treatment of tibia or femur diaphyseal non union[13] . Plating was even believed to produce poor result in treating non union specially in this case with infection and bone loss[14] in current work we studied a femoral diaphyseal non-union, reunited by compression plating with metaphyseal locking compression plate . Our main purpose is to investigate the result of compression plating, emphasizing the essential techniques of compressing the bone gaps and highliting the advantage of this technique.We also aim to explore compression plating as an alternative method for treatment of diaphyseal non-union of the femur.

Bone resorption as an atropic non-union of excision for infection (sequestrum) or tumors can also result in bone defects. The extend of the defect can be considered in turns of the length of the bone involved. This defect can range from few milimeters to several inches. Also the defect can be partial or segmental circumferential loss. Those involving upto more than 50 % of the circumference can heal spontaneously but often required additional treatment to restore normal volumes straight segmental defects of greater than two cm are unlikely to heal spontaneously following skeletal stabilization alone. The age of the patient, the process of chronic diseases and tobacco users may alter the potential of bone defect to heal [15].

Case report:

A 55 years old female patient had a history of RTA due to fall from CNG auto rickshaw(high velocity RTA) . Sustaining injury over right thigh leading to closed fracture mid shaft of femur of same side . From X-ray of right thigh shows fracture mid shaft of right femur with a displaced fracture fragment .

The patient admitted in KHIDMAH JANATA HOSPITAL LTD , HAYBATNAGAR , KISHOREGANJ for better treatment . After resuscitation, According to ATLS protocol. She was treated on fifth day after RTA by ORIF with ILIM nail in her right femur. She attended post operatively on 3 , 6 and 12 weeks post-operative follow up but no sign of union was seen on radiograph . Suddenly she had no follow up on the next 3 months to 10 months. After that, she suddenly attended to me. We thoroughly examined the patient and necessary investigation were done and diagnosed as a case of non-union of fracture shaft of right femur with ILIM nail in situ and a fracture gap >2.5 cm in mid shaft of her right femur . Then she admitted to PAHMCH for better treatment. We planned revision surgery by removing of ILIM nail and fixation with MLCP with corticocanceleous bone graft.

Figure B1: Post operative after 3 days with ILIM nail .

Figure B2: Features of non-union .

Figure B3: Post operative X-Ray after 3 weeks with MLCP .

Figure B4: X-Ray of post operative bone graft .

Figure A: Fracture shaft of right femur

Figure C1: Sign of bridging callus .

Figure C2: Features of healing .

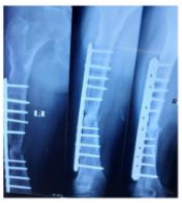

Figure C3: Features of union (consolidation phase)

Figure C4

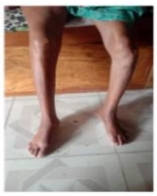

Figure C5 :Patient after recovery (C4,C5)

SURGICAL PROCEDURES:

After ensuring normal inflammatory marker's preoperatively (ESR and CRP) to exclude the possibility of active infection , she was operated upon under spinal anaestheisa . The position of the patient on the operative table was dicteted according to the bone graft donor site in a usual situation , the patient should be positioned supine and ipsilateral iliac crest should be prepared and included within the surgical drape for the posibility of harvesting bone graft , thorough a direct lateral approach to the femur engaging , the previous skin incisions whenever possible , the following steps are followed :

Debridement:

After ILIM nail was removed, proper exposure was done . We exciesd the scarred fibrous tissues from surrounding fractured site of femur , perform refreshment of fractured site,tissue samples were sent for histological and microbiological examination . We did excise the atrophic segment , however instead , after we osteotomised the atrophic segment proximally and distally , the marrow cavity was thoroughly reamed with several reamer of the femoral bone.

Plate Fixation:

Before the introduction of reamed exchange nailing, the use of compression plating for femoral shaft non unions was gold standard. The plate functions as a tension band on the lateral side. As such, it will also help with correction of mal-alignment . The bone itself absorbs the axial compression forces. In their book on non-unions , weber and Cech advocated debridement , sequestrectomy ,use of plates for "mechanical rest" and "massive cancelleous autograft". Fracture end of the femoral shaft fixed with 12 holed MLCP

with 10 locking screws and 2 cortical screws is done . The patient was treated in a single stage by removal of ILIM nail , debridement , ORIF by bridging with MLCP .

Harvesting of iliac bone graft:

Which was then impacted at the fractured non union area to enhance the biological environment for healing . From iliac crest corticocancellous bone graft was harvested preferably from ipsilateral anterior aspect of the iliac bone to reduce morbidity. The gap was filled with long chips (silvers) of autogenous iliac crest bone graft.

The surgical wound was closed by a negative suction drain which was removed after 48 hours post operatively. The patient was allowed non weight bearing walking with the help of axillary crutches. After drain tube removal, patient was discharged on sixth post-operative day after conversion of intravenous antibiotics to oral antibiotics. Stitches were removed at 2 weeks post operatively. The operative right lower limb was supported by a plaster stab for 1 month. Further follow up was done at 6 weeks and 12 weeks post operatively and monthly for 6 months to total follow up period was 10 months. Full weight bearing without supports or unrestricted use of lower limb depending upon the operated part was permitted only after fracture union was consolidated. Radiographs and clinical photographs were taken at each follow up along with clinical details as per proforma decided.

RESULTS:

In atrophic non-union; loose fibrous tissue is present at the non-union site which is avascular and biologically inactive, in that case compression done 1st to crush the tissue to invite inflammation and coming neo-vascularization, that is conducive for Neo-osteogenesis [18]

Clinical and radiological assessment was done for notice healing and bone deformity during treatment peroid. Radiological assessment was done at monthly interval, starting at the end of 1 month to 10 months. Cross sectional diameter of regenerated bone is equal to the width of bone at injury site. Union was established, if there was bridging callous across fracture site in entire cross section of orthogonal views. Union confirmed clinically by the absence of pain on weight bearing. The outcome of treatment was assessed according to ASAMI bone and functional result criteria, also complications (Deformity was evaluated as per Paley's classification (Table, 1. 2)

Table I : ASAMI scoring :19,20

Type (Score)	Criteria
Bone result using ASAMI scoring system:	
Excellent	Union , no infection , deformity <7 LLD < 2.5 cm
Good deformity <7. LLD < 2.5 cm	Union with any 2 of the following : absence of infection
Fair <7 LLD <2.5 cm.	Union with any of the following , absence of infection ,
Poor >7 and LLD >2.5cm	non union / refracture / union with infection , with deformity

Functional results using ASAMI criteria	
Excellent	Active , no limp , minimum knee stiffness (loss of <15 degree dorsiflexion) No RSD , insignificant pain .
Good	Active , with 1 or 2 of the following : limp , stiffness , RSD , significant pain .
Fair	Active , with 3 or all of the following : limp , stiffness , RSD , significant pain .
poor	Inactive (unemployment or inability to perform daily activities because of injury).
Failures	Amputation

LLD – limb length discrepancy , RSD – Reflex sympathetic dystrophy

Table II: Paley classification of bone deformity

Paley Type	Deformities
Type 1	Intact femur with mobile hip and knee a. normal ossification proximal femur . b. delayed ossification proximal femur .
Type 1-0	Ready for surgery , no factors to correct before lengthening .
Type 1-1	One factor to correct before lengthening
Type1-2	Two factor to correct before lengthening
Type1-3	Three factors to correct before lengthening.
Type 2	Mobile pseudoarthrosis with mobile knee a. femoral head mobile in acetabulam b. femoral head absent or stiff in acetabulam
Type 3	Diaphyseal deficiency of femur a. Knee motion >45 degrees b. Knee motion <45 degrees

Factors requiring correction prior to lengthening of femur : NSA < 90 degree +/- delayed ossification proximal femur , CE angle < 20 degrees sublaxing patella and/or dislocating knee .

In the subsequent follow up we found after clinical and radiogical assessment confirmed bony union. After complete healing and consolidation of regenerated bone , substantiated by radiological evidence without removing of plate . She was instructed to incur physiotherapy to recuperate range of motion (ROM) at the knee and hip joint. ROM of the knee was 0-100° and normal hip motion. C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) were done. 3 consecutive tests in a week of surgery, the values were in normal range and did not increase . Intraoperative bacteriological culture was done to see deep seated infection. There was no evidence of infection.

Table III: Bone healing status of the patient:

Criteria	Patient presesnt
internal fibrous tissue (months)	6 months
Consolidation time (months)	8 months
Union time (months)	10 months
Consolidation index	30 day / cm

Table IV: Bone defect status of the patient:

Criteria	Patient Profile
Femoral defect at first (cm)	nil
Bone ressection (cm)	nil
Angulation after fixation	10 degree
Amount of elongation (cm)	nil
Shortening at the end (cm)	0.5 cm
Follow up (month)	10 months

Table V: ASAMI criteria, bone and functional status also complication, classification of the patient:

Criteria	patient present
ASAMI bone	Excellent
ASAMI function	Excellent
Knee flexion	135 degree full flexion
Knee extension loss	0 degree (no loss)
Paley 1	intact femur with normal range of movement of knee and hip joint
Paley 2	none
Paley 3	none

-Bone union , no infection , angulation , LLD-0.5 cm
Active , no limp , full ROM knee (flexion 135 degree , extention 0 degree) , No RSD , no pain .
-After 12 months or one year of ORIF with MLCP , now the patient's full free movement of knee and hip joint . She had no question during walking.
The patient followed up regularly, bridging callous was seen around 6 weeks radiologically and union around 8 months with remodelling of bone. Patient achieved Complete range of motion and complete union with at the end of 10 months of surgery but mild stiffness RT. Knee joint . At present patient walk without the help of walking aid or crutches .

Discussion:
Muller and Rosen first described the utilization of the plate compression principle in the treatment of femoral non unions. Despite the disadvantages of upper blood loss, higher rate of infection and better non union rate than with exchange nailing plate osteosynthesis has been proven effective. Since there's high risk of infection and non-union with plating we have avoided to do it . In our case since non union with implant failure already occurred we decided to do MLCP with bone grafting.

Bone grafting techniques are used as adjuncts Combined with some surgical techniques usually plating Autologus bone graft are often obtained either from the iliac crest or from the reaming products.. In case of Intramedullary nailing autogenous bone has repeatedly been shown to be superior to all other types of bone grafts or bone substitute .

Cancellous bone features a large surface area and more cells a survive per unit volume of graft than in cortical bone grafts. Therefore autogenous cancellous bone features a greater potential to form new bone than autogenous contical bone. Osteoinduction is the process of recruitment mesenchymal precursor cell to differentiate into pre osteoblast on chondroblast leading to cartilage and bone production (16,17) . Osteoconduction occur through provision of matrix for the ingrowth of recipient site capillaries in vascular tissue and osteoprogenitor cell necessary for bone formation (15-16,17) .

The cortical graft functions as a scaffold and mechanically structure during bone replacement. Cortical bone graft heal for more slowly than cancellous bone grafts but follow the identical sequential process . Those delay is said to slowed revascularization in cortical graft secondary to the limited porosity of cortical bone . After failure of fixation due to non union twice attempted autologous cortical and cancellous bone graft with metaphyseal locking compression plating yielded good functional result .
Femoral shaft fractures are frequently occuring injury due to high energy trauma such as road traffic accident and also low energy trauma , like fracture in elderly caused by osteoporosis . Femoral shaft fractures are 10-21 % per 100000 per year . In this case , Gustilo type I , comminutedfracture , middle segment shaft of the right femur by motor vehicle accident ..
There are many treatment options in fracture shaft of femur but deficiency of standard guidelines the treatment options are open reduction and internal fixation (ORIF) by plate , intramedullary nail by external fixation . The more diversity of treatment options reflect more challenges of femoral shaft fractures: Depending upon the surgeons, treatment option may choose on their experience, knowledge and availability of tools and implants. Plate fixation is suitable in comminuted fracture shaft of femur and Minimally invasive plate Osteosynthesis (MIPO) procedure preserve vascularity and soft tissue which facilated bone healing.

The patient's fracture was fixed by Metaphyseal locking compression plate (MLCP) for Non-union. Post operative radiographs ensured bony fragments (graft) and plate was in position, maintaining well alignment with minimal fracture gap between fragments.

Infection and non union are the morbid complications of femoral fractures. Infections are more common in open tracture and also caused by superficial surgical site Infection (SSTI). The incidence of infection in closed bone fracture 1-3%, and it is higher in open fracture that is 5 % in Gustilo Type I, 10% in Gustilo Type-II 15% Gustilo type III. In femoral fracture infection rate is 4-7% in open, 1-2% in closed cases and surgical site infection (SSI) in femur fracture are 3.6% to 4.8%. The fracture complexity and soft tissue demage are the critical factors that influence the risk of infection. Thorough clinical evalution, proper investigations and a specific treatment strategy , are the troublesome factors to diagnosis infection after long bone fracture surgery. Complete blood counts (CBC), ESR, CRP with radiological image studies can be give accurate information if underlying infection. Infected tissue Culture provides the final and specific diagnosis post implant classification is done according to Roman CL. Et. Al.

Stage-1: wound debridement and surgical toileting intravenous antibiotic given as per culture and sensitivity test (C/S). No need for implant removal.

Stage: 2: Treated with antibiotic with or without implant removal.

Stage 3: Implant removed and sucessfully treated by external fixator. Infection causes delay union or may lead non union of fracture due to decrease blood flow and tissue damage.

Table VI. Romano cl. Et.al. classification of post implant infections

	stage 1	stage 2	stage 3
Post op. period	2-6 week	2-9 months	>2 monthas
Involvement of tissue	soft tissue	bone (non intra medullary)	Bone (intra medullary)
Removal of implant	not required	not required	required

Table VII : clinical signs observed in the patient with SSI in femur fracture

Clinical signs	patient present
serous or bloody exudates	no
edema , hypermia and local temparature increases	yes
purulent or yellowish or greenish exudate	no
hardened or floating area in place	no
sensory lowering and vomiting	no
local pain	yes

During subsequent follow up wound was healed and infection subsided. According to Romano classification (Table-VI) the fracture was in stage 1. Post implant infection, as infection was diagnosed within 2 weeks of initial surgery and not spread to bone. The plate provides sufficient stability. That is why of initial surgery it kept in position.

Refractures are another complication by further trauma where implant failure in the region of improper callus formation. The incidence of refracture is 6.5 to 14.2%. Approximately 5-12% non-unions occur in all fracture and it is around 20% for diaphyseal fracture. Delayed union (3%) and non unions are more common in femur fracture (1.1 % - 14%).On average 200 cases of long bone non unions occur per population, estimating of 150,000 cases in Europe each years.

The patient came after 4 months of her operation with complaints of mild pain in

Right thigh during walking following trauma by fall. During physical examination we found mild tenderness without any abnormal mobility at fracture site. There were no sign of infection. Knee and hip joints movement mildly restricted due to pain. In radiograph, There was bridging callus formation was seen with no angulation and other deformities. There were 3 cm callous formed subsequent next several follow up and limb functions are excellent movement except mild stiffness .

Consent:
We are certify that we have taken all appropriate patient's consent form. In the forms , the patient given her consent for use of her images (both photographic and radiological) and clinical information to be published both in electronic and print form. The patient understand that her name, and initials will not be published and due efforts will be made to hide his identity.

Acknowledgments:
We are the authors declared; none of us received any payment or benefit from other third party directly or indirectly.

Author Contribution
Mustofa MG - study conception, surgical procedure, manuscript writing; Bhadra A -clinical management, manuscript revision; Saha S - data collection, follow-up, manuscript revision. All authors read and approved the final manuscript.

Funding Source
Funding Source: No external funding was received for this study.

Data Availability
Data Availability: The data that support the findings of this case report are available from the corresponding author upon reasonable request.

AI Disclosure
AI Disclosure: No artificial intelligence tools were used in the preparation of this manuscript.

Conflicts of interest.
There is no conflict of interest.

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Review Article
DOI:https://doi.org/10.70945/pahmc.v03i01.06 ISSN-2959-9474

Polycystic Ovary Syndrome and Women's Health in Resource-Limited Settings: A Narrative Review with Insights from Floodplain Regions of Bangladesh

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Abstract

Polycystic ovary syndrome (PCOS) is a prevalent endocrine disorder with reproductive, metabolic, and psychosocial consequences. Evidence is dominated by high-income or urban settings; far less is known about PCOS in resource-limited, ecologically vulnerable contexts such as Bangladesh's floodplain (haor) regions, To synthesize global and regional evidence on PCOS and interpret its relevance for Bangladesh—especially floodplain communities—by mapping prevalence, determinants, psychosocial impact, comorbidities, treatments, and conceptual frameworks, and by identifying practice and research priorities.A narrative review (English, 2010–May 2025) of PubMed, Scopus, Web of Science, and Google Scholar identified 21 peer-reviewed studies. Data (design, population, findings) were extracted into a matrix and thematically grouped into six domains:[1] prevalence/burden,[2] determinants[3],psychosocial/cultural[4],comorbidities and long-term outcomes[5], treatment/interventions, and[6] conceptual/mixed evidence. Globally, PCOS affects 6–15% of women of reproductive age, with higher estimates in South Asian cohorts. However, no population-based data exist for Bangladesh. Determinants consistently include insulin resistance, obesity, dyslipidemia, and genetic/familial risk, compounded in floodplain settings by poverty, food insecurity, and limited access to diagnostics. Psychosocial burden—depression, anxiety, stigma—appears substantial yet under-studied locally. Comorbidities span metabolic syndrome, type 2 diabetes, cardiovascular disease, thyroid dysfunction, sleep disturbance, and adverse pregnancy outcomes. Treatment recommendations (lifestyle change, metformin, ovulation induction, ART) face feasibility barriers in rural Bangladesh due to cost, monitoring gaps, and cultural constraints. Across domains, evidence specific to haor communities is absent.

PCOS in Bangladesh—particularly in floodplain regions—likely represents an underrecognized multisystem burden. Priority actions include integrating symptom screening and metabolic/thyroid checks into reproductive and NCD services; task-sharing with community health workers; culturally adapted lifestyle programs; basic mental-health screening; stronger referral pathways; and targeted research (community prevalence, psychosocial studies, pragmatic trials, health-system readiness, and genetic/familial risk).

PAH Med Col J. Jan 2025; 2(1): 30-37

Keywords: *Polycystic Ovary Syndrome; Reproductive Health; Metabolic Syndrome; Mental Health/Psychosocial Factors; Resource-Limited Settings; Bangladesh Floodplain (Haor) Communities*

Introduction

Polycystic ovary syndrome (PCOS) is a leading endocrine disorder affecting 6–15% of reproductive-aged women worldwide. [1,,2.] It presents with infertility, menstrual irregularities, hirsutism, acne, obesity, and metabolic abnormalities [3,4] Long-term risks include metabolic syndrome, diabetes, cardiovascular disease, and adverse pregnancy outcome occurs.[5–7.] Despite its prevalence, PCOS is underdiagnosed, especially in low-resource settings with limited awareness, diagnostics, and specialist care [8]. Global research on PCOS has grown, covering prevalence, determinants, psychosocial effects, and treatment [1,3,9–11].

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Article History: Received: 03-09-2025 **Revised:** 23-10-2025 **Accepted:** 18-12-2025
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Yet most data come from high-income or urban settings, where diagnostic assays and ultrasound are accessible. In rural contexts, inadequate infrastructure and specialist shortages limit applicability of global guidelines.[12] Barriers also affect treatment: lifestyle change and drugs such as metformin face challenges of affordability, diet patterns, and health literacy. [13,14]

In South Asia, PCOS burden is high due to genetics, diet and rising insulin resistance [15] Studies from India, Pakistan, and Nepal report prevalence above global averages, often with obesity, infertility, and psychosocial distress. [16–18]

In Bangladesh, evidence is scarce, limited to urban tertiary hospitals. Many women remain undiagnosed due to low awareness, stigma, and lack of standardized pathways, despite of national progress in maternal health and growing recognition of non-communicable and chronic reproductive disorders [19,20]

Flood plain (*haor*) regions, including Kishoreganj, pose added risks. These wet lands remain submerged for six to seven months annually, isolating communities from health facilities [21]. Due to shortages of providers, referral gaps, and lack of diagnostic tools combine with seasonal food insecurity and restrictive gender norms to heighten PCOS vulnerability [22] Yet no prevalence data exist for these populations.

Psychosocial effects are also underexplored in Bangladesh. International evidence shows women with PCOS experience depression, anxiety, low quality of life, and stigma. [23–25.] In South Asia, infertility can cause marital strain and loss of social standing [26]. Such burdens may be intensified in rural floodplains, where health literacy is limited and taboos restrict dialogue. No qualitative studies from Bangladesh address these experiences.

Comorbidities such as thyroid dysfunction, metabolic syndrome, diabetes, and obstetric complications are well documented globally. [6,7,27] A Bangladeshi study has reported thyroid dysfunction [28] but broader data are lacking. Given the country's rising burden of diabetes and hypertension, integrating PCOS screening into NCD programs is a pressing need. [29]

Treatment guidelines recommend lifestyle change, metformin, letrozole, and assisted reproductive technologies. [30,31] Yet in Bangladesh, cultural and economic constraints limit feasibility [13,32], and ART is mostly unavailable in rural areas.

These gaps—epidemiological, psychosocial, and clinical—underscore the need for context-specific evidence in Bangladesh's floodplains. This review synthesizes global and regional literature, identifies research and policy priorities, and frames PCOS as a reproductive, metabolic, and sociocultural disorder with implications for women's health in vulnerable regions like Kishoreganj.

Methods

This study adopted a narrative review design to synthesize evidence on polycystic ovary syndrome (PCOS), focusing on prevalence, determinants, psychosocial impacts, comorbidities, and treatment in resource-limited settings. Unlike systematic reviews following PRISMA (Preferred reporting items for Systemic metaanalysis), the narrative approach allowed broader integration of global and regional findings and contextualization for floodplain regions of Bangladesh where empirical data are limited [33,34.]

Literature Search

A comprehensive search was conducted (April–June 2025) in PubMed, Scopus, Web of Science, and Google Scholar using MeSH(Medical subjects heading) and free-text terms: "polycystic ovary syndrome" OR "PCOS" OR "polycystic ovarian disease" AND ("prevalence," "determinants," "psychosocial," "treatment," "metabolic syndrome," "thyroid dysfunction," "Bangladesh," "South Asia," "rural," "floodplain"). Boolean operators refined results; reference lists were also screened [35]

Articles in English (2010–2025) were included to capture recent evidence while acknowledging key landmark studies [36] Both original research and reviews were considered, with priority given to South Asian studies [15–19].

Eligibility

Inclusion criteria: studies reporting PCOS prevalence, risk factors, psychosocial dimensions, comorbidities, or treatment strategies. Exclusion: non-peer-reviewed sources, animal/laboratory-only studies, or articles on unrelated gynecological/metabolic disorders.

Study Selection and Data Extraction

From >200 records, 25 studies meet criteria after screening titles, abstracts, and full texts. [1–32] For each, bibliographic details, design, sample, main

findings, and thematic focus were extracted into an Excel matrix for comparison.

Thematic Synthesis

Studies were grouped into six domains: (1) prevalence/burden, (2) determinants, (3) psychosocial, (4) comorbidities, (5) treatment, and (6) conceptual/mixed. This framework enabled structured synthesis and highlighted research gaps: absence of prevalence studies in floodplain populations, limited psychosocial data in South Asia, and lack of trials on culturally adapted interventions. [37–39]

Rationale for Narrative Approach

Given limited empirical research in Bangladesh's *haor* regions, a narrative review best facilitated integration of epidemiological, clinical, and cultural evidence. This approach supports identifying context-specific implications for women in ecologically vulnerable, resource-limited areas. [40]

Results

Twenty-one studies were synthesized into six domains: (1) prevalence and burden, (2) determinants, (3) psychosocial and cultural dimensions, (4) comorbidities, (5) treatment, and (6) conceptual and mixed evidence. Together, they provide global and regional insights while exposing major gaps for Bangladesh's floodplain communities.

1. Prevalence and Burden

Seven studies reported prevalence estimates [1,2,4,5,6,7,23,41]. Global prevalence ranges from 6–15%, varying by criteria, with Rotterdam yielding higher and NIH(National nstitute of health) lower estimates [1–3] South Asian rates may reach 20% due to genetic and metabolic risk. [4,,5] Bangladesh lacks population-based data, relying on hospital series [41]. Up to 50% of cases remain undiagnosed, mainly due to poor awareness and access, [6,7] a problem likely exacerbated in *haor* areas with seasonal inaccessibility. [42]

2. Determinants and Risk Factors

Five studies addressed determinants. [8–12] Insulin resistance, obesity, and dyslipidemia are central to PCOS [8,9] Socioeconomic constraints delay diagnosis, as shown in Nigeria[10] echoing barriers in rural area. Of Bangladesh. Flooding disrupts food security and mobility, worsening metabolic risk.[43.] Genetic associations such as IL-6 polymorphisms [11] and family history [12,44] are well established but underexplored in South Asia.

3. Psychosocial and Cultural Dimensions

Three studies examined psychosocial effects.[13–15] Women with PCOS show higher depression, anxiety, and reduced quality of life,[13] often linked to visible symptoms and stigma.[14.] Misconceptions about menstruation and supernatural beliefs delay care, [15] mirroring Bangladeshi cultural stigma.[45] In South Asia, infertility can reduce status and cause marital strain,[26] risks likely intensified in floodplain communities where fertility defines social identity.

4. Comorbidities and Long-Term Outcomes

Three studies highlighted comorbidities.[16–18] PCOS is linked with metabolic syndrome, diabetes, cardiovascular disease, and thyroid dysfunction.[16] Women face higher pregnancy complications, including gestational diabetes and hypertension, [17] posing public health challenges in rural Bangladesh. [46] Sleep disturbances further impair quality of life. [18] These findings frame PCOS as a chronic multisystem disorder, reinforcing the need for integration into NCD programs. [47]

5. Treatment and Interventions

Evidence on treatment is limited. Lifestyle change, metformin, and letrozole are globally recommended [19,20] but difficult in South Asia. Metformin requires monitoring for liver disease, [19] problematic in rural Bangladesh where NAFLD is rising. [48] Lifestyle advice is constrained by rice-dominated diets, poverty, and cultural restrictions on women's mobility, necessitating community-based strategies.[49] ART is available only in urban centers, leaving rural infertility untreated.[20,,50]

6. Conceptual and Mixed Evidence

Three studies offered broader perspectives results. [21–23] Consensus emphasized the multifactorial nature of PCOS, [21] while exploratory work revealed knowledge gaps and poor awareness. [22.] These studies frame PCOS as a complex public health issue requiring integrated interventions that address biological, psychosocial, and cultural dimensions [23]

Across domains, PCOS emerges as underdiagnosed, socially stigmatized, and medically complex. Determinants include metabolic, socioeconomic, and environmental risks. Comorbidities highlight chronic disease implications, while treatment strategies show a mismatch between global guidelines and local feasibility. Conceptual work underscores the need for multi-level responses. Crucially, no studies addressed PCOS in Bangladesh's floodplain (*haor*) regions, marking a critical research gap.

Table1. Summary of included studies on PCOS (n = 21), organized by thematic domain

Domain	***First Author (Year)***	***Country/ Setting***	***Study Design***	***Sample/ Population***	***Main Findings***	***Relevance to Bangladesh / Floodplain Context***
Prevalence & Burden	*Liu J (2025) 6*	*Global (GBD dataset)*	*Secondary analysis*	*Global burden data 1990–2021*	*PCOS contributes substantially to global infertility burden*	*Highlights under-recognition in Bangladesh, where no prevalence studies exist*
	Teede (2010) 5	*Australia*	*Narrative review*	*Women with PCOS*	*PCOS impacts reproductive, metabolic, psychological health*	*Global framing applicable to Bangladesh*
	Naidu (2013) [7]	*India*	*Cross-sectional*	*120 women*	*High insulin resistance and dyslipidemia in PCOS*	*Reinforces metabolic risks in South Asia*
	Nielsen (2020) [2]	*Denmark*	*Cohort*	*1,300 pregnant women*	*Higher hypertension in pregnancy with PCOS*	*Pregnancy risks likely under-reported in rural BD*
	Sultana (2018) [41]	*Bangladesh (Dhaka)*	*Hospital case series*	*120 women*	*Clinical features of PCOS in urban tertiary hospital*	*No community-level data; not representative of floodplain*
	Rotterdam Consensus (2004) [23]	*International*	*Consensus criteria*	*Diagnostic definitions*	*Criteria (NIH, Rotterdam, AE-PCOS) vary prevalence*	*Diagnostic inconsistency affects BD studies*

	Aversa (2020) [1]	*Italy*	*Consensus review*	*N/A*	*Expert definitions of PCOS complexity*	*Informs international consensus, applicable to BD*
Determinants & Risk Factors	*Nwakobe (2024) [8]*	*Nigeria*	*Qualitative*	*PCOS-diagnosed women*	*Poverty, stigma, healthcare inaccessibility delay diagnosis*	*Similar barriers exist in rural BD floodplains*
	Tumu (2013) [21]	*India*	*Case-control*	*250 women*	*IL-6 promoter polymorphism linked to PCOS risk*	*Genetic predisposition understudied in BD*
	Bharathi (2017) [44]	*India*	*Epidemiological survey*	*600 women*	*Family history strong predictor of PCOS*	*Suggests familial risk research in BD needed*
	Azumah (2022) [14]	*Global*	*Systems biology*	*Multi-omics review*	*Pathways in PCOS regulation*	*Molecular findings could inform BD cohorts*
	Shafiee (2017) [18]	*UK*	*Molecular study*	*Tissue samples*	*Sterol regulatory protein implicated in PCOS*	*Basis for genetic/metabolic exploration in BD*
Psychosocial & Cultural	*Roos (2011) [12]*	*Sweden*	*Cohort*	*12,000 women*	*Higher adverse pregnancy outcomes in PCOS*	*Fertility risks socially amplified in BD*
	Greenwood (2018) [13]	*USA*	*Cross-sectional*	*1,000 women*	*Depression & low QoL common in PCOS*	*Psychosocial distress under-studied in BD*
	Wasata (2020) [3]	*Bangladesh (urban)*	*Qualitative*	*35 women*	*Misconceptions & stigma around PCOS*	*Cultural stigma parallels rural haor context*
Comorbidities & Outcomes	*Barman (2019) [16]*	*India*	*Cross-sectional*	*250 women*	*PCOS associated with elevated TSH & prolactin*	*Supports thyroid-PCOS link relevant in BD*
	Pervin	*Bangladesh*	*Cross-sectional*	*200*	*High thyroid*	*Directly*

	(2020) [9]			*women*	*dysfunction in PCOS*	*relevant for BD guidelines*
	Mo (2019) [17]	*Australia*	*Cross-sectional*	*800 women*	*Sleep disturbances prevalent in PCOS*	*Sleep disorders unexplored in BD*
Treatment & Interventions	*Holbrey (2013) [15]*	*UK*	*Qualitative*	*40 women*	*Daily life disrupted by PCOS symptoms*	*Management challenges parallel BD women*
	Azizia (2011) [19]	*UK*	*Review*	*Pregnant women*	*PCOS linked to obstetric complications*	*Strengthens argument for BD maternal health integration*
	Inhorn (2015) [50]	*Global*	*Review*	*N/A*	*ART access inequities globally*	*Highlights rural BD infertility inequities*
Conceptual & Mixed	*Spinedi (2018) [10]*	*Argentina*	*Narrative review*	*N/A*	*Psychosocial &chronobiotic perspectives*	*Frames PCOS as systemic, aligns with BD needs*
	Sarkar (2019) [11]	*USA*	*Clinical cohort*	*250 women*	*PCOS associated with NAFLD & fibrosis*	*NAFLD rising in BD, overlaps with PCOS*
	Teberik (2017) [20]	*Turkey*	*Case-control*	*150 women*	*Ocular complications in PCOS*	*Illustrates systemic nature; underexplored in BD*

Discussion

This review synthesized 21 studies on polycystic ovary syndrome (PCOS) across six domains: prevalence, determinants, psychosocial dimensions, comorbidities, treatment, and conceptual evidence. PCOS emerges as a reproductive, metabolic, and psychosocial disorder with global relevance but remains neglected in low-resource and ecologically vulnerable settings such as Bangladesh's floodplains.

Interpretation of Findings

Prevalence. Global estimates range from 6–15% [1–3] but Bangladesh lacks population-based studies, and none exist for *haor* regions. Up to half of cases remain undetected, [4] a problem intensified by seasonal inaccessibility and weak referral systems. [41,42]

Determinants. Insulin resistance, obesity, dyslipidemia, and genetic risk dominate. [5–7.] In *haor* areas, flooding worsens food insecurity, rice-heavy diets, and reduced mobility, amplifying metabolic risk. [8,43] Fertility-related stigma further delays care. [45]

Psychosocial. Depression, anxiety, and stigma are consistently reported. [9–11] In South Asia, infertility reduces social status and causes marital strain. [12,26] For rural Bangladeshi women, fertility's cultural centrality magnifies these burdens, while mental health services remain absent. [45]

Comorbidities. PCOS is linked with diabetes, cardiovascular disease, thyroid dysfunction, and pregnancy complications.[13–15] With NCDs rising in Bangladesh, women in rural areas—already underserved in screening and obstetric care—face compounded risks. [46,47]

Treatment. Lifestyle change and metformin are global mainstays [16,17] but face feasibility issues in rural Bangladesh: seasonal diets, poverty, limited monitoring, and gender restrictions on activity. [48,49] Assisted reproductive technologies are mostly urban, leaving infertility untreated in floodplains. [20,50].

Conceptual Evidence. Consensus studies frame PCOS as a multifactorial disorder requiring integrated responses. [18–20]. In Bangladesh, positioning PCOS within reproductive, metabolic, and psychosocial health is essential. [51]

Implications for Practice

Key strategies include:

1. **PCOS screening** integrated into reproductive and NCD service [52]
2. **Task-sharing with community health workers** to raise awareness and deliver adapted health education [49].
3. **Culturally tailored lifestyle programs** considering seasonal diets and mobility restrictions. [48,53]
4. **Mental health integration** using tools such as PHQ-9 and GAD-7. [54.]
5. **Strengthening referral pathways** for obstetric and endocrine care in floodplains. [46]
6. **Awareness campaigns** leveraging local leaders and women's groups to reduce stigma. 45.

Research Priorities

1. **Prevalence studies** in rural and floodplain Bangladesh. [41,42]
2. **Psychosocial research** on stigma, marital strain, and coping .[45]
3. **Longitudinal cohorts** on diabetes, thyroid, and obstetric risks [47]
4. **Pragmatic trials** of low-cost, locally adapted interventions. [48,49]
5. **Health system readiness assessments** on provider knowledge and supply chains. [46.]
6. **Genetic studies** exploring familial risk in South Asian populations. [11,12,44].

Strengths and Limitations

This is the first synthesis linking PCOS to floodplain vulnerabilities in Bangladesh. The thematic structure allowed integration of biological, psychosocial, and systemic factors. As a narrative review, it lacks systematic rigor [33,34] and absence of *haor*-specific data required extrapolation.[41] Nonetheless, contextualization highlights urgent priorities for practice and research.

Conclusions

PCOS is prevalent, underdiagnosed, and multifaceted, with reproductive, metabolic, and psychosocial impacts. In Bangladesh's floodplain regions, seasonal isolation, food insecurity, and cultural stigma exacerbate risks. Addressing PCOS requires integrated strategies spanning reproductive health, NCD care, and mental health. Prioritizing prevalence surveys, psychosocial studies, and context-adapted interventions can support equitable, holistic care and ensure that women in vulnerable floodplain communities are not overlooked.

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