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Instruction for the Authors

The Journal of Ad-din Women's Medical College (ISSN 2313-4941) is an official organ of the Ad-din Women's Medical College, Dhaka and published twice in January and July every year. This journal is recognized by the Bangladesh Medical and Dental Council (BMDC). We publish original articles, review articles, case reports and others (see page vi) including society news.

The manuscripts submitted in this journal should not have been published in any other journal before. All submitted papers are subjected to be reviewed by the board of reviewers and editorial panel before accepting any manuscripts. The unaccepted articles will not be sent back, but will be destroyed. Proof corrections by the authors are well appreciated.

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Papers are accepted for publication with an understanding that they are submitted solely to the journal of Ad-din Women's Medical College and are subject to peer review and editorial revision. Statement and opinion expressed in the papers, communications letter herein are those of author(s) and not necessarily of the editor and/or publisher.

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Abstract

Each manuscript requires an unstructured abstract that should include objective, methods, results, conclusion and key words in not more than 150 words for any review article or case report an 250 words for structured abstract only for original article summarizing the significant information and findings. Authors must give two to five key words identifying the most important topics covered by the manuscript. Abbreviations, diagrams, and references in the abstract should be avoided.

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The body of the manuscript/text should be divided into the following sections: i) Introduction, ii) Materials and Methods, iii) Results (include tables and diagrams), iv) Discussion, v) Conclusion, and vi) Acknowledgement if any (particularly on funding, study subjects and co-author).

Introduction

It includes a short yet robust background purpose and the rationale for the study (or summarized observation), including pertinent references, but data or conclusion from any work should not to be included.

Material and methods

In this section, selection of the study subjects (patient or laboratory animals, including controls) should be described clearly. The age, sex and other characteristics

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- Minimum 300 dots per inch (DPI) or higher
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Discussion

This section should present a detailed yet comprehensive analysis of findings/results to describe, compared & criticized (positively or negatively) in the light of previous relevant studies, in the country or abroad. It should emphasize the new and important aspect of the study and the conclusions that follow from them. Repetition of detailed data &/or other materials given in introduction or result section may be avoided, unless deemed essential (in rare cases).

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In the gist, study findings should be linked with the study goals. Recommendation may be included as appropriate including implication(s) of the findings and limitations if any.

Acknowledgements

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or other retrieval information (date of access), text division (if applicable). Examples of references are given below.

(i) Reference from the Journals

1. Parkin DM, Clayton D, Blook RJ, Massyer E, Fried HP, Iranov E et al. Childhood leukaemia in Europe after Chernobyl: 5 years follow up. Br J Cance 1996; 73: 1006-1012
2. Paganini HA, Chao A, Ross RK, Henderson Aspirin use and chronic diseases: a cohort st of the elderly. BMJ 1989; 299: 1247-1250

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(ii) Books

1. Gyton AC, Hall JE The thyroid metabolic hormones In Textbook of Medical Physiology. 10th edn. NewTork: WB Saunders Company. 2000: 858-86

(iii) Internet

I. Harverd medical school Available https:// en.wikipedia. org/wiki/havard medical college, accessed October 2011

(iv) Thesis/Dissertations

1. Khan MAH. Lipid profile and renal function status of hypothyroid patients [MD Thesis). Dhaka Bangabandhu Skeikh Mujib Medical University:2005

(v) Scientific or technical report

1. Akutsu T. Total heart replacement device. Bethesda MD: National Institutes of Health, National Heart and Lung Institute, 1974 Apr report No. N1H-NHLI-69 2185-4 Ethical approval

The authors should mention the name of the ethical approval authority or (IRB: Institutional Review Board) for their study either separately or in materials and methods section, particularly if the study has been done on human subjects, laboratory samples or laboratory animals. However, not all surveys may not require an ethical permission, parse, in general. But it can be obtained & attached with the proposal, if the authors(s) wish.

Authorship Statement

A form must be signed by all listed authors indicating the contribution to the paper made by each. The corresponding author is responsible for obtaining signatures from all listed authors and using. A check off form, should indicate by name what each author contributed to each of the various aspects of the study: However, (e-signature are accepted except 1st & corresponding authors).

- study concept
- study design
- data collection & processing
- statistical analysis
- manuscript writing

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Once the Board of Editors receives the manuscripts it would be examined & reviewed thoroughly for its content, quality, writing skills & if the manuscript contains any newer/novel issues, important to get it published. Rejected manuscripts will not be returned. Proofs correction by the authors will be

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12. Type of article: **Reader's forum**
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    Abstract: No
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    Abstract: No
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Editorial

Medical Education in Bangladesh

Muhammod Abdus Sabur

Besides allopathy, unani, ayurvedic and homeopathy systems of medicine are recognized for practice in Bangladesh (MOHFW 2012). For allopathy, Bangladesh has diploma, graduation and post-graduation courses. Diploma in Medical Assistant, a course of 4 years duration with 6 months internship (SMF 2021) is conducted by 67 Medical Assistant Training Schools (MATS) with 5,572 seats of which 16 belong to the government with 1,082 seats and 51 operate by the non-government with 4,490 seats (DGME 2026). For graduation, Bachelor of Medicine and Bachelor of Surgery (MBBS) and Bachelor of Dental Surgery (BDS) courses are offered. 113 medical colleges offer MBBS course with 11,833 seats of which 37 government medical colleges have 5,100 seats (DGME 2025), 69 non-governmental medical colleges have 6,308 seats (DGME 2026) and 7 military medical colleges have 425 seats (Google 2026). 34 dental colleges and medical college dental units offer BDS course with 1,905 seats of which 9 government dental college and medical college dental units have 545 seats (DGME 2025) and 25 non-governmental dental college and medical college dental units have 1,360 seats (DGME 2026). Post-graduation courses in allopathy are offered by Bangladesh Medical University (BMU) and Bangladesh College of Physicians and Surgeons (BCPS). BMU offered MD in 40 disciplines, MS in 30 disciplines, M. Phil in 6 disciplines, M. Med in 1 discipline, Diploma in 18 disciplines, MPH in 8 disciplines and PhD (BMU 2026). BCPS offer fellowship (Fellow of College of Physicians and Surgeons, FCPS) in 27 general subjects and 38 specialized subjects and membership (Member of College of Physicians and Surgeons, MCPS) in 16 subjects (BCPS 2026).

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For unani and ayurvedic, diploma (Diploma in Unani Medicine and Surgery, DUMS and Diploma in Ayurvedic Medicine and Surgery, DAMS) and graduation (Bachelor of Unani Medicine and Surgery, BUMS and Bachelor of Ayurvedic Medicine and Surgery, BAMS) courses are offered (BBUASM 2026). The lone Government Unani and Ayurvedic Medical College has 25 seats for BUMS and another 25 seats for BAMS. Another non-government unani and ayurvedic institute offers 30 seats for each of BUMS and BAMS. Two non-government Unani Medical College have 100 seats. Thus, 155 seats are available for BUMS and 55 seats for BAMS (DGME 2026b). 17 institutes offer DUMS courses, of which 1 belongs to the government and rest 16 from non-government and 10 institutes offer DAMS courses, all of which are non-governmental (BBUASM 2026).

In homeopathy also, diploma (Diploma in Homeopathic Medicine and Surgery, DHMS) and graduation (Bachelor of Homeopathic Medicine and Surgery, BHMS) courses are offered. 66 non-governmental institutes with 7,540 seats conduct DHMS courses (BHMEC 2026). For BHMS, two homeopathic medical colleges, one from the government and the other by the non-government offer 150 seats in total. The Government Homeopathic Medical College has 50 seats, while the non-governmental Bangladesh Homeopathic Medical College has 100 seats (DGME 2026b).

Bangladesh is well-developed in medical education. For allopathy, which is the main system of medicine, ranging from diploma to graduate to post-graduate courses are offered in large number of disciplines covering general and sub-specialties. Also for alternate medical systems, both diploma and graduate courses are available for unani, ayurvedic and homeopathy.

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Original Article

A Study to Evaluate the Effect of Antepartum Hemorrhage on Fetomaternal Outcomes in Major Degree Placenta Previa

Tania Noor[1], Sharmin Mostofa[2], Laila Noor[3], Sukur SB[4]

Abstract

Background: Placenta previa is a major cause of antepartum hemorrhage (APH), associated with adverse maternal and neonatal outcomes. This study aimed to assess maternal characteristics, complications, mode of delivery, and neonatal outcomes among women with placenta previa presenting with and without APH.

Objective: This study aims to evaluate the effect of antepartum hemorrhage (APH) on fetomaternal outcomes among women with a major degree of placenta previa.

Methods: This cross-sectional observational study was conducted on 121 women diagnosed with placenta previa at the time of delivery. Participants were classified into placenta previa with APH (n=50) and placenta previa without APH (n=71) groups. Maternal demographics, obstetric history, placenta previa type, maternal complications, delivery mode, and neonatal outcomes were recorded at delivery. Statistical significance was set at $p<0.05$.

Results: Maternal age, gravidity, parity, and previous cesarean sections did not differ significantly. The APH group had a higher mean number of previous abortions (1.56 ± 0.88 vs 1.41 ± 0.59, p=0.029). Type IV placenta previa was most common in both groups without significant difference. Anemia (54% vs 15.5%), PROM (8% vs 1.4%), and GDM (18% vs 14.1%) were higher in APH group (p=0.024). Emergency cesarean section was more frequent in APH group (56% vs 25.4%, p=0.001). Maternal outcomes including hysterectomy, transfusion, and ICU admission were similar, but hospital stay was longer (5.86 ± 2.40 vs 4.72 ± 1.70 days, p=0.003). Neonates in the APH group had lower gestational age (36.04 ± 1.41 vs 36.71 ± 1.49 weeks, p=0.014), higher prematurity (58% vs 28.4%, p<0.001), lower birth weight (2.46 ± 0.48 vs 2.76 ± 0.44 kg, p=0.001), and increased malpresentation (22% vs 4.2%, p=0.011); Apgar scores were comparable.

Conclusion: APH in placenta previa is associated with increased maternal complications, emergency cesarean delivery, prolonged hospitalization, and adverse neonatal outcomes including prematurity, low birth weight, and malpresentation. Previous abortion history may be an additional risk factor. Careful monitoring at delivery is essential to optimize maternal and neonatal outcomes.

Keywords: Placenta previa; Antepartum hemorrhage; Maternal outcomes; Neonatal outcomes; Cross-sectional study.

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Introduction

Placenta praevia (PP), in which the placenta implants at or near the internal cervical os, remains a high-risk obstetric complication with significant maternal and perinatal consequences.[1] According to the distance between the placental edge and the internal os, PP is often categorized as minor (placental edge within 2 cm of the os) or major (placental edge reaching or overlapping the os).[2]

Although relatively uncommon, the prevalence of PP is increasing. A recent meta-analysis from China estimated

the prevalence at 1.44% and noted an upward trend following shifts in fertility policies.[3] PP is a major cause of antepartum hemorrhage and remains a leading reason for maternal ICU admissions and "near-miss" cases worldwide.[4] Obstetric hemorrhage contributes as a direct cause of maternal mortality. Almost 30% maternal deaths in the Asian population are due to major obstetrical hemorrhage in placenta praevia, especially due to rise in the incidence of caesarean sections. Perinatal mortality in pregnancies complicated by placenta praevia is around 4-8 %.[5]

The etiology of PP is multifactorial, but disruption of the endometrium and uterine scarring are key factors. Recognized risk factors include advanced maternal age, multiparity, smoking, uterine curettage, prior PP, assisted reproductive technology, and, most notably, prior cesarean delivery.[6] Recent studies confirm that prior cesarean and advanced maternal age significantly increase the risk of PP and its severe forms.[7]

PP is associated with numerous maternal complications, including massive hemorrhage, postpartum hemorrhage, transfusion, hysterectomy, ICU admission, and prolonged hospitalization.[4] The risks are even greater when complicated by placenta accreta spectrum (PAS), with higher rates of blood loss, hysterectomy, and preterm delivery.[8]

Adverse fetal and neonatal outcomes are also common. Prematurity and intrauterine growth restriction (IUGR) contribute to low birth weight, lower Apgar scores, respiratory distress requiring NICU admission, malpresentation, and perinatal mortality.[6,9] A recent African cohort reported a preterm birth rate of 43%, a stillbirth rate of 3%, and low birth weight in nearly one-fifth of neonates born to mothers with PP and prior uterine scar.[10]

Given these risks, recent investigations have examined how antepartum hemorrhage and placental location/ type influence maternal and perinatal outcomes. A Turkish study in 2024 found that planned cesarean deliveries in PP, particularly when complicated by PAS, were associated with better maternal and surgical outcomes than emergency operations.[11]

In the present study, we aim to assess the effect of antepartum hemorrhage on short-term feto-maternal outcomes in major degree PP, and to evaluate whether placental type and location modify the risk of hemorrhage and complications.

Materials and Methods

Study Design & Period:

This is a cross sectional observational study carried out in the department of Obstetrics and Gynecology at Ad-din Women's Medical College Hospital, Moghbazar, Dhaka, from January 2023 to December 2023. Ethical clearance for the proposed study was obtained from Ad-din Medical College Institutional Review Board (IRB).

Study Population & Sampling Procedure:

A total 121 of singleton pregnant women complicated with major degree placenta praevia diagnosed by ultrasonography at the time of delivery were enrolled randomly for analysis.

Inclusion Criteria:

1. Age of the patient is between 20-40 years.
2. Gestational age between ≥ 28 - 40 weeks,
3. Pregnant women with major degree placenta praevia and placenta acreata spectrum disorders.

Exclusion Criteria:

1. Pregnant women diagnosed with antepartum hemorrhage due to abruption placenta.
2. Bleeding disorders like decreased platelet counts or altered coagulation profiles or HELLP syndrome.
3. Women with multiple gestation pregnancies were also excluded to avoid overrepresentation of studying high risk women.

Method of Data Collection:

Data will be collected in a predesigned data sheet from all those patients who fulfill the inclusion and exclusion criteria and are admitted to the patient department of Ad-din Women's Medical College Hospital, where pregnancies need to be terminated by C-section. Detailed history was taken, regarding maternal demographics, obstetric history (gravidity, parity, gestational age, previous cesarean sections, abortions, D&C), placenta previa type, and maternal complications were recorded at delivery. Delivery mode, maternal outcomes (e.g., hysterectomy, blood transfusion during cesarean section, hemoglobin level before and after operation, ICU admission, hospital stay), and neonatal outcomes (gestational age, birth weight, Apgar score, malpresentation) were collected.

Patients who had per vaginal bleeding during the pregnancy period will be assigned to the group, Placenta praevia with APH. Patients who didn't give a history of vaginal bleeding during pregnancy will be assigned to the group, placenta praevia without APH.

Operational Definitions:

APH (Antepartum Hemorrhage): Bleeding from or into the genital tract, occurring from 28 weeks of pregnancy and before the birth of the baby, according to WHO.

Moderate anemia: corresponds to a hemoglobin level of 7.0-9.9 g/dl.

Severe anemia: corresponds to a hemoglobin level of less than 7 g/dl.

Low birth weight (LBW): defined as a birth weight of less than 2500 g (up to and including 2499 g), as per the World Health Organization.

Data Collection Tools:

A checklist was designed to collect data about study participants' socio-demographic characteristics, obstetrics history, history of current pregnancy, mode of delivery, and maternal and neonatal outcomes.

Statistical Analysis:

Data will be analyzed by SPSS version 23.0 for statistical analysis. Continuous variables were summarized as mean ± standard deviation, and categorical variables as frequencies and percentages. Comparisons between APH and non-APH groups were made using independent t-tests for continuous variables and chi-square or Fisher's exact tests for categorical variables. Statistical significance was defined as $p<0.05$.

Results

Table 1: Maternal Demographic and Clinical Characteristics

Variable	APH (n=50)	No APH (n=71)	P-value
Maternal age, years, mean±SD [median, range]	28.46±4.482 [28,22]	29.01±4.234 [28,21]	0.880
Gravidity, mean ± SD [median, range]	3.88±1.796 [4,8]	3.90±1.475 [4,6]	0.324
Parity, mean ± SD [median, range]	2.42±1.052 [2,4]	2.56±1.038 [3,4]	0.783
Number of previous abortions, mean ± SD [median, range]	1.56±0.884 [1,2]	1.41±0.599 [1,4]	0.029
Number of previous D&C mean ± SD [median, range]	1.16±0.618 [1,4]	1.14±0.389 [1,2]	0.588
Number of previous CS mean ± SD	1.34±0.895	1.11±0.903	0.843
Placenta Previa type			
Type II Posterior	6 (12)	13 (18.3)	0.212
Type III	6 (12.0)	15 (21.1)	
Type IV	24 (48.0)	27 (38)	
Placenta Acreta	5 (10)	11 (15.5)	
Placenta Increta	8 (16)	5 (7.0)	
Placenta Percreta	1 (2)	0 (0)	
Placenta Localization			
Anterior	21 (42)	28 (39.4)	0.777
Posterior	29 (58)	43 (60.6)	
Gestational Complication			
None	12 (4.0)	35 (49.3)	0.024
Anemia	27 (54.0)	11 (15.5)	
PIH or PE	3 (6.0)	4 (5.6)	
GDM	9 (18.0)	10 (14.1)	
PROM	4 (8.0)	1 (1.4)	
Obesity	0 (0)	1 (1.4)	
IUGR	1 (2.0)	1 (1.4)	
Oligohydramnios	3 (6.0)	4 (5.6)	
Others	1 (2.0)	4 (5.6)	
LSCS			
Emergency	28 (56.0)	18 (25.4)	0.001
Emergency LSCS due to			
APH	22 (44)	12 (16.9)	0.007
PROM	3 (6)	1 (1.4)	
LP	1 (2)	1 (1.4)	
FD	2 (4)	4 (5.6)	

A total of 121 women with placenta previa were included, of whom 50 (41.3%) presented with antepartum hemorrhage (APH) and 71 (58.7%) did not. The mean maternal age was comparable between the APH group (28.46 ± 4.48 years) and the non-APH group (29.01 ± 4.23 years) (p=0.880). Similarly, gravidity (3.88 ± 1.80 vs 3.90 ± 1.47, p=0.324), parity (2.42 ± 1.05 vs 2.56 ± 1.03, p=0.783), and number of previous cesarean sections (1.34 ± 0.89 vs 1.11 ± 0.90, p=0.843) showed no significant differences.

However, the mean number of previous abortions was significantly higher among women with APH (1.56 ± 0.88) compared to those without APH (1.41 ± 0.59, p=0.029). The frequency of dilatation and curettage (D&C) procedures did not differ significantly between groups.

The distribution of placenta previa types was comparable between women with antepartum hemorrhage (APH) and those without APH, with no statistically significant difference observed (p = 0.212). Type IV placenta previa was the most frequent subtype in both groups, occurring in 24 (48.0%) of the APH group and 27 (38.0%) of the non-APH group. Type III placenta previa was the second most common presentation and was observed more frequently in the non-APH group 15 (21.1%) compared with the APH group 6 (12.0%). Type II posterior placenta previa accounted for 6 (12.0%) of cases in the APH group and 13 (18.3%) in the non-APH group.

Abnormally adherent placentation was identified in both groups. Placenta accreta was present in 5 (10.0%) of APH cases and 11 (15.5%) of non-APH cases, while placenta increta was more common in the APH group 8 (16.0%) vs. 5 (7.0%). Placenta percreta was rare, occurring in one case 1 (2.0%) in the APH group and in none of the non-APH cases.

Placental localization did not differ significantly between groups (p = 0.777). Posterior placental location predominated in both the APH group 29 (58.0%) and the non-APH group 43 (60.6%), while anterior placentation was observed in 21 (42.0%) and 28 (39.4%) of cases, respectively.

Maternal Complications

Gestational complications varied between the groups. Women with APH were more likely to develop anemia 27 (54%) vs 11 (15.5%), PROM 4 (8%) vs 1 (1.4%), and GDM 9 (18%) vs 10 (14.1%), whereas complications such as obesity, intrauterine growth restriction (IUGR), and oligohydramnios were infrequent across both groups. The overall difference in complication rates was statistically significant (p=0.024).

Mode of Delivery

The rate of emergency lower segment cesarean section (LSCS) was significantly higher among the APH group 28 (56%) vs 18 (25.4%), p=0.001. The primary indication for emergency LSCS was APH itself, accounting for 22 (44%) of cases, followed by PROM 3 (6%), labor pain 1 (2%), and fetal distress 2 (4%). In contrast, among the non-APH group, only 12 (16.9%) required emergency LSCS due to APH, and the remainder were for fetal distress 4 (5.6%), PROM 1 (1.4%), or labor pain 1 (1.4%) (p=0.007).

Table 2: Maternal Outcomes

Variables	APH (n=50)	No APH (n=71)	P-value
Preoperative hemoglobin, g/dL, mean ± SD [median, range]	10.83±0.779 [10.8,4.6]	10.82±1.19 [10.70,8.5]	0.162
Predischarge hemoglobin, g/dL, mean ± SD [median, range]	10.70±0.9731 [11,4.9]	11.05±1.165[11,7.2]	0.088
Hysterectomy Yes	13 (26)	18 (25.4)	0.936
No	37 (74)	53 (74.6)	
Uterine conservation, n (%)	0 (0)	0 (0)	
Bilateral uterine artery ligation	4 (8)	10 (14.1)	
Multiple hemostatic sutures			
Both	4 (8)	6 (8.5)	0.722
B-lyneh suture	1 (2)	0 (0)	
None	28 (56)	37 (52.1)	
Per Operative blood transfusion			
No blood transfusion	14 (28.0)	17 (23.9)	0.595
1-2 Unit	23 (46.0)	34 (47.8)	
3-4 Unit	3 (6.0)	9 (12.8)	
≥ 5 Unit	10 (20)	11 (15.5)	
Maternal Morbidity			
Bladder injury	2 (4.0)	5 (7.0)	0.742
PPH	2 (4)	3 (4.2)	
Hemorrhagic Shock	2 (2)	2 (2.8)	
DIC	0 (0)	0 (0)	
ICU admission	10 (20)	13 (18.3)	
Hospital length of stay, days, mean ± SD	5.86±2.408[5,10]	4.72±1.709[4,11]	0.003

Preoperative hemoglobin levels were similar in both groups (10.83 ± 0.78 vs 10.82 ± 1.19 g/dL, p=0.162). Pre-discharge hemoglobin also did not differ significantly (10.70 ± 0.97 vs 11.05 ± 1.16 g/dL, p=0.088). Hysterectomy was required in 13 (26%) of women with APH and 18 (25.4%) without APH (p=0.936), while uterine conservation procedures (bilateral uterine artery ligation, multiple hemostatic sutures, or B-Lynch sutures) were comparable between groups (p=0.722).

The need for preoperative blood transfusion was similar in both groups, with nearly half of women in each group requiring 1–2 units. Higher transfusion requirements (≥5 units) were slightly more frequent in the APH group 10 (20%) vs 11 (15.5%), but this was not statistically significant (p=0.595).

Maternal morbidity, including bladder injury, postpartum hemorrhage, hemorrhagic shock, and ICU admission, occurred in both groups without significant differences (p=0.742). Notably, ICU admissions were slightly higher in the APH group 10 (20%) vs 13 (18.3%). However, hospital stay was significantly prolonged in women with APH (5.86 ± 2.40 days vs 4.72 ± 1.70 days, p=0.003).

Table 3: Neonatal Outcomes

Variable	APH (n=50)	No APH (n=71)	P value
Gestational week at delivery, mean ± SD [median, range]	36.04±1.41 [36,7]	36.71±1.49 [37,10]	0.014
Prematurity	29 (58)	18 (28.4)	0.000
Birth weight, kg, mean ± SD [median, range]	2.46±0.478 [2.50,2.10]	2.76±0.445 [2.80,2.80]	0.001
Apgar score,≥7 in 5 min, mean ± SD [median, range]	1.92±0.274 [2.0,1]	1.96±0.203 [2.0,1]	0.385
Malpresentation, (n%)			
Breech	8 (16)	2 (2.8)	0.011
Transverse	3 (6)	1 (1.4)	

Gestational age at delivery was significantly lower in the APH group (36.04 ± 1.41 weeks) compared to the non-APH group (36.71 ± 1.49 weeks, p=0.014). Consequently, the incidence of prematurity was markedly higher in the APH group 29 (58%) vs 18 (28.4%), p<0.001. Mean neonatal birth weight was also significantly lower in the APH group (2.46 ± 0.48 kg vs 2.76 ± 0.44 kg, p=0.001). Apgar scores at 5 minutes were comparable across groups (p=0.385). Fetal malpresentation was significantly more frequent in the APH group 8 (16%) vs 2 (2.8%), p=0.011, with breech being the most common.

Discussion

This study compared maternal profiles, obstetric complications, delivery patterns, and short-term outcomes in women with placenta praevia who experienced antepartum hemorrhage (APH) versus those who did not. Out of 121 cases reviewed, about 41% presented with APH. While maternal age, parity, gravidity, and history of cesarean section were similar across both groups, women with APH had a greater number of prior abortions. This suggests that repeated uterine instrumentation or scarring from abortion procedures may increase vulnerability to abnormal placental implantation and hemorrhage. Similar findings were found in Bangladesh, whereas other studies emphasized different predictors, such as complete placenta praevia and reduced cervical length rather than abortion history.[12,13,14] These inconsistencies may reflect population-specific risk profiles and variations in clinical practice.

In our study, the type of placenta praevia was not significantly different between groups, although complete (type IV) praevia was most frequent overall. Previous research has consistently shown that complete placenta praevia carries the highest risk for bleeding, another studying confirming its association with earlier and heavier hemorrhage.[13,15] The lack of a significant relationship in our findings may stem from the sample size, referral patterns, or active management strategies at our center. Nonetheless, the predominance of type IV praevia underscores its clinical importance in risk stratification and patient counseling.

Maternal complications were considerably higher in women with APH, especially anemia, premature rupture of membranes (PROM), and gestational diabetes mellitus (GDM). The link between APH and anemia is well documented, with studies by Fan et al. and Wang et al. reporting increased transfusion requirements in women with placenta previa and bleeding.[12,15] PROM, though

less frequently described, may occur as a consequence of bleeding-induced cervical changes. Interestingly, our study noted a higher prevalence of GDM in the APH group. A study described GDM in women with placenta previa, its direct association with APH is less established.[16] Local maternal factors such as body mass index, nutrition, or diagnostic thresholds may have influenced this outcome in our population.

Antepartum hemorrhage strongly influenced the mode of delivery. Women with APH were substantially more likely to undergo emergency lower segment cesarean section (LSCS), with bleeding itself being the primary indication in nearly half of these cases. This observation is in line with a study, which reported a threefold higher risk of emergency cesarean delivery in APH cases.[17] Similarly, Another study emphasized APH as a key factor necessitating urgent surgical intervention.[12] These results reaffirm the importance of preparedness for rapid operative delivery in hospitals managing placenta previa cases.

Maternal morbidity outcomes were somewhat different from findings in larger international studies. Despite higher rates of anemia diagnoses, there was no significant difference in hemoglobin levels post-discharge, transfusion volumes, or major morbidities such as hysterectomy, bladder injury, or ICU admission between groups. In contrast, a research documented markedly higher hysterectomy rates in APH cases.[13] The lower severity observed in our study may reflect effective local surgical practices, including conservative methods like uterine artery ligation and hemostatic suturing. However, consistent with global evidence, APH was associated with prolonged hospital stays, reflecting the added healthcare burden.[15]

Neonatal outcomes were notably affected by APH. Deliveries occurred at earlier gestational ages, resulting in higher rates of prematurity and lower birth weights. These associations have been repeatedly confirmed in prior studies.[12,13,15] Additionally, we observed a greater frequency of malpresentations, especially breech, among neonates born to mothers with APH. This is consistent with a findings which described malpresentation as a frequent complication in bleeding previa.[18] Despite the adverse outcomes in gestation and birth weight, Apgar scores at five minutes did not differ significantly, suggesting that timely neonatal intervention and supportive care may reduce immediate postnatal risks.

Conclusion

This study demonstrates that antepartum hemorrhage in placenta praevia substantially worsens both maternal and neonatal outcomes. Women with APH had higher rates of anemia, PROM, emergency cesarean delivery, prematurity, low birth weight, and malpresentation, underscoring the need for close antenatal monitoring and proactive delivery planning. A possible link between previous abortions and APH was also observed, warranting further research into reproductive history as a predictor of hemorrhagic risk. The differences in maternal morbidity compared with international reports may reflect the effectiveness of conservative surgical and supportive measures in our setting. Future multicenter studies with larger sample sizes are recommended to validate these findings and provide clearer guidance for clinical management.

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Original Article

Pattern and Clinical Profile of Ocular Trauma at a Tertiary Eye Hospital in Bangladesh: A Prospective Observational Study

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Abstract

Background: Ocular trauma is a leading cause of monocular vision loss and preventable blindness, particularly in developing nations. Globally, approximately 1.6 million people are blind due to ocular injuries, with younger, economically active populations bearing a disproportionate burden.

Objectives: This study aims to analyze the epidemiological patterns, clinical characteristics, and visual outcomes of ocular trauma at a specialized tertiary eye hospital in Dhaka, Bangladesh.

Methods: This prospective observational study was conducted at the Vision Eye Institute and Hospital in Dhaka, from January 2024 to December 2026. A cohort of 207 participants (215 eyes) was analyzed. Clinical severity was classified according to the Birmingham Eye Trauma Terminology System (BETTS). Visual outcomes were assessed using Snellen charts at presentation and three months post-intervention.

Results: The study population was predominantly male 168 (81.16%), with the 21–30 age group most affected 68 (32.85%). Occupational accidents were the leading mode of injury 73 (35.27%), and the workplace was the most common site of trauma 61 (29.47%). Notably, 98.55% of patients reported not using protective eyewear at the time of injury. Open-globe injuries predominated 131 (63.29%), with corneal lacerations 51 (24.64%) and subconjunctival hemorrhages 47 (22.71%) as the primary findings. At presentation, 21 (9.77%) of eyes had "Good Vision" (6/12 or better), which improved to 57 (26.51%) at follow-up. Blindness rates decreased from 41 (19.07%) to 29 (13.49%) over the study period.

Conclusion: Ocular trauma in this setting involves severe mechanical injuries in young, productive males. The critical lack of acompliance with protective eyewear usage underscores an urgent need for the enforcement of occupational safety regulations and public health education. Specialized management significantly improves vision, but the persistence of blindness highlights the necessity for early presentation and aggressive prevention strategies.

Keywords: Ocular Trauma; Open-Globe Injury; Visual Outcome; Occupational Safety; BETTS; Bangladesh.

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Introduction

Ocular trauma represents a significant global public health concern, frequently leading to monocular vision loss and severe socioeconomic burdens.[1] In developing countries, this issue is particularly pronounced, contributing substantially to preventable blindness and disability, especially in regions with limited access to specialized ophthalmic care.[2,3] Worldwide, approximately 1.6 million individuals are blinded annually by such injuries, with an additional 2.3 million experiencing bilateral low vision, disproportionately affecting younger, economically active populations.[3,4,5] These patterns underscore the urgent need for comprehensive epidemiological studies to characterize region-specific injury profiles and inform targeted prevention and treatment strategies.

In Bangladesh, a detailed investigation into the prevalence and patterns of ocular trauma is essential to formulate effective public health interventions. Although studies from various regions demonstrate that ocular injuries are a significant cause of visual impairment- often necessitating specialized medical attention.[6] A comprehensive understanding of specific clinical profiles, etiological factors, and visual outcomes at tertiary care facilities remains underexplored.[6,7,8,9] This study addresses this gap by prospectively analyzing patterns and clinical profiles, offering detailed insights into injury mechanisms, demographics, and visual outcomes of ocular trauma patients presenting to a tertiary eye hospital in Dhaka, Bangladesh, thereby contributing crucial data to the literature.

Materials and Methods

The objective of this study is to analyze the epidemiological patterns, clinical characteristics, and visual outcomes of ocular trauma at a specialized tertiary eye hospital in Dhaka, Bangladesh.

Study Design and Setting

This prospective observational study was conducted at the Vision Eye Institute and Hospital, a tertiary eye hospital in Dhaka, Bangladesh, from January 2024 to December 2025.

Sample Size Calculation and Sampling Technique

The sample size was determined using the Kish and Leslie formula [(10)] for estimating a single population proportion: $n = Z^2pq / d^2$

where n is the required sample size, Z is the standard normal deviate at a 95% confidence level, p is the estimated prevalence of ocular trauma (0.02, based on a 2% prevalence reported in rural Bangladesh, q = 1 - p, and d is the margin of error.[11] A 2% prevalence of ocular trauma in rural Bangladesh was used for sample size calculation because this study included patients from both rural and urban areas of Bangladesh, and because specific urban data were unavailable.

Substituting these values yielded a minimum sample size of 188. To account for potential data loss or follow-up attrition, an additional 10% was added, resulting in a final target of 207 participants recruited via purposive and consecutive sampling techniques.

Study Population

The study population comprised patients presenting to the Vision Eye Institute and Hospital with ocular trauma during the specified study period.

Inclusion and Exclusion Criteria

Patients of all ages and both sexes presenting with acute ocular injury to one or both eyes were included, provided they gave informed consent and completed 3-month follow-up after initial management. This also encompassed individuals referred from other medical facilities without prior primary care for their ocular trauma.[12] Patients with pre-existing ocular conditions that could confound the assessment of trauma-induced visual impairment, or those unwilling to participate, were excluded.

Data Collection and Management

Data collection for this study used a standardized, pre-tested pro forma to capture demographic, clinical, and injury-related variables systematically. Following recruitment, detailed histories were obtained from all 207 participants. Informed written consent was obtained from adult participants, and assent was obtained from the legal guardians of pediatric patients.

Detailed histories documented each patient's socio-demographic profile, including age, gender, residence, religion, and occupation. Socioeconomic status was categorized into three groups based on monthly household income in Bangladeshi Taka (BDT), following the classification proposed for Bangladesh.[13]

- **Low Income**: <12,500 BDT
- **Middle Income**: 12,500–21,500 BDT
- **High Income**: >21,500 BDT

The mode of injury, mechanism of trauma, type of injuring object, and duration from trauma to hospital presentation were also recorded.

A comprehensive ophthalmic and systemic examination was conducted to assess ocular tissue involvement and any associated bodily injuries.

- **Anterior Segment**: Evaluated using slit-lamp biomicroscopy to check corneal and scleral integrity.

- **Pupillary Evaluation**: Performed via torchlight examination to assess pupillary reflex and detect relative afferent pupillary defect.
- **Posterior Segment**: Assessed using direct and indirect fundoscopy where clinically feasible.
- **Ancillary Investigations**: Included B-scan ultrasonography as needed to aid diagnosis and surgical planning.

Ocular trauma cases were classified according to the Birmingham Eye Trauma Terminology System.[4] Mechanical injuries were subdivided into:

- **Closed Globe Injury (CGI)**: Injury to the eye wall without a full-thickness wound.
- **Open Globe Injury (OGI)**: Full-thickness wound of the eye wall, further categorized as rupture, penetrating injury, intraocular foreign body, or perforating injury.

The initial management for each eye—whether surgical, medical, or observation-only—was recorded. Patients underwent a minimum three-month follow-up to evaluate final visual outcomes. Visual acuity (VA) was measured using Snellen charts at presentation and follow-up, and graded as.[14]

- **Good Vision**: VA 6/12 or better
- **Visual Impairment**: VA from 6/18 to 6/60
- **Blindness**: VA worse than 6/60

Statistical Analysis

All collected data were entered into a Microsoft Excel spreadsheet, and statistical analyses were performed using SPSS software (IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp.). Descriptive statistics, including frequencies and percentages, were employed to characterize the demographic and clinical profiles of the study population.[15]

Ethical Approval

The study was approved by the Institutional Review Board of Vision Eye Institute and Hospital (Reference: VEIH/IRB/ 2023/12-003) before its initiation. All participants provided written informed consent before data collection, aligning with ethical research practices.

Results

Demographic and Socioeconomic Profile

A total of 207 participants (215 eyes) were analyzed. The cohort was predominantly male 168 (81.16%), and the most frequently affected age group was 21–30 years 68 (32.85%). Residents of urban areas comprised 124 (59.90%) of the sample. In terms of occupation, industrial workers 54 (27.54%) and farmers 34 (16.43%) were the most affected groups. Regarding socioeconomic status, 109 (52.66%) of patients belonged to the middle-income group.

Table 1: Demographic and Socioeconomic Profile

Variables	Number (%)
Age groups (in years)	
0 -10	26 (12.56)
11 - 20	29 (14.01)
21 - 30	68 (32.85)
31 - 40	35 (16.91)
41 - 50	19 (9.18)
51 - 60	23 (11.11)
61 - 70	5 (2.42)
71 - 80	1 (0.48)
>80	1 (0.48)
Gender	
Male	168 (81.16)
Female	39 (18.84)
Residence	
Urban	124 (59.90)
Rural	83 (40.10)
Religion	
Islam	189 (91.30)
Hindu	14 (6.76)
Christian	1 (0.48)
Buddhism	2 (0.97)
Others	1 (0.48)
Occupation	
Student	29 (14.01)
Farmer	34 (16.43)
Laborer	31 (14.98)
Industrial worker	57 (27.54)
Doctor	3 (1.45)
Homemaker	17 (8.21)
Driver	14 (6.76)
Shopkeeper	9 (4.35)
Teacher	2 (0.97)
Police and armed forces personal	3 (1.45)
Businessman	2 (0.42)
Others	3 (1.45)
Socio-economic condition	
Low	52 (25.12)
Middle	109 (52.66)
High	46 (22.22)

The majority of patients belonged to the 21–30 years age group 68 (32.85%), followed by 31–40 years 31 (16.91%), and 11–20 years 29 (14.01%). Very few cases were observed in older age groups above 70 years 1 (0.48% each).

Most patients were male 168 (81.16%), while females accounted for 39 (18.84%) of participants.

The residential distribution of the patients. A higher proportion of patients were from urban areas 124 (59.90%) compared to rural areas 83 (40.10%).

The majority of participants were Muslim 189 (91.30%), followed by Hindu 14 (6.76%), while very small proportions belonged to Christianity, Buddhism, and other religions.

The occupational distribution of the patients. Industrial workers constituted the largest group 57 (27.54%), followed by farmers 34 (16.43%), laborers 31 (14.98%), and students 29 (14.01%).

More than half of the participants belonged to the middle-income group 109 (52.66%), followed by the low-income group 52 (25.12%) and high-income group 46 (22.22%).

Clinical Characteristics of Ocular Trauma

The right eye was involved in 117 (56.52%) of cases, while bilateral involvement was rare 8 (3.86%). The workplace was the most common site of injury 61 (29.47%), with occupational accidents 73 (35.27%) and homicidal assaults 36 (17.39%) being the primary modes of trauma. Sharp objects 86 (41.55%) and blunt objects 84 (40.58%) were responsible for nearly equal proportions of injuries. Notably, 204 (98.55%) of patients were not using eye protection at the time of trauma.

According to the BETTS classification, open-globe injuries predominated 131 (63.29%). Common clinical findings included corneal lacerations 51 (24.64%), subconjunctival hemorrhages 47 (22.71%), and corneal foreign bodies 36 (18.36%).

Table 2: Clinical Characteristics of Ocular Trauma

Variables		Number (%)
Eye involved		
Right		117 (56.52)
Left		82 (39.61)
Both		8 (3.86)
Mode of injury		
Accidental	Road Traffic Accident (RTA)	28 (13.53)
	Chemical Exposure	18 (8.70)
	Sport	33 (15.94)
	Occupational	73 (35.27)
	Electrical	2 (0.97)
	Domestic	17 (8.21)
Homicidal (assault)		36 (17.39)
Type of object causing injury		
Objects		
Sharp		86 (41.55)
Blunt		84 (40.58)
Projectile		19 (9.18)
Chemical		18 (8.70)
Type of injury		
Open globe		131 (63.29)
Close globe		85 (41.06)
Place of sustaining trauma		
Home		34 (16.43)
Work place		61 (29.47)
School		16 (7.73)
Road		32 (15.46)
Playground		21 (10.14)
Industry		34 (16.43)
Outdoor		4 (1.93)
Hospital		2 (0.97)
Not documented		3 (1.45)
Time of injury		
12 am – 4 am		2 (0.97)
4 am – 8 am		2 (0.97)
8 am – 12 pm		70 (33.82)
12 pm – 4 pm		53 (25.60)
4 pm – 8 pm		42 (20.29)
8 pm – 12 pm		38 (18.36)
Time taken to reach the hospital		
Duration		
0 – 6 hours		54 (26.09)
>6 hours – 12 hours		67 (32.37)
>12 hours – 24 hours		43 (20.77)
>1 day – 3 days		23 (11.11)
>3 days – 7 days		12 (5.80)
>1 week – 1 month		7 (3.38)
>1 month 1 (0.48)		
Eye protective wear		
Yes		3 (1.45)
No		204 (98.55)

The right eye was more frequently affected 117 (56.52%) than the left 82 (39.61%), and bilateral involvement was observed in 8 (3.86%) of cases. Occupational injuries were the most common cause 73 (35.27%), followed by homicidal assault 36 (17.39%), sports-related injuries 33 (15.94%), and road traffic accidents 28 (13.53%).Sharp objects were responsible for the largest proportion of injuries 86 (41.55%), closely followed by blunt objects 84 (40.58%). Open globe injuries accounted for the majority of cases 131 (63.29%), whereas closed globe injuries constituted 85 (41.06%).The workplace was the most common site of injury 61 (29.47%), followed by home 34 (16.43%), industry 34 (16.43%), and road 32 (15.46%). Most injuries occurred during the daytime, particularly between 8 am and 12 pm 70 (33.82%) and 12 pm and 4 pm 53 (25.60%). The largest proportion of patients presented within 6–12 hours 67 (32.37%), followed by within 0–6 hours 54 (26.09%). The largest proportion of patients presented within 6–12 hours 67 (32.37%), followed by within 0–6 hours 54 (26.09%). Only 3 (1.45%) of patients reported using eye protective devices at the time of injury, whereas 204 (98.55%) did not use any protective eyewear.

Table 3: Tissue Involved

Tissue involved	Complications or findings	Number (%)
Anterior Segments		
Lids and adnexa	Lid laceration	31 (14.98)
	Eyebrow laceration	7 (3.38)
	Canalicular injury	8 (3.86)
Conjunctiva	Laceration	27 (13.04)
	Sub-conjunctival haemorrhage	47 (22.71)
Sclera	Foreign body	11 (5.31)
	laceration	38 (18.36)
	Perforation	13 (6.28)
Cornea	Abrasion	30 (14.49)
	Laceration	51 (24.64)
	Perforation	19 (9.18)
	Foreign body	38 (18.36)
	Oedema	10 (4.83)
Anterior chamber	Hyphema	33 (15.94)
	Traumatic uveitis	6 (2.90)
	Foreign body	4 (1.93)
	Secondary glaucoma	2 (0.97)
Iris	Prolapse	28 (13.53)
	Iridodialysis	5 (2.42)
	Traumatic Mydriasis	9 (4.35)
Lens	Traumatic cataract	25 (12.08)
	Capsule rupture	7 (3.38)
	Subluxation	7 (3.38)
	Aphakia (dropped lens)	5 (2.42)
	Decentered IOL	3 (1.45)
Posterior segment		
Vitreous	Hemorrhage	21 (10.14)
	Prolapse	10 (4.83)
Retina	Detachment	11 (5.31)
	tear	2 (0.97)
	Dialysis	1 (0.48)
	Fibrosis	1 (0.48)
	Intraretinal haemorrhage	8 (3.86)
	Macular hole	2 (0.97)
	Commotion retinae	6 (2.90)
Choroid	Rupture	5 (2.42)
	Prolapse	13 (6.28)
	Detachment	1 (0.48)
Optic nerve	Traumatic optic neuropathy	3 (1.45)
Others	Intraocular foreign body	6 (2.90)
	Endophthalmitis	2 (0.97)

Table 3 presents the distribution of ocular tissue involvement and complications. Corneal laceration 51 (24.64%), subconjunctival hemorrhage 47 (22.71%), scleral laceration 38 (18.36%), and corneal foreign body 38 (18.36%) were among the most commonly observed findings.

Table 4: Associated Injury

Associated with other Injuries	Number (%)
Yes	24 (11.59)
No	183 (88.41)

Table 4 shows the presence of associated systemic or bodily injuries. Most patients 183 (88.41%) had no associated injuries, while 24 (11.59%) had additional injuries.

Management and Visual Outcomes

Surgical intervention was required for 158 (73.49%) of the eyes. At presentation, only 21 (9.77%) of eyes had good vision (6/12 or better), while 41 (19.07%) were classified as blind. Following management, at the three-month follow-up, the proportion of eyes with good vision improved to 57 (26.51%), and the rate of blindness decreased to 29 (13.49%).

Table 5: Visual Acuity at Presentation

Grade of Visual Acuity	Number (%)
Good Vision (≥6/12)	21 (9.77)
Visual Impairment (6/18 – 6/60)	149 (69.30)
Blindness (<6/60 – No PL)	41 (19.07)
Could not be assessed	4 (1.86)

Table 5 illustrates the visual acuity at presentation. The majority of eyes had visual impairment 149 (69.30%), while blindness was present in 41 (19.07%) and good vision in only 21 (9.77%) of eyes.

Table 6: Initial Management

Initial Management	Number (%)
Surgical	158 (73.49)
Medical	55 (25.58)
Observation	2 (0.93)

Table 6 presents the initial management of ocular trauma. Surgical management was required in the majority of eyes 158 (73.49%), while medical treatment was provided in 55 (25.58%) of cases.

Table 7: Final Visual Outcome After 3 Months

Grade of Visual Acuity	Number (%)
Good Vision (≥6/12)	57 (26.51)
Visual Impairment (6/18 – 6/60)	125 (58.14)
Blindness (<6/60 – No PL)	29 (13.49)
Could not be assessed	4 (1.86)

Table 7 shows the final visual outcome after 3 months. Visual impairment remained the most common outcome 125 (58.14%), while good vision improved to 57 (26.51%) and blindness was observed in 29 (13.49%) of eyes.

Discussion

The findings of this study provide critical insights into the epidemiological characteristics, clinical profiles, and visual outcomes of ocular trauma in a tertiary care setting in Bangladesh. By analyzing 207 participants (215 eyes), this research elucidates prevailing injury patterns and risk factors, offering a robust foundation for targeted preventive strategies and public health interventions.[3]

The overwhelming male predominance observed in our cohort (81.16%) aligns with global and regional trends, where men are disproportionately exposed to occupational hazards and high-risk outdoor activities.[4,7] Our results closely mirror findings from a rural hospital in Central India (81.5% male) and a tertiary center in India (80.5%) male.[4,8] Furthermore, the high concentration of injuries in the 21–30 age group 68 (32.85%) underscores the vulnerability of the most economically productive segment of society. This demographic trend is a recurring theme in South Asian ocular trauma literature, emphasizing the significant socioeconomic burden resulting from productivity loss in young adults.[3,4,16]

The workplace emerged as the primary site of injury in 61 (29.47%) of cases, a figure comparable to the 26.3% reported in Indian clinical profiles.[4] While this is slightly lower than the 34.5% reported in Singapore, the disparity likely reflects differences in industrial safety enforcement and urban-industrial density.[17] A critical and alarming finding in this study was that 98.55% of patients were not using protective eyewear at the time of injury. This pervasive non-compliance is consistent with existing literature, where rates of non-use in high-risk occupations often exceed 95% and directly contributes to the high burden of severe preventable injuries observed in our cohort.[17,18] Such data highlight a significant failure in occupational health education and necessitate urgent intervention in both industrial and agricultural sectors.[11]

In this study, open-globe injuries accounted for 131 (63.29%) of cases—a rate significantly higher than the

41.5% reported in Pakistan and 45.3% in rural India.[7,8] This higher prevalence likely reflects the nature of our tertiary center as a referral hub for the most complex mechanical traumas that exceed the management capabilities of primary facilities. The data also reveal a high frequency of anterior segment involvement, particularly corneal lacerations 51 (24.64%) and subconjunctival hemorrhages 47 (22.71%). These findings align with regional research in Nepal and India, which identifies the anterior segment as the primary site of trauma and emphasizes the critical necessity of timely surgical intervention to mitigate adverse outcomes.[16,19]

The visual prognosis following ocular trauma is heavily influenced by the mechanism of injury and the initial visual acuity.[1,20] Our study observed a significant post-intervention improvement, with "Good Vision" (6/12 or better) increasing from 21 (9.77%) at presentation to 57 (26.51%) at the three-month follow-up. This trend supports the efficacy of current surgical and medical protocols in achieving meaningful visual recovery in a subset of patients.[2,4,14] However, the persistence of blindness in 29 (13.49%) of eyes—despite a reduction from the initial 41 (19.07%) underscores the devastating potential of severe mechanical trauma, especially in cases involving the posterior segment or globe rupture.[20,21]

The high prevalence of visual impairment and poor initial vision at presentation highlights the urgency of public health initiatives. Delayed presentation remains a significant hurdle; while early presentation is consistently linked to better outcomes.[22] Delays are often driven by geographical distance, economic constraints, and a lack of awareness regarding the severity of ocular symptoms.[23,24] In resource-limited settings, these barriers are compounded by limited access to comprehensive follow-up care.[23]

Future research should investigate the socioeconomic and cultural determinants influencing injury incidence and treatment adherence. Furthermore, the disparities in outcomes across different age groups warrant exploration to tailor age-specific interventions.[7] To address these challenges, we advocate for community-based educational campaigns that emphasize the importance of protective eyewear and the need for prompt consultation, even for seemingly minor injuries, to prevent permanent disability.[1,16,25] Such measures are vital for enhancing the overall effectiveness of ophthalmic care and reducing the burden of preventable blindness in traditionally "safe" environments, such as the home or small-scale workplaces.[9,26]

Limitations

While providing valuable clinical insights, this study has several limitations:

- **Referral bias**: As a single-center study at a tertiary hospital, our findings are skewed toward severe mechanical trauma—such as the high rate of open-globe injuries—and may not reflect patterns in primary or secondary care settings.
- **Follow-up duration**: The three-month follow-up is adequate for primary surgical recovery but insufficient to capture late-onset complications, such as traumatic glaucoma or secondary retinal detachment.
- **Recall bias**: Relying on patient or guardian recall for injury mechanisms and timing risks inaccuracies in the reported interval between trauma and presentation.
- **Geographic constraints**: With a primarily urban population, the findings may not capture rural Bangladesh's distinct agricultural trauma patterns or systemic care barriers.
- **Limited scope of behavioral data**: Although socioeconomic status was assessed via income, other factors-such as health literacy or pre-presentation use of traditional medicine-were not comprehensively analyzed.

Conclusion

This observational study examined the epidemiology and clinical outcomes of ocular trauma at a tertiary eye hospital in Bangladesh and found that injuries predominantly affected young, economically active males, with workplace-related accidents being the most common. The high frequency of open-globe injuries and the low use of protective eyewear highlight the largely preventable nature of these events. Although most patients required surgical intervention, specialized care resulted in significant visual improvement. Given the substantial socioeconomic burden, stronger occupational safety measures, greater promotion of protective eyewear, public awareness regarding timely eye care, and the establishment of a national ocular trauma registry are essential to reduce ocular morbidity and its broader impact.

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Original Article

Association between Non-Reactive Cardiotocography and Increasing Caesarean Section Rates: Impact on Neonatal Outcomes

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Abstract

Background: The global increase in caesarean section (CS) rates has become a major public health concern, with non-reactive cardiotocography (CTG) frequently identified as a common indication. CTG is widely used for intrapartum fetal monitoring to assess fetal well-being; however, abnormal findings often lead to surgical intervention despite an inconsistent association with adverse neonatal outcomes.

Objective: This study aimed to evaluate the rising rate of caesarean sections performed due to non-reactive CTG and to determine the correlation between non-reactive CTG findings and neonatal outcomes.

Methodology: This prospective observational study was conducted in the department of Gynaecology and Obstetrics at Ad-din Women's Medical College and Hospital from May 2023 to October 2023, which included pregnant women who underwent caesarean section for non-reactive CTG. Neonatal outcomes were assessed using APGAR scores, NICU admission, and other clinical indicators to determine whether non-reactive CTG reliably predicts poor neonatal outcomes or contributes to potentially avoidable caesarean deliveries.

Results: Among 6,709 caesarean sections performed during the study period, 334 cases (4.98%) were due to non-reactive CTG. The mean maternal age was 25.7 ± 4.84 years and mean gestational age was 37.4 ± 2 weeks. CTG was performed antepartum in 58.7% and intrapartum in 41.3% of patients. Loss of variability was the most common abnormality (45.5%). Meconium-stained liquor and cord around the neck were observed in 21% and 28.4% of cases, respectively. Most newborns (78.1%) had APGAR scores >7, while 20.4% required NICU admission and neonatal mortality was 4.8%.

Conclusion: Non-reactive CTG was associated with relatively favorable neonatal outcomes in most cases, suggesting possible overuse of caesarean delivery based solely on CTG findings.

Keywords: Non-reactive CTG; Caesarean section; APGAR score.

Introduction

Cardiotocography (CTG) uses an ultrasound transducer on the mother's abdomen to continuously record the fetal heart rate. CTG is widely used to evaluate fetal health, especially in pregnancies when there is a higher chance of complications.[1] To identify prenatal hypoxia, cardiotocography (CTG) displays fetal heart activity and uterine contractions graphically.[2, 3, 4] In most hospitals in

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affluent nations, it is the most widely utilized test for antepartum and intrapartum fetal surveillance.[5]

When a fetus's blood flow or oxygen exchange is disrupted prior to, during, or soon after birth, it can result in perinatal asphyxia. Due to reduced blood flow and oxygen to a fetus or child during the peripartum period, perinatal hypoxia can cause severe systemic and neurologic consequences.[6] CTG can begin as early as week 28 of pregnancy. Nonetheless, the majority of medical professionals recommend doing it after the 32nd week. It is specifically used to track high-risk pregnancies brought on by diabetes, high blood pressure, and women who have had many infertility tests.[7] The primary indicator of fetal distress during labor is abnormalities in cardiotocography, which could result in a marked rise in the rate of cesarean sections.[8] The WHO reports that the rate of cesarean sections is 15%.[9] According to several studies, the rate of cesarean sections due to fetal distress monitored by CTG ranges from 9.6% to 19%.[8,10]

Interpretation of CTG tracing requires both qualitative and quantitative descriptions of several factors. This is commonly summarized using the acronym DR C BRAVADO:

- DR: Define Risk
- C: Contractions (uterine activity)
- BRA: Baseline fetal heart rate (FHR)
- V: Baseline FHR variability
- A: Presence of accelerations
- D: Periodic or episodic deceleration
- O: Changes or trends of FHR patterns over time.[11]

CTG patterns are categorized as either normal (reassuring), suspicious (non-reassuring), or pathological (abnormal) according to National Institute for Health and Care Excellence (NICE) guidelines. If any one of the four criteria are missing, the pattern will be suspicious; if two or more aspects are missing, the trace will be pathological.[12] Over the past ten years, a number of interventions and supplementary modalities have been developed to maximize the utilization of continuous monitoring modalities and lower the high false positive rate. Fetal scalp stimulation (FSS), combined cardiotocographic-electrocardiographic monitoring, computer processing of fetal monitoring signals, and fetal blood sample (FBS) for pH and lactate measures are some of the currently available modalities.[13] The purpose of this study is to determine the caesarean section rate and neonatal outcome in women undergoing caesarean section due to nonreactive CTG.

Materials and Methods

A prospective observational study was carried out in the Department of Gynecology and Obstetrics at Ad-din Women's Medical College Hospital from May to October 2023. Ethical approval was obtained from the institutional review committee prior to the commencement of the study. The study included 334 pregnant women with a gestational age of 34 weeks or more, who were admitted through both the outpatient and emergency departments of Ad-din Women's Medical College Hospital, Dhaka. Informed consent was obtained from all participants prior to enrollment.

A detailed clinical examination of the patient was done. A systematic review was also done to see any comorbidities. All patients underwent for base line like CBC and specific investigations, especially Ultrasonography of pregnancy profile.

Inclusion Criteria:

- Pregnant women with a gestational age of 34 weeks or more presenting with non-reactive cardiotocography
- Cephalic presentation of fetus
- Singleton pregnancy

Exclusion Criteria:

- Gestational age <34 weeks
- History of previous cesarean section
- Presence of any other obstetrical indication for cesarean delivery
- Fetus with congenital anomalies
- Multiple gestation
- Severe antepartum hemorrhage

Based on FIGO criteria, CTG was defined as non-reactive when fetal tachycardia > 150 bpm, fetal bradycardia < 110 bpm, reduced or absent beat-to-beat variability, late deceleration, and extreme variable deceleration.[14] All enrolled participants were observed and followed until delivery. Data were collected using a structured questionnaire, including demographic characteristics and clinical outcomes such as maternal age, parity, gestational age, neonatal APGAR scores at one and five minutes, birth weight, color of amniotic fluid, neonatal death, and the need for neonatal intensive care unit (NICU) admission. Quantitative variables were summarized as mean ± standard deviation (SD), while qualitative variables were presented as frequencies and percentages.

Results

The study was conducted on 334 patients at Ad-din Women's Medical College and Hospital. During the study period, a total of 6,709 cesarean sections were performed, with 4.98 (5%) attributed to non-reactive cardiotocography (CTG). Maternal age ranged from 20 to 39 years, with a mean ± standard deviation (SD) of 25.7 ± 4.84 years. Gestational age at delivery varied between 34 and 42 weeks, with a mean ± SD of 37.4 ± 2 weeks.

Table 1: Demographic Variables of Study Subjects

Age of the patients	No. of the patients (%)
20-24 years	187 (55.9)
25-29 years	75 (22.5)
30-34 years	46 (13.8)
35-39 years	26 (7.8)
Parity	
Primigravida	245 (73.4)
Multi Para	79 (23.7)
Grand Multi Para	10 (3)

The majority of patients, 187 (55.9%), were in the 20–24 years age group. Regarding parity,245 (73.4%) were primigravida, 79 (23.7%) were multiparous, and 10 (3%) were grand multiparous.

Table 2: Distribution of Study Patients by Timing of CTG

Timing of CTG	No. of the patients (%)
Ante-partum	196 (58.7)
Intra-partum	138 (41.3)

In this study, cardiotocography (CTG) was performed ante-partum in 58.7% of patients and intra-partum in 41.3%, with the majority undergoing monitoring before labor to assess fetal well-being.

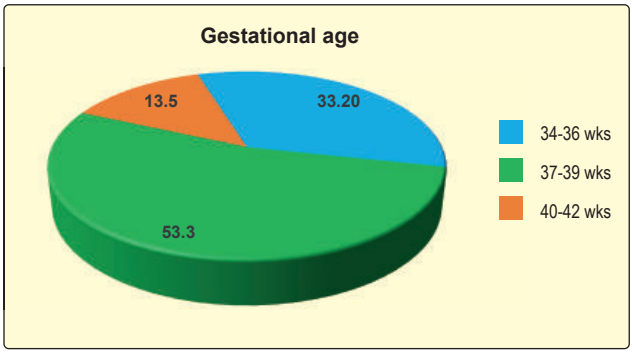

Figure 1: Gestational age distribution

The majority of patients, 178 (53.3%), were delivered between 37 and 39 weeks of gestation. Additionally, 111 (33.2%) delivered between 34 and 36 weeks, while 45 (13.5%) delivered between 40 and 42 weeks.

Table 3: Distribution of Patients by Abnormal CTGF finding

Abnormal CTG pattern	No. of the patients (%)
Deceleration	27 (8)
Non-reactive (absent of accelerations)	52 (15.6)
loss of variability	152 (45.5)
Sinusoidal pattern	8 (2.4)
Tachycardia	60 (18)
Bradycardia	35 (10.5)

In this study, 334 patients exhibited abnormal CTG patterns. The most common abnormality was loss of variability 152 (45.5%), followed by a non-reactive pattern (absent accelerations) in 52 (15.6%) and fetal tachycardia in 60 (18%). A smaller proportion showed bradycardia, decelerations, or a sinusoidal pattern.

Table 4: Per-operative Findings

Per-operative finding	No. of the patients (%)
Meconium stain liquor	70 (21)
Scanty liquor	92 (27.5)
Cord around the neck of the baby	95 (28.4)
Liquor normal in amount and colour	77 (23.1)

In this study, per-operative findings revealed meconium-stained liquor in 70 cases (21%), scanty amniotic fluid in 92 cases (27.5%), and umbilical cord around the neck in 95 cases (28.4%).

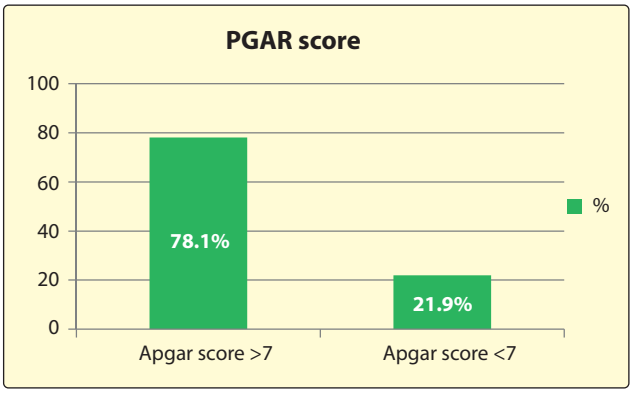

Figure 2: APGAR score

Based on the study, a satisfactory Apgar score (greater than 7) was observed in 261 babies (78.1%), while an Apgar score of less than 7 was found in 73 babies (21.9%).

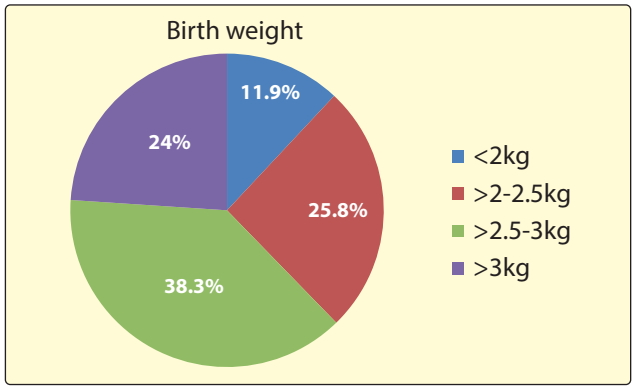

Figure 3: Birth weight of the neonate

In this study, neonatal birth weight was >2–2.5 kg in 86 babies (25.8%), >2.5–3 kg in 128 babies (38.3%), and >3 kg in 80 babies (24%).

Table 5: Neonatal Outcome

Neonatal outcome	No. of the Babies (%)
Immediate resuscitation needed	78 (23.4)
NICU admission	68 (20.4)
Neonatal death	16 (4.8)

Among 334 babies, 78 babies (23.4%) needed Immediate resuscitation, 68 babies (20.4%) required NICU admission and neonatal death occurred in 16 babies (4.8%).

Table 6: Evaluation of Neonatal Death in Different Cases (Medical Audit)

Sl no	Ges. age	Maternal risk factors	CTG (non-reactive)	Cause of death
1	40+ wks	Uncontrolled DM	Reduced Beat to variability	Birth wt 4kg
				Birth Asphyxia
2	38+	DM with HTN with Hypothyroidism	Deceleration	Birth wt 2.7kg
				Birth Asphyxia
3	34	PROM, Oligohydramnios, IUGR	Deceleration	Birth wt 1kg, SGA with prematurity
			Tachycardia	
4	36	HTN, Oligohydramnios, IUGR	Reduced Beat to variability	Birth wt 1.6kg, SGA Birth Asphyxia
5	34	HTN, Oligohydramnios, IUGR	Deceleration	Birth wt 1kg, SGA with prematurity,
			Tachycardia	Birth Asphyxia
6	35+	Severe Pre-eclampsia	Deceleration	Birth wt 1.9kg
			Bradicardia	Birth Asphyxia
7	38	DM with HTN with Hypothyroidism	Reduced Beat to variability	Birth wt 4.5kg
				Birth Asphyxia
8	40	DM with anaemia	Deceleration	Birth wt1.6kg, SGA ,RDS
			Bradicardia	
9	40	Obstructed labour	Reduced Beat to variability	Birth wt 3.5kg
				Birth Asphyxia
10	39	Oligohydramnios, IUGR	Reduced Beat to variability	Birth wt 1.5kg, SGA
				Birth Asphyxia
11	36	Severe Pre-eclampsia	Deceleration	Birth wt 1.8kg
				Birth Asphyxia
12	40	HTN	Deceleration	Birth wt 2.6kg
				Birth Asphyxia
13	36	PROM, Oligohydramnios, IUGR	Reduced Beat to variability	Birth wt 1.3kg, SGA
				Birth Asphyxia
14	37	DM, Severe Pre-eclampsia, IUGR	Reduced Beat to variability	Birth wt 1.7kg,
				SGA, RDS
15	34	PROM, Oligohydramnios, IUGR	Reduced Beat to variability	Birth wt 1.3kg, SGA with prematurity
16	35	Pre-eclampsia, Oligohydramnios,	Deceleration	Birth wt 1.7kg, SGA
				Birth Asphyxia

Discussion

Cardiotocography, or CTG, uses an ultrasound transducer that is positioned on the mother's abdomen to continuously measure the fetal heart rate. It is frequently used throughout pregnancy to evaluate the health of the fetus, especially in pregnancies with a higher risk of problems. To carry out interventions before the fetus is injured, CTG recording are used to detect when there is worry about fetal well being. Proper interpretation of CTG findings can help greatly decrease the health- related risk of newborns.[15]The aim of electric fetal heart monitoring by cardiotocography was to identify fetuses affected by hypoxia during labour in a better way. Long term neonatal outcome did not show any benefit and caesarian section rates increased by four folds.[16]

In this study, the prevalence of cesarean sections (C/S) due to non-reactive cardiotocography (CTG) was 5%. A total of 334 pregnant women were included, with maternal age ranging from 20 to 39 years. The mean ± standard deviation of maternal age was 25.6 ± 4.84 years. A mean age of 26 ± 2.1 years in another study[17]. In comparison, our study observed a gestational age range of 34 to 42 weeks, with a mean ± standard deviation of 38.6 ± 2.37 weeks. The majority of patients, 178 (53.3%), delivered between 37 and 39 weeks of gestation, while 111 (33.2%) delivered between 34 and 36 weeks, and 45 (13.5%) delivered between 40 and 42 weeks. Another study found that approximately 51(41.8%) of pregnant women delivered between 37 and 39 weeks of gestation.[18] In this study, cardiotocography (CTG) was performed antepartum in 58.7% of patients and intrapartum in 41.3%. Another study reported antepartum CTG in 62% and intrapartum CTG in 38% of patients.[19] In this study, 334 patients exhibited abnormal CTG patterns. The most common abnormality was loss of variability (45.5%), followed by a non-reactive pattern (absent accelerations) in 15.6%, fetal tachycardia in 18% and deceleration 8%. A smaller proportion showed bradycardia, or a sinusoidal pattern. In other study showed, 34% patient had deceleration of abnormal CTG,20% had non-reactive (absent of acceleration),22% had tachycardia and 6% absent beat to beat variability.[19]

In this study, per-operative findings revealed meconium-stained liquor in 70 babies (21%), scanty amniotic fluid in 92 babies (24.5%), and umbilical cord around the neck in 95 babies (28.4%). Another study reported that meconium-stained liquor was found in 43 cases (35.2%).[18] In our study, of the 334 non-reactive CTG cases, 73 babies (21.9%) had an APGAR score <7 at both 1 and 5 minutes, while 261 babies (78.1%) had an APGAR score >7, which was statistically non-significant. A similar study showed that 69 babies (61.6%) had an APGAR score >7, while 43 babies (38.4%) had an APGAR score <7.[17]In this study, neonatal birth weight was >2–2.5 kg in 86 babies (25.8%), >2.5–3 kg in 128 babies (38.3%), and >3 kg in 80 babies (24%). A related study reported that 67 babies (54.9%) had a birth weight ≤3 kg, while 55 babies (45.1%) had a birth weight >3 kg.[18] Babies born with low Apgar score, required resuscitation and some of them required N ICU admission. NICU admission was done 68 (20.4%) babies and neonatal death was found 16 (4.8%) babies.

However, in the study by Leung TY, 11% of cases required emergency Caesarean delivery due to non-reassuring fetal status, and 9% due to poor labor progress.[20] A high prevalence of Caesarean sections has been associated with cardiotocographic abnormalities in other studies.[21] When CTG was used in low-risk pregnancies, an increased rate of Caesarean deliveries was observed. According to guidelines for cardiotocography monitoring put forward by the National Institute for Clinical Excellence (NICE) [22,] the practice is advised on an as-needed basis for low-risk delivery but should be employed continuously for high-risk labour.

Limitation of the Study

Like all hospital-based studies, the present study has certain limitations. These limitations are acknowledged, and as a result, the findings may not be fully generalizable to the broader population at the national or global level. Due to the short duration of the trial, it was challenging to draw definitive conclusions regarding complications and mortality. Additionally, as the study population was drawn from a single hospital in Dhaka city, the findings may not accurately reflect the overall situation across the country. In the present study, early neonatal outcomes were assessed clinically. Further randomized studies with larger sample sizes, incorporating biochemical assessments such as umbilical cord blood gas analysis and fetal scalp pH, are recommended to validate these findings and provide more comprehensive insights.

Conclusion

Despite controversy over its impact on neonatal outcomes, CTG remains the most widely used method for fetal surveillance in developed countries. The study aimed to evaluate the increasing rate of caesarean

sections attributed to non-reactive CTG and to assess fetal outcomes in cases of abnormal CTG.CTG gives direct insight into fetal condition and serves well as a screening tool. It should not be the only factor in managing high-risk pregnancies. Abnormal CTG findings should be followed by further evaluations, such as amniotic fluid volume assessment, the oxytocin stress test, and a biophysical profile, before initiating any interventions.

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Original Article

Association of Keratoconus with Elevated Serum Low-Density Lipoprotein (LDL): A Cross-Sectional Comparative Study

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Abstract

Background: Keratoconus (KC/KCN) is a progressive corneal ectasia traditionally considered a localized biomechanical disorder; however, emerging evidence highlights the role of systemic metabolic factors and oxidative stress in its pathogenesis.

Objective: This study aims to evaluate the association between serum low-density lipoprotein (LDL) levels and progressive keratoconus in a Bangladeshi cohort.

Methods: This case-control study was conducted from July 2024 to June 2025 at Vision Eye Institute and Hospital, Dhaka. It included 47 patients with progressive keratoconus and 48 age- and gender-matched controls with refractive errors but no keratoconus. Progression was defined as >1.00 D(Diopter) increase in K-max (Meximum keratometry) over one year with minimum pachymetry ≥400 µm. Exclusion criteria eliminated confounding systemic and ocular conditions. Fasting lipid profile, blood glucose, BMI, keratometry, and pachymetry were assessed. Statistical analysis was performed using SPSS, with $p < 0.05$ considered significant.

Results: No significant differences were found in age ($p = 0.29$), gender ($p = 0.47$), BMI ($p = 0.62$), or fasting glucose ($p = 0.68$) between groups. Total cholesterol, triglycerides, and HDL were also comparable. However, mean LDL was significantly higher in keratoconus patients (112.86 ± 36.34 mg/dL) compared to controls (97.78 ± 31.89 mg/dL, $p = 0.03$). Corneal parameters differed significantly, with higher K-max (57.41 ± 5.17 D vs. 46.19 ± 3.61 D, $p < 0.01$) and lower pachymetry (481.32 ± 56.33 µm vs. 532.59 ± 42.37 µm, $p < 0.01$).

Conclusion: Elevated serum LDL is significantly associated with keratoconus, suggesting a potential role of systemic metabolic factors and oxidative stress in its pathogenesis. Monitoring dyslipidemia may aid in risk stratification and management, warranting further research.

Keywords: Keratoconus; LDL; Dyslipidemia; Corneal Ectasia; Oxidative Stress; Bangladesh.

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Introduction

Keratoconus is a progressive, non-inflammatory corneal ectatic disorder characterized by corneal thinning and protrusion, leading to irregular astigmatism, myopia, and ultimately vision impairment.[1] This condition typically manifests in adolescence or early adulthood and progresses over several years, necessitating careful monitoring and intervention to prevent severe visual compromise.[2] While traditionally considered a biomechanical disorder, emerging evidence highlights the intricate interplay of genetic predispositions and environmental factors, including oxidative stress and inflammatory processes, in its pathogenesis.[3,4] Specifically, heightened levels of inflammatory markers, including proteases, cytokines, and tumor necrosis factor-alpha, have been detected in the tear film of keratoconus patients, indicating a localized inflammatory response. Systemic inflammatory markers, such as the monocyte-to-HDL-cholesterol ratio and neutrophil-to-lymphocyte ratio, have also been found to be elevated in individuals with keratoconus, suggesting a broader systemic involvement.[5·] Furthermore, studies have linked increased systemic oxidative stress to keratoconus, indicating that an imbalance between pro-oxidants and antioxidants may contribute to disease progression.[4] Given these systemic associations, recent investigations have also begun to explore the potential role of metabolic markers, such as lipid profiles, in the pathophysiology of keratoconus, noting a possible link between dyslipidemia and disease presentation.[2] A pilot molecular study has revealed distinctions in metabolic pathways concerning energy production, lipid metabolism, and amino acid metabolism between keratoconus and normal corneas, further supporting the need for a comprehensive assessment of lipid profiles in affected individuals. This cross-sectional comparative study was therefore undertaken to investigate the association between keratoconus and serum lipid levels, particularly low-density lipoprotein, aiming to contribute to a deeper understanding of potential systemic metabolic risk factors for this ocular condition. This investigation aims to determine if elevated serum LDL levels are significantly associated with the presence of keratoconus, thereby elucidating a potential systemic metabolic component in its etiology. This study hypothesizes that individuals with keratoconus will exhibit significantly higher levels of serum low-density lipoprotein compared to age and gender-matched controls (Non-Keratoconus patients). Understanding such associations could inform new diagnostic markers and potential therapeutic strategies targeting systemic metabolic pathways to mitigate disease progression.

Materials and Methods

This cross-sectional comparative study conducted in Vision Eye Institute and Hospital, Dhaka, Bangladesh from July 2024 to June 2025 which included 47 patients diagnosed with keratoconus Who had history of progression and 48 age and gender matched normal individual with only refractive error and no sign of keratoconus or any other ocular disease were taken as control (Non-Keratoconus patients) by purposive sampling.

Progression of keratoconus was considered as an increase of 1.00 diopter or more in K-max over a one-year period prior to the inclusion in the study, alongside a minimum corneal pachymetry of 400 microns at the thinnest point. Diagnosis of keratoconus was established by a corneal specialist based on characteristic slit lamp biomicroscopy findings of localized corneal thinning and ectasia, further corroborated by Pentacam examinations to record flat, steep, and maximum simulated keratometric readings, as well as corneal pachymetry.[6,7,8]

The primary outcome of the study was the difference in fasting serum LDL levels between keratoconus and control (Non-Keratoconus patients) groups. A sample size calculation was performed based on detecting a moderate standardized effect size (Cohen's $d \approx 0.44$), corresponding to an anticipated mean LDL difference of approximately 15 mg/dL with a pooled standard deviation of approximately 34 mg/dL.

Assuming a two-sided alpha of 0.05, 1:1 allocation ratio, and 80% statistical power, the required sample size was estimated to be approximately 82 participants per group (164 total). Due to feasibility constraints and the defined study period, 47 keratoconus patients and 48 controls were enrolled. Based on the observed effect size and sample, the achieved post-hoc power for detecting the LDL difference was approximately 57%. Therefore, the study should be interpreted as exploratory in nature, particularly for secondary lipid outcomes.

Any existing causes of dyslipidaemia, including poor dietary habits, physical inactivity, smoking, hypothyroidism, and diabetes, were systematically excluded from this study through comprehensive patient history collection, thorough clinical examinations, and analysis of both previous and current laboratory blood test results.

Morning fasting flood samples were subsequently collected to assess fasting serum lipid profiles, which encompassed Total Cholesterol, triglyceride, LDL, and HDL levels, alongside a measurement of Fasting Blood Sugar (FBS). Demographic information, including age, sex, education level, height (cm), and weight (kg), was meticulously recorded for all participants.

Height and weight measurements were obtained using a digital height and meter measurement device, and the Body Mass Index was calculated for each participant using the standard formula: BMI = Weight (kg) / height^2 (m^2). BMI categories were subsequently defined as lean (< 25 kg/m^2), overweight (25-29.9 kg/m^2), and obese (≥ 30 kg/m^2), with a specific focus on the ≥ 30 kg/m^2 threshold for defining high BMI in the current analysis. Additionally, maximum keratometry and central corneal pachymetry were measured for all participants, allowing for a comparative analysis of these key corneal parameters between the keratoconus and control groups.[2]

The inclusion criteria for the study comprised patients with progressive keratoconus and age-matched controls (Non-Keratoconus patients) exhibiting normal corneal topography, with specific exclusion criteria encompassing prior ocular surgeries, corneal trauma, active systemic or ocular inflammation, and certain systemic diseases that could confound the results.[6,7] Exclusion criteria were stringently applied to ensure the homogeneity of the study population, encompassing individuals with a history of keratorefractive surgery, ocular surgery, corneal cross-linking, or corneal rings implantation, as well as those with severe dry eye, pregnancy, previous corneal scar or hydrops, and other ocular diseases apart from keratoconus.[9] Patients with a history of diabetes, those who had undergone eye surgery, or who had uveitis, glaucoma, or dry eye disease were also excluded.[10]

All statistical analyses were performed using SPSS software, with quantitative data compared between groups using Student's t-test or Mann-Whitney U test, as appropriate for normality.[5] Categorical data were analyzed using chi-square tests or Fisher's exact tests, and a p-value less than 0.05 was considered statistically significant for all analyses.[11]

The ethical approval for this study was obtained from the Institutional Review Board of Vision Eye Institute and Hospital, ensuring compliance with the Declaration of Helsinki.[12] All participants provided written informed consent before their inclusion in the study, or informed consent was obtained from a legal guardian for participants under 18 years of age.[13]

Results

This section presents the findings from the comparative analysis between the keratoconus and control groups, detailing demographic characteristics, lipid profiles, and corneal parameters.

Table 1: Demographic Characteristics of Study Participants

Variables	Keratoconus patients (n=47)	Non-keratoconus patients (n=48	P value
Gender			
Male	26 (55.32%)	23 (47.92%)	0.47
Female	21 (44.68%)	25 (52.08)	
Age Group (years)			
0-10 Yrs.	3 (6.38%)	1 (2.08%)	0.29
11–20 Yrs.	19 (40.43%)	17 (35.42%)	
21–30 Yrs.	24 (51.06%)	23 (47.92%)	
31–40 Yrs.	1 (2.13%)	7 (14.58%)	
Total	47 (100%)	48 (100%)	
Mean age ± SD	22.71±11.84	25.51±13.47	

SD = standard deviation

Table 1 summarizes the demographic features of the study participants, highlighting the distributions of gender and age groups within both the keratoconus and non-keratoconus cohorts. The mean age of the participants in the keratoconus group was 22.71 ± 11.84 years, while in the control group it was 25.51 ± 13.47 years, with a p-value of 0.29, indicating no statistically significant difference in age between the two groups. In terms of gender, the keratoconus group comprised 26 males (55.32%) and 21 females (44.68%), compared to the non-keratoconus group with 23 males (47.92%) and 25 females (52.08%). The p-value for gender distribution was 0.47, confirming no statistically significant difference. This demographic parity in age and gender between the cohorts ensures that any observed differences in lipid profiles or corneal parameters can be more confidently attributed to the presence of keratoconus rather than confounding demographic factors.[14, 15]

Table 2: Clinical Distribution of Characteristics in Patients with and Without Keratoconus

Parameters	Keratoconus patients (n=47)	Non-keratoconus patients (n=48)	Mean Difference (95% CI)	Cohen's d	P-value
BMI (kg/m^2)	23.69±5.35	24.21±4.97	-0.52 (-2.60 to 1.56)	-0.10	0.62
FBS level (mmol/L)	4.71±2.19	4.92±2.75	-0.21 (-1.22 to 0.80)	-0.08	0.68
Total cholesterol (mg/dl)	204.76±62.59	178.38±76.33	26.38 (-2.06 to 54.82)	0.38	0.07
Triglyceride (mg/dl)	136.58±79.12	118.93±71.48	17.65 (-13.80 to 49.10)	0.23	0.26
LDL (mg/dl)	112.86±36.34	97.78±31.89	15.08 (1.16 to 29.00)	0.44	0.03
HDL (mg/dl)	36.17±16.62	41.31±18.11	-5.14 (-12.19 to 1.91)	-0.30	0.09
K-max (D)	57.41±5.17	46.19±3.61	11.22 (9.39 to 13.05)	2.50	<0.01
Pachymetry (μm)	481.32±56.33	532.59±42.37	-51.27 (-71.39 to -31.15)	-1.02	<0.01

Table 2 details the clinical distribution of various characteristics in both the keratoconus and non-keratoconus groups, providing a comparative overview of anthropometric, biochemical, and corneal parameters.

The analysis revealed no statistically significant differences between the two groups for Body Mass Index (BMI) and Fasting Blood Glucose (FBS) levels. The mean BMI for keratoconus patients was 23.69 ± 5.35 kg/m^2, compared to 24.21 ± 4.97 kg/m^2 for the non-keratoconus group (p = 0.62). Similarly, fasting blood glucose levels were 4.71 ± 2.19 mmol/L in keratoconus patients and 4.92 ± 2.75 mmol/L in the control group (p = 0.68).

Regarding lipid profiles, while total cholesterol (204.76 ± 62.59 mg/dL in keratoconus vs. 178.38 ± 76.33 mg/dL in controls (Non-Keratoconus patients), p = 0.07) and triglycerides (136.58 ± 79.12 mg/dL in keratoconus vs. 118.93 ± 71.48 mg/dL in controls (Non-Keratoconus patients), p = 0.26) were numerically higher in the keratoconus group, these differences did not reach statistical significance. High-density lipoprotein levels were lower in the keratoconus group (36.17 ± 16.62 mg/dL) compared to the non-keratoconus group (41.31 ± 18.11 mg/dL), but this difference was also not statistically significant (p = 0.09).

Crucially, a statistically significant difference was observed in low-density lipoprotein levels. Keratoconus patients exhibited a mean LDL level of 112.86 ± 36.34 mg/dL, which was significantly higher than the 97.78 ± 31.89 mg/dL found in the non-keratoconus group (p = 0.03).[2] This finding suggests a potential association between elevated LDL levels and keratoconus.

Furthermore, key corneal parameters demonstrated highly significant differences between the groups. Maximum keratometry was substantially higher in keratoconus patients (57.41 ± 5.17 D) compared to controls (Non-Keratoconus patients) (46.19 ± 3.61 D), with a p-value of <0.01. Conversely, central corneal pachymetry was significantly lower in the keratoconus group (481.32 ± 56.33 μm) compared to the non-keratoconus group (532.59 ± 42.37 μm), also with a p-value of <0.01. These significant differences in K-max and pachymetry are consistent with the characteristic corneal steepening and thinning associated with keratoconus.

The result suggests that while BMI and fasting blood glucose levels are similar between age and gender-matched keratoconus and non-keratoconus groups, there are statistically significant differences in K-max, pachymetry, and notably, LDL levels.

Discussion

The observed elevation in LDL levels within the keratoconus cohort aligns with previous research indicating a potential link between altered lipid metabolism and the pathogenesis of the disease. Specifically, a meta-analysis has identified LDL levels ≥ 110 mg/dL as a significant risk factor for keratoconus, with an odds ratio of 3.00, underscoring its predictive value. This increased oxidative stress, often linked to elevated LDL, may exacerbate the corneal degradation processes characteristic of keratoconus. Furthermore, the association between elevated LDL and keratoconus suggests a systemic component to the disease, moving beyond its traditional classification as solely an ocular disorder. This systemic perspective is further supported

by evidence highlighting the role of systemic inflammatory markers in keratoconus, suggesting that compromised metabolic pathways may contribute to corneal ectasia.[2]

Importantly, beyond statistical significance ($p = 0.03$), the standardized effect size for LDL (Cohen's $d = 0.44$) in the present study indicates a small-to-moderate magnitude difference between keratoconus and control groups. This suggests that while the elevation in LDL is not large, it represents a clinically meaningful shift rather than a trivial statistical fluctuation. The 95% confidence interval (1.16 to 29.00 mg/dL) further supports the presence of a true positive association, although the moderate effect size indicates that LDL is likely one contributing factor among multiple systemic and local drivers of keratoconus pathophysiology.

Previous studies, while examining various lipid-derived metabolites, have not consistently found significant variations in cholesterol or related compounds between keratoconus patients and healthy controls (Non-Keratoconus patients).[15,16] However, the current study's robust finding of significantly elevated LDL levels in keratoconus patients, even after controlling for potential confounders, reinforces the need for further investigation into the precise mechanisms linking dyslipidemia and corneal health.

In contrast, other lipid parameters (total cholesterol, triglycerides, and HDL) demonstrated only small effect sizes (Cohen's d ranging from 0.23 to 0.38), despite some approaching statistical significance. These small magnitudes suggest limited practical impact and may reflect insufficient statistical power rather than true absence of association. The negligible effect sizes observed for BMI and fasting blood glucose further indicate that generalized metabolic disturbance was not a dominant differentiating factor in this cohort, thereby strengthening the specificity of the LDL finding.

The inflammatory component of keratoconus, characterized by increased levels of pro-inflammatory cytokines and reduced anti-inflammatory mediators in tears, may be influenced by systemic oxidative stress and metabolic alterations like dyslipidemia.[17,18] These systemic inflammatory responses, evidenced by elevated Neutrophil-Lymphocyte Ratio (NLR), Systemic Immune Inflammation Index (SII), and Platelet-Lymphocyte Ratio (PLR) in keratoconus patients, contribute to the chronic inflammatory state that can drive corneal thinning and progression.[17] Such systemic inflammation, initially believed to be absent in keratoconus, is now recognized as a critical factor in its pathogenesis, involving both local and systemic pro-inflammatory mediators.[17,19]

The magnitude of effect observed for classical corneal parameters was markedly larger, with very large effect sizes for K-max ($d \approx 2.50$) and central pachymetry ($d \approx 1.02$), confirming strong structural differentiation between groups. The contrast between these very large corneal effects and the modest biochemical effect sizes further supports the interpretation that dyslipidemia may function as a contributory systemic modifier rather than a primary structural determinant of keratoconus.

The recognition of keratoconus as a condition influenced by systemic factors, rather than a purely localized corneal pathology, opens new avenues for understanding its complex etiology and developing comprehensive management strategies.[19] This paradigm shift emphasizes the importance of a holistic approach to patient care, integrating metabolic and inflammatory evaluations into routine ophthalmological assessments for keratoconus patients. This integration could potentially lead to the identification of novel biomarkers for early detection and therapeutic targets aimed at mitigating disease progression, particularly given the growing evidence of inflammatory processes in keratoconus.[20,21,22]

This expanded understanding positions keratoconus as a systemic disorder with ocular manifestations, where chronic inflammation and dyslipidemia may act as synergistic drivers of corneal remodeling and ectasia.[6,23] This broader perspective on keratoconus's pathophysiology, encompassing systemic metabolic and inflammatory factors, aligns with emerging evidence that implicates immune dysregulation in the disease's progression.[21,24,25]Given this intricate interplay, future research should delve into the specific molecular pathways through which elevated LDL contributes to corneal inflammation and subsequent remodeling (e.g., through formation of oxidized LDL, interaction with corneal cells, impact on collagen cross-linking) in keratoconus, potentially identifying targets for systemic therapeutic interventions. Investigating the genetic predispositions to both dyslipidemia and keratoconus could further elucidate common pathways and shared risk factors.[26] Such investigations could uncover novel targets for precision medicine, tailoring interventions to the individual patient's metabolic and genetic profile to halt or even reverse keratoconus progression.

The findings of the present cross-sectional comparative study align with and expand upon existing literature regarding demographic characteristics, corneal parameters, and potential systemic associations with keratoconus.

Consistent with numerous studies, this investigation established demographic homogeneity between the keratoconus and control groups, with no statistically significant differences in age or gender distribution. This meticulous matching strengthens the validity of the comparisons, ensuring that observed clinical and biochemical differences are more likely attributable to keratoconus itself rather than confounding demographic variables.[17,27-35] For instance, a study on the inflammatory profile of keratoconic corneal epithelium also reported no significant differences in mean age or gender between keratoconus and control groups.[5] Similarly, in a study on keratoconus risk factors, ensured age and sex matching of participants.[2]

The results regarding corneal parameters are in strong agreement with the established understanding of keratoconus. We observed significantly higher maximum keratometry values and significantly lower central corneal pachymetry in keratoconus patients compared to healthy controls (Non-Keratoconus patients). This aligns with the defining features of keratoconus, characterized by progressive corneal steepening and thinning.[2,8,33] Studies utilizing advanced imaging techniques consistently report similar significant differences in corneal curvature and thickness between keratoconic and normal eyes, emphasizing these parameters as crucial diagnostic indicators.[33,34] For instance, a study reported significantly higher curvature values and lower thickness values in keratoconus eyes compared to healthy controls (Non-Keratoconus patients), mirroring the findings.[33] Another study also found significant differences in corneal curvature, asphericity, and elevation values in keratoconus patients compared to controls (Non-Keratoconus patients).[28]

A particularly notable finding in the study is the statistically significant elevation of low-density lipoprotein levels in keratoconus patients compared to the control group. This finding is supported by other research, which identified elevated serum LDL levels (≥ 110 mg/dL) as a significant risk factor for keratoconus, reporting a three-fold increased risk for individuals with such levels.[2] This further supports the potential association between altered lipid metabolism and the pathogenesis of the disease.

The broader literature widely acknowledges that keratoconus, while traditionally considered non-inflammatory, involves significant inflammatory and oxidative stress pathways.[3,4,19-26,35] Recent research indicates elevated local and systemic pro-inflammatory mediators and oxidative stress markers in keratoconus patients.[2,4,6,17,18,35] For example, studies have shown that oxidative stress is related to lipid peroxidation and inflammation, which are involved in the progression of anterior ocular diseases like keratoconus.[35] The elevated serum LDL level observed in our study is particularly relevant as high serum LDL is known to increase the risk of oxidative stress, and oxidized LDL can trigger inflammatory reactions. This finding, therefore, adds evidence supporting an inflammatory background in keratoconus and suggests that elevated serum LDL levels could be a risk factor for the condition.[2] This systemic perspective is further supported by evidence highlighting the role of systemic inflammatory markers, such as increased neutrophil/lymphocyte ratio, systemic immune-inflammation index, and platelet/lymphocyte ratio, which are recognized indicators of systemic inflammation and have been found elevated in keratoconus patients.[6,17,18]

In summary, this study reinforces established clinical findings regarding corneal morphology in keratoconus. Critically, it also presents compelling evidence for an association between elevated serum LDL levels and the condition, a finding corroborated by other recent investigations.[2] This observation highlights the potential role of systemic metabolic factors, particularly those related to oxidative stress and inflammation, in the complex etiology of keratoconus. Future research should aim to further elucidate the precise mechanisms by which elevated LDL may contribute to corneal changes and keratoconus progression, and investigate its utility as a potential biomarker or therapeutic target.

Limitations of the study

Despite the significant association found between elevated serum LDL and keratoconus, several limitations of this study must be acknowledged.

First, the cross-sectional design inherently limits the ability to establish a definitive causal relationship between dyslipidemia and the development or progression of keratoconus. While we observed higher LDL levels in the keratoconus group, longitudinal studies

are required to determine if lipid profile alterations precede corneal changes or if they are concurrent markers of a broader systemic inflammatory state.

Second, the sample size, while statistically adequate for the primary outcome, may have been insufficient to detect smaller but potentially clinically significant differences in other lipid parameters, such as total cholesterol or high-density lipoprotein, which showed numerical but non-significant trends.

Third, as a single-center study conducted in an urban specialized eye hospital, the findings may not be fully representative of the general population or different ethnic groups.

Finally, while we excluded major systemic diseases, other potential confounding factors such as dietary habits, physical activity levels, and specific genetic predispositions for dyslipidemia were not exhaustively controlled for, which could influence serum lipid concentrations. Future multi-center, prospective studies with larger cohorts and more comprehensive metabolic profiling are necessary to further validate these findings and explore the underlying pathophysiological mechanisms.

Conclusion

This cross-sectional comparative study provides significant insights into the association between elevated serum low-density lipoprotein levels and keratoconus, suggesting that systemic metabolic factors, particularly those linked to oxidative stress and inflammation, may play a crucial role in its pathogenesis. The findings suggest that monitoring and managing dyslipidemia could be a relevant consideration in the comprehensive care of keratoconus patients, offering a novel avenue for therapeutic intervention or risk stratification. Further longitudinal studies to track LDL changes and keratoconus progression and also investigation into the precise mechanisms through which elevated LDL contributes to the progression of corneal ectasia and whether lipid-lowering therapies could modulate disease trajectory is warranted.

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Original Article

Overcoming Dogear of Lateral End of Mastectomy Wound By Y-Closure Technique: Our Experience

Sadia Armin Khan[1], Taposhi Rabeya Khan[2], Mohammad Jahangir Alam[3]

Abstract

Introduction: The improvement in the treatment of breast cancer is due to early diagnosis, better understanding of the natural history of this disease and therapeutic improvements over the years. There is a gradual shift away from radical surgery to the breast conservative surgery during the last few decades all over the world. Till now modified radical mastectomy is the most common surgery performed by surgeons for carcinoma breast.

Objective: This study aims to evaluate a technique of mastectomy wound closure designed to maximize cosmesis at the lateral end.

Methods: As a surgical technique, patients were evaluated according to NCCN guidelines, and all underwent modified radical mastectomy using a transverse Stewart incision. After achieving hemostasis, closure was planned. At the lateral end, equal markings were made on the superior and inferior flaps based on redundant skin over the latissimus dorsi. A triangular flap was advanced medially, three points sutured, residual dog ears excised, producing a Y-shaped closure. This procedure was performed in 31 cases between January 2024 to June 2025 those were undergone modified radical mastectomy by Stewart incision.

Result: The patient's mean age was 46 years (range 28-62 years). The mean weight of the excised breast tissue was 1015 g (range 356–2003). The mean lengths of the two limbs of the Y-plasty were 5.3 cm (range 3–10). The mean length of the base of the flap was 7.6 cm (range 4–14). 9 patients developed a small area of skin necrosis at the apex of the Y-plasty. 8 further patients developed superficial wound infections following marginal flap necrosis and 3 patients developed wound hematoma.

Conclusion: The Y-shaped closure approach (y-closure) for modified radical mastectomy is a simple and safe technique. It improves cosmesis and prevents discomfort in obese women by eliminating lateral dog ear deformity.

Keywords: Mastectomy; Dog ear; y-shaped closure.

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Introduction

Breast cancer is the number one cancer in women. There were 2,296,840 new cases of breast cancer in 2022 among women.[1] A modified radical mastectomy is a commonly performed surgical procedure worldwide for breast cancer still now. However, if the mastectomy incision is not planned properly, it can result in a dog ear laterally. This is not only cosmetically unpleasing but can also be a source of discomfort to the patients, interfering with arm movement and the fitting of the brassiere and/or prosthesis placement. Its actual incidence is

unclear, but this lateral mastectomy dog ear formation is seen more frequently in overweight or obese women.

Several techniques have been described to prevent or correct lateral dog-ear deformity following mastectomy, including elliptical excision, fish-tail closure, Z-plasty, and extended lateral incisions.[2] While these methods may be effective, they often increase scar length, compromise wound tension, or create additional cosmetic concerns.[3] Moreover, some techniques are technically demanding and may not be easily reproducible in routine surgical practice, particularly in high-volume or resource-limited settings.[4]

An ideal closure technique should be simple, reliable, cosmetically acceptable, and should not significantly prolong operative time or increase morbidity. Proper management of redundant lateral skin is especially important in patients with higher body mass index, where excessive axillary and lateral chest wall tissue predisposes to dog-ear formation.[3] Failure to address this issue at the primary surgery may necessitate secondary corrective procedures, leading to patient dissatisfaction and additional healthcare costs.[5]

The Y-closure technique is a modification designed to redistribute redundant lateral skin without excessive tissue excision or scar extension. By converting redundant tissue into a triangular advancement flap, this method allows for a tension-free closure with improved contour of the lateral chest wall.[6] In this study, we describe our experience with the Y-closure technique in preventing lateral dog-ear deformity following modified radical mastectomy and evaluate its feasibility, simplicity, and cosmetic outcome in our patient population.

Materials and Methods

This prospective study was conducted between January 2024 and June 2025 and included patients who underwent Modified Radical Mastectomy (MRM) using a transverse Stewart incision. A total of 31 patients were enrolled in the study. The procedures were performed at Ad-din Medical College Hospital and in private practice.

All patients underwent thorough preoperative evaluation in accordance with NCCN (National Comprehensive Cancer Network) guidelines. Distant metastasis was ruled out in every case before surgery, and all patients were planned for modified radical mastectomy. The Stewart incision consisted of an elliptical skin incision of variable dimensions, tailored according to breast size, tumor size, and tumor location. Standard techniques were used for mastectomy and axillary lymph node dissection.

After achieving meticulous hemostasis, wound closure was planned. At the lateral end of the incision, redundant skin was managed using the Y-closure technique, resulting in a final Y-shaped wound closure. Any residual lateral dog-ear deformity was excised to achieve optimal contour.

Data were collected prospectively using a structured data sheet. Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 25.0. Descriptive statistics were used to summarize patient demographics and surgical outcomes. Results were expressed as frequencies, percentages, and means where appropriate.

Procedure: After completion of mastectomy and axillary dissection, depending on the extra skin covering the latissimus dorsi muscle, marking is done on the superior and inferior flap margins at equal distances from the lateral end of the incision. Three points, as seen in the photo, are sutured together after the triangle flap is advanced medially. Any dog ears that are lateral are removed. The final look upon closure is shaped like a "Y."

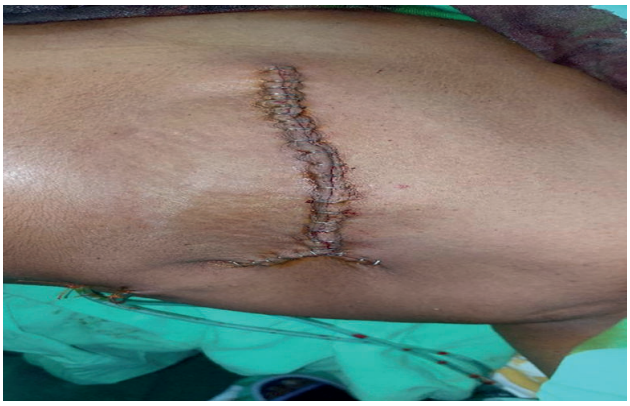

Figure 1: Final Appearance of Scar as Like as Y

Advantages:

- Easy closing technique without undue tension
- Cosmetically superior
- No hindrance to movement of ipsilateral arm
- Brassiere fits without any discomfort
- Avoids seroma formation in the lateral pocket of the dog ear
- Avoids lateral shift of scar thus reducing the volume to be irradiated

Disadvantages:

- creates a tri point at risk for necrosis
- an additional limb scar apart from the linear scar

Results

Table 1: Age Distribution of the Study Population (n = 31)

Age group (years)	Number of cases (%)
21–30	3 (9.7)
31–40	5 (16.1)
41–50	14 (45.2)
51–60	5 (16.1)
61–70	4 (12.9)

Table 1 shows the age distribution of patients undergoing modified radical mastectomy with Y-closure technique. The majority of patients belonged to the 41–50 years age group 14 (45.2%), indicating a higher prevalence in middle-aged women. Patients aged 31–40 years and 51–60 years each accounted for 5 (16.1%) of cases, while younger patients aged 21–30 years constituted the smallest proportion 3 (9.7%).

Table 2: Body Mass Index (BMI) Distribution of the Study Population (n = 31)

BMI category	Number of cases (%)
Underweight	0 (0)
Normal	9 (29)
Overweight	17 (54.8)
Obese	4 (12.9)
Morbidly obese	1 (3.2)

Table 2 summarizes the BMI distribution of patients undergoing modified radical mastectomy with Y-closure technique. More than half of the patients were overweight 17 (54.8%), while obese and morbidly obese patients together constituted (16.1%), highlighting the predominance of higher BMI in the study population—a known risk factor for lateral dog-ear formation.

Table 3: Weight Distribution of the Mastectomy Specimen (n = 31)

Specimen weight (grams)	Number of cases (%)
0–500	2 (6.5)
501–1000	9 (29)
1001–1500	11 (35.5)
1501–2000	8 (25.8)
2001–2500	1 (3.2)

Table 3 shows the distribution of mastectomy specimen weight among the study population. The majority of specimens weighed between 1001–1500 grams 11 (35.5%), followed by 501–1000 grams 9 (29.0%) and 1501–2000 grams 8 (25.8%). Heavier specimen weights, which may contribute to increased lateral skin redundancy, were observed in a substantial proportion of patients.

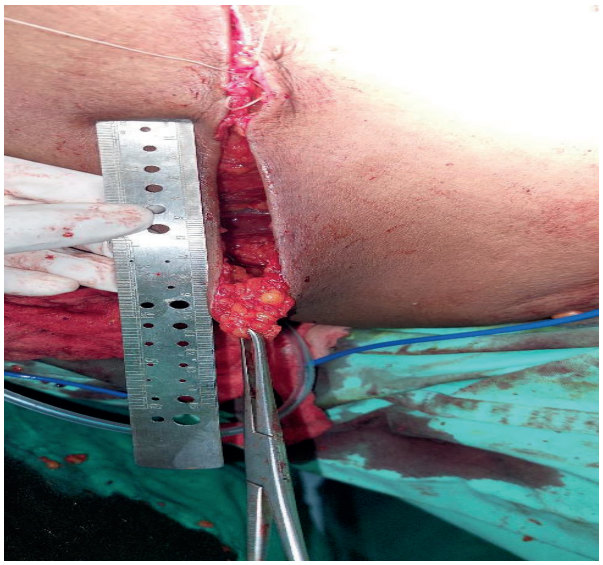

Figure 2: Mean of Upper Limb 6.2cm

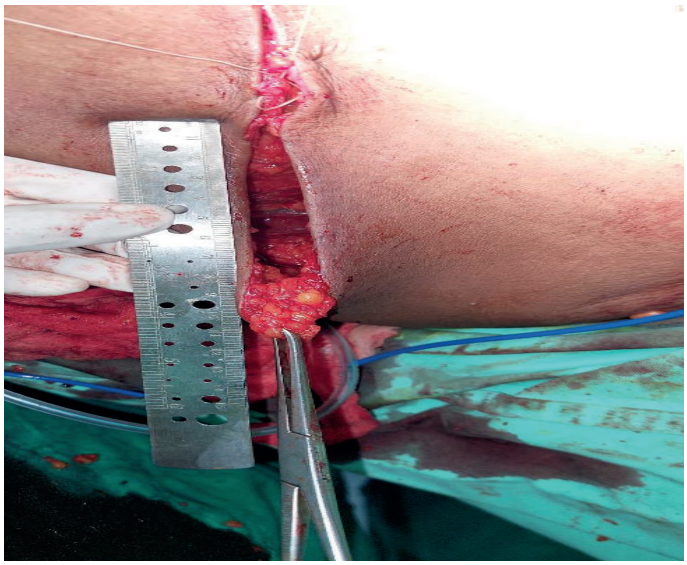

Figure 3: Mean of Lower Limb 5.6cm

Table 4: Length of Hospital Stay of the Study Population (n = 31)

Length of hospital stay (days)	Number of cases (%)
3–5	23 (74.2)
6–10	7 (22.6)
11–15	1 (3.2)

Table 4 shows the duration of hospital stay following modified radical mastectomy with Y-closure technique. The majority of patients 23 (74.2%) were discharged within 3–5 days, indicating a favorable postoperative recovery. Only 1 (3.2%) of patients required hospitalization beyond 10 days, suggesting a low rate of prolonged postoperative morbidity.

Table 5: Postoperative Complications Following Y-Closure Technique (n = 31)

Postoperative complication	Number of cases (%)
Necrosis at tripoint/apex	9 (29)
Marginal flap necrosis	8 (25.8)
Wound seroma	4 (12.9)
Wound hematoma	3 (9.7)

Table 5 summarizes the postoperative complications observed after modified radical mastectomy with Y-closure technique. The most common complication was necrosis at the tripoint or apex 9 (29.0%), followed by marginal flap necrosis 8 (25.8%). Seroma 4 (12.9%) and hematoma 3 (9.7%) were less frequent. Some patients experienced more than one complication. Most complications were managed conservatively and did not require reoperation.

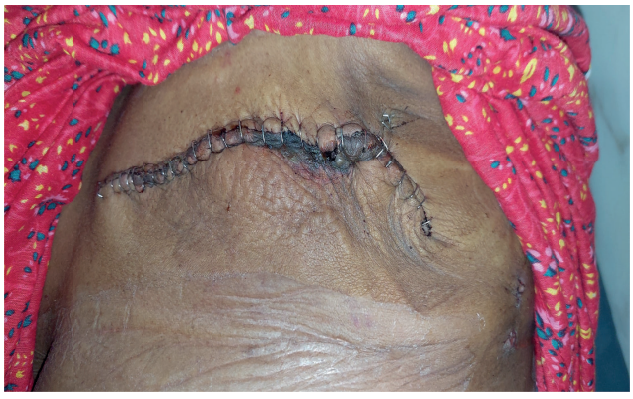

Figure 4: Marginal Flap Necrosis with Necrosis

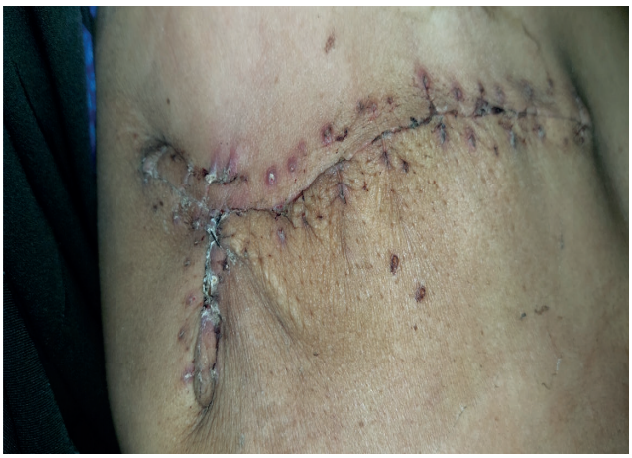

Figure 5: Completely Healed Wound at Apex

Follow-up

- Cosmetic result was excellent without lateral dog ear deformity. Patients did not complain of any discomfort. Pain was minimal in the postoperative period.

  After 6-month postoperative follow-up, most of the patients are very satisfied with the cosmesis.

Discussion

Mastectomy, both with and without reconstruction, is still a crucial component of surgical management for the treatment of breast cancer, despite significant advancements in oncoplastic breast-conserving surgery. The mastectomy wound typically has uneven opposite side lengths and a significant lateral apical angle. The "dog-ear" is the phrase used to describe the outward and upward protrusion of tissue caused by rotational and compressive forces applied to the corners of the wound as it closes. After a mastectomy, dog ears are not unusual, especially in patients with big breasts or obesity.[7] Dog ears are unattractive, can cause pain or pressure injuries, and typically lie at or above the bra line, resulting in an ill-fitting bra.[7,8,9] Additionally, dog ears frequently need surgical repair and can be a subject of litigation from disgruntled patients.

- Several surgical methods to prevent or treat dog ear on the lateral aspect of the mastectomy scar have been published, but there is no set technique.[10]

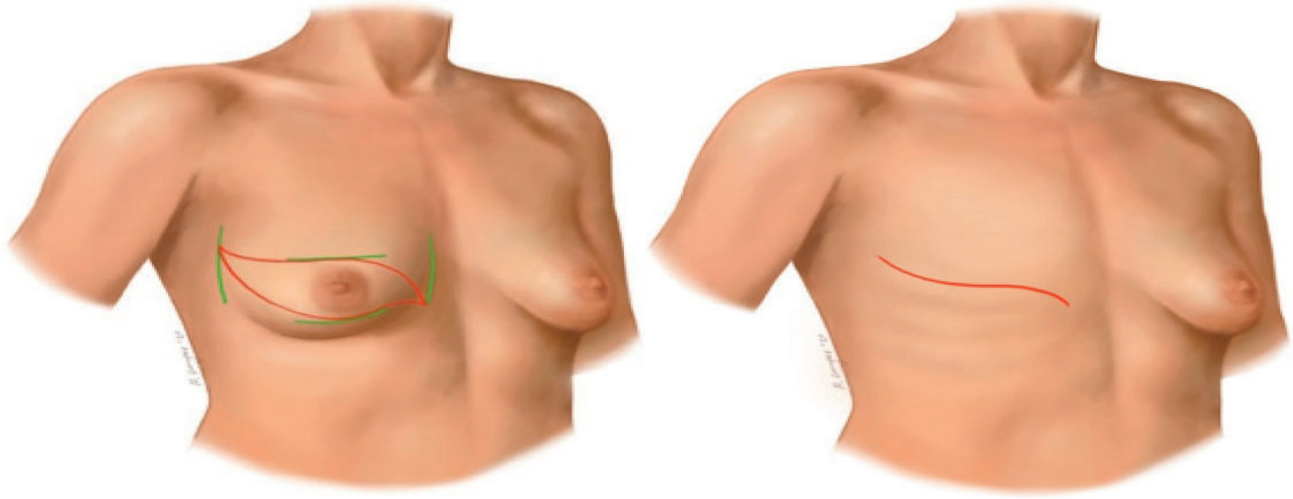

Figure 6: Double S Incision

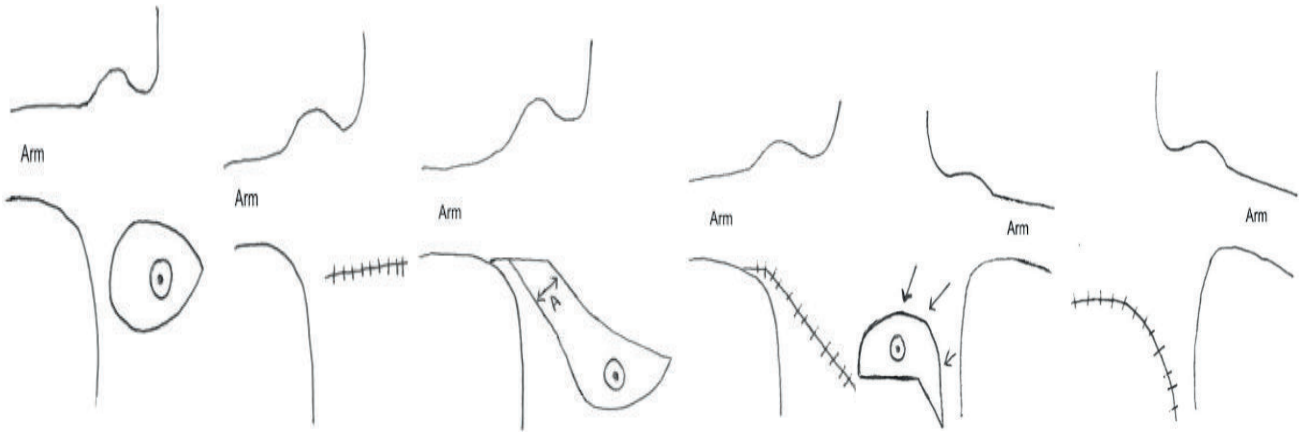

Figure 7: Tear Drop Incision (L-Technique and FISH Technique)[11]

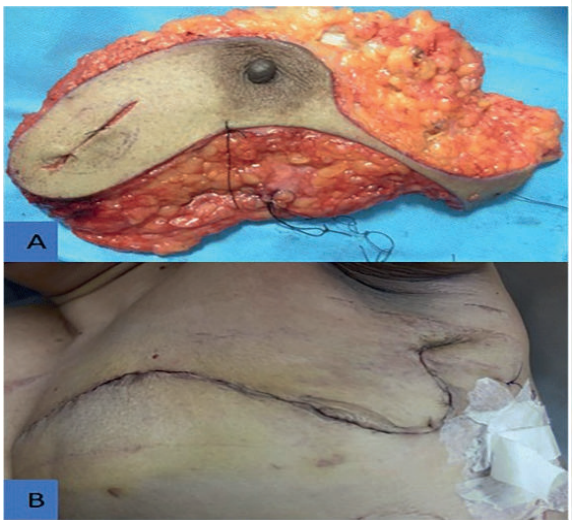

Figure 8: D-Incision

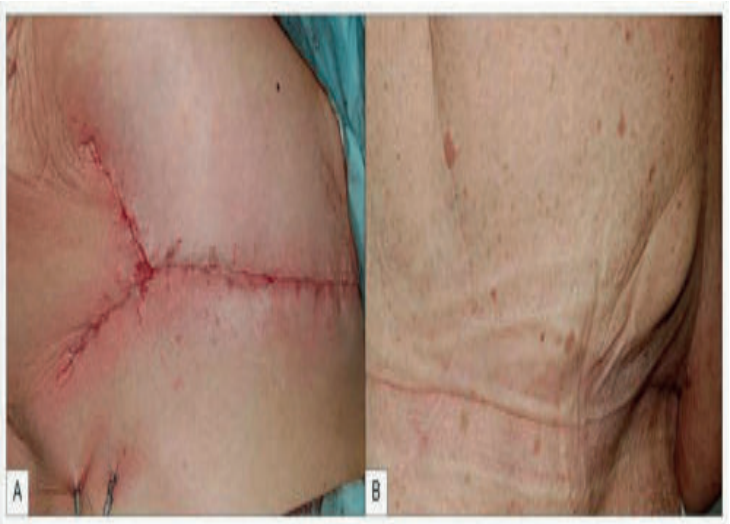

Figure 9: Y Closure is the Commonest Described Technique

The Y-closure procedure is straightforward and requires no further incisions. It involves pulling excess axillary tissue forward and creating a "Y" configuration at the lateral half of the transverse mastectomy incision (Stewart incision). Compared to other methods mentioned, the cosmetic result is better.[7]

Originally reported in the late 1980s, the Y-technique of closure after mastectomy is mostly employed to remove lateral "dog ears."[6]

A research initially presented the Y-shaped closure approach, and another study independently defined the phrase "fish-shaped closure." The same year, redundant axillary tissue is dragged forward in the Y-closure procedure, which creates a "Y" shape at the lateral half of the transverse mastectomy incision (Stewart incision).[7]

Researchers performed a systematic review of the studies describing techniques aimed at preventing the dog ear.[12] They found Y-closure or fish-shaped closure to be the most common described methods. In their review, they found results of 160 patients with Y-shaped or fish-shaped closures and found 8 complications in them, which included necrosis in 3, infection in 4, and hematoma in 1. All complications were treated successfully. They concluded this technique to be safe and gives best cosmetic outcome.

Several modifications and alternative techniques have been proposed to address lateral dog-ear deformity following mastectomy. A research demonstrated that the addition of quilting sutures to Y-plasty further reduces dead space and dog-ear formation in patients with large cup-sized breasts.[13] Other approaches, such as the L-incision with lipoaspiration described as the modified M-plasty, double-S closure, and angel wings incision, have shown satisfactory cosmetic outcomes but often involve longer scars, increased technical complexity, or additional operative steps.[14,15,16,17,18] Systematic reviews emphasize that technique selection should be individualized, considering breast size, body habitus, and surgeon expertise.[16] In this context, the Y-closure technique remains a simple, reproducible option with acceptable cosmetic and clinical outcomes.

Conclusion

There have been several surgical methods described to address the lateral dog ear of the mastectomy scar, each with advantages and disadvantages of its own. The most often reported method, known as "fish-shaped" incision or "Y closure," was shown to be safe. In order to improve cosmesis after a mastectomy, a Y-shaped closure may be advised, particularly in obese patients and avoid discomfort caused by redundant skin. It is crucial that the breast surgeon is familiar with the various techniques so that the patient can receive individualized surgical management.

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Case Report

Primary Tuberculosis, Phlyctenular Conjunctivitis and Erythema Nodosum: A Rare Association

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Abstract

Primary tuberculosis (TB) are usually pulmonary, an increase in extra-pulmonary TB as cervical lymphadenitis has been reported frequently. Phlyctenular Keratoconjunctivitis (PKC) and Erythema nodosum (EN) are manifestations of an immunological response to tuberculosis. EN and PKC may rarely be associated with this, but are usually found separately. In the recent past, we have not found any case reports with these associations which prompt us to present this case.

Keywords: Phlyctenular keratoconjunctivitis; Erythema nodosum; Lymphadenopathy.

Introduction

Tuberculosis (TB) is a leading cause of morbidity and death in all ages globally according to the 2025 WHO Global Tuberculosis Report, estimated new cases of tuberculosis (TB) were 10.7 million, of which 11% were children.[1] Mycobacterium tuberculosis infection can cause severe TB disease in young children, particularly infants <2 years old.[2] Diagnosis in this age group is challenging due to the paucibacillary nature of paediatric TB, the non-specific and often acute disease presentation, and the difficulty in collecting respiratory samples for diagnostic testing.[3] In Bangladesh TB incidence is 36 per thousand population among the 0-14 years age group.[4] Pulmonary TB is the commonest type of TB in children. Extrapulmonary disease is also common (around 30-40% of cases).[5]

Initial lesions are usually pulmonary, although an increase in extra-pulmonary TB has been reported in recent years. These frequently involve the head and neck, with the most common presentation being a mass in the cervical region.[6] Additionally, primary TB of the orofacial region is more commonly found in children and adolescents than in adults.[7,8] EPTB may provide difficulty in diagnosis if it presents primarily without pulmonary involvement.[9]

PKC represents an allergic cell mediated response in cornea and/or conjunctiva to some antigen, to which they have already become sensitized.[10] Erythema nodosum is a skin condition where red lumps appear on the shins and less commonly forearms and thighs. This is a painful disorder of the subcutaneous fat that can manifest with tender, erythematous, subcutaneous nodules.[11] Erythema nodosum and phlyctenular conjunctivitis both are hypersensitivity reactions of primary TB.[12] Though PKC is still found in association with TB erythema nodosum is now a days a rare association.[10,13,14] The present study highlights the rare association of these two conditions with primary extrapulmonary TB in an eight-year-old girl.

Case: A nine-year-old female child presented to the department of Paediatrics at Ad-din Women's Medical College Hospital complaining of low-grade fever for

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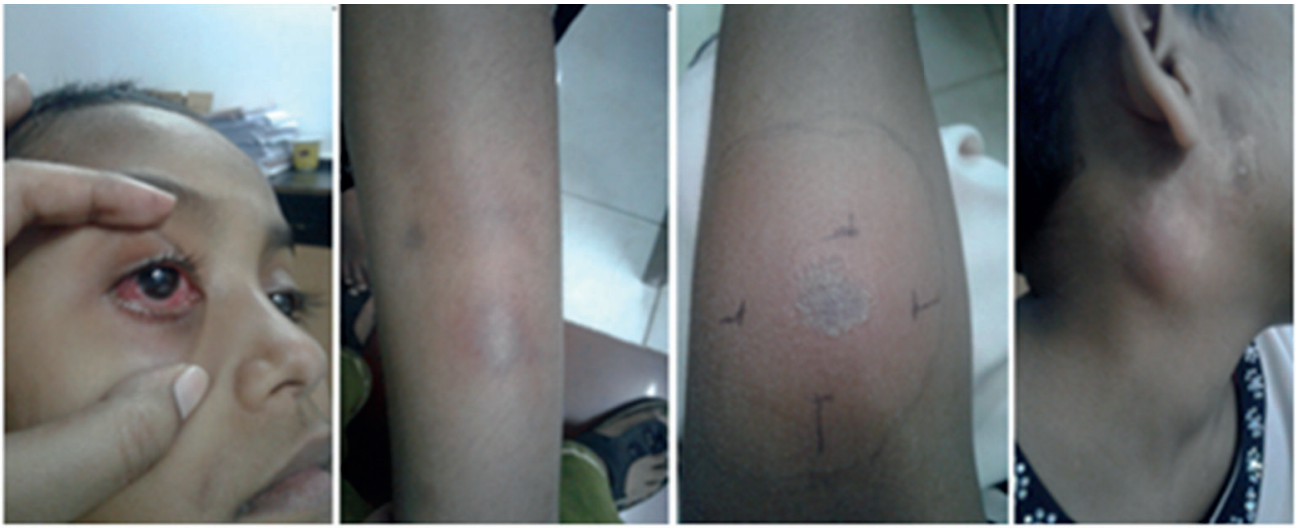

Figure : A. Phlyctenular keratoconjunctivitis B. Erythema nodosum C. MT 28mm. D. Lymphadenopathy

three months with evening rise of temperature which subsided in early morning with profuse sweating. Mother also complained of a painless swelling in her right mandibular angle for two and a half months. Fifteen days prior to admission mother noticed some red colored tender lesion on shins and continuous watering and redness from both eyes. The child was a student of a local madrasa and lived in the dormitory where she was exposed to a TB patient six months ago.

On examination, the child had cervical lymphadenopathy, largest one was the right jugulodigastric node, 2.5×2.5 cm approximately, soft, rounded, non-tender, mobile and showed signs of matting without any discharging sinus. Lymph nodes of other regions were not palpable.

On skin survey, erythema nodosum were found on the both shins. Phlyctenular conjunctivitis was found in both eyes.

Other systemic examinations revealed no abnormality. CBC report showed Hb% was 12.1 gm/dl, TC was 10,380/cu mm, N was 64% and L was 24% and ESR was 49 mm in 1st hour. Chest X-ray was normal, MT was positive (28 mm). FNAC of the lymph nodes showed epithelioid cells, lymphocytes, histocytes and polymorphs in the background of casaeation necrosis which are consistent with TB but chest X-ray was normal. A diagnosis of primary TB lymphadenitis was made and the patient we started on short course antitubercular therapy (ATT) with isoniazide, rifampicin, ethambutol and pyrazinamide for two months followed by isoniazide and rifampicin for four months. Topical steroid was used for eyes and conjunctivitis was cleared within two weeks. Her weight began to increase two months after initiation of treatment and lymph nodes become normal in size within five months of treatment.

Discussion

Lymphadenitis is the most common clinical presentation of extra-pulmonary tuberculosis. Tuberculous lymphadenitis most frequently involves the cervical lymph nodes. [15, 16] Cervical lymphadenitis, which is also referred to as scrofula, may be manifestation of a systemic tuberculous disease or a unique clinical entity localized to neck. It may represent a spread from the primary focus of infection in the tonsils.[12,15] In initial stage of superficial lymph node involvement progressive multiplication of the M. tuberculosis occurs, the onset of delayed hypersensitivity is accompanied by marked hyperemia, swelling, necrosis and caseation of the center of the nodes. This can be followed by inflammation, progressive swelling and matting with other nodes within a group. Adhesion to the adjacent skin may result in induration and purplish discoloration. The center of the enlarging gland becomes soft and caseous material may rupture into surrounding tissue or through skin with sinus formation. Mycobacterial infection should be considered in the differential diagnosis of a cervical swelling, especially in endemic areas. The duration of symptoms before diagnosis may range from few weeks

to several months.[15, 17] It may present as a unilateral single or multiple painless slow growing mass or masses developing over weeks to months, mostly located in the posterior cervical and less commonly in supraclavicular region .[15,17,18]

PKC and erythema nodosum are two uncommon signs indicative of recent TB infection.[12,19] Phlyctenular keratoconjunctivitis is a nodular affliction characterized by the formation of a small, circumscribed lesion at the corneal limbus[20] and is a nonspecific allergic response in the cornea and/or conjunctiva, to a variety of antigens.[21] Conjunctival phlyctens are usually transient and asymptomatic, but occasionally in larger phlyctens, frank pustular conjunctivitis may develop with subsequent penetration into sclera, leading to permanent scar formation. Corneal phlyctens present with lacrimation, photophobia and blepharospasm and tend to leave opacities, leading to permanent vision impairment or occasionally blindness.[21] Tuberculosis as an etiological association, is being supplanted by staphylococcal infection and worm infestation in the developed world. Tuberculosis has been implicated in 77% (86/112) of all cases of PKC from India. PKC lesions were observed to be more severe and recurrent in patients with tuberculosis. The most common underlying tubercular focus was found to be the lungs, followed by tubercular lymphadenopathy.[10] Tubercular phlyctenular conjunctivitis usually regresses completely with antitubercular therapy.[22]

Erythema nodosum is a skin condition where red lumps appear on the shins and less commonly forearms and thighs. This is a painful disorder of the subcutaneous fat that can manifest with tender, erythematous, subcutaneous nodules. Erythema nodosum is a well-known delayed hypersensitivity reaction to a variety of different stimuli such as infections, autoimmune diseases or drugs, depending on the country of the patient's origin.[11] The association of erythema nodosum with tuberculosis is well known, especially in endemic regions.[23] Some series reported TB as the second most common cause of secondary erythema nodosum, whereas others consider Mycobacterium tuberculosis infection as a rare cause.[13,14, 24] In a recent study found that almost all patients with primary TB presented with EN whereas 20% of those with EN had tuberculosis.[25] A strong association of EN with TB within one month of diagnosis was also found in a study.[23] Similarly, a study reported that among clinical forms of TB, primary TB is unique to cause erythema nodosum, frequently seen in children and young adolescents. It may even manifest before the development of a skin-test reaction to tuberculin.[24]

We have diagnosed the girl as a case of extrapulmonary primary TB because no focus was found in the lungs but there is evidence of cervical TB lymphadenitis with simultaneous presence of PKC and EN, which are hypersensitivity reactions of primary TB.

Primary TB as cervical lymphadenitis with phlyctenular keratoconjunctivitis (PKC) and erythema nodosum (EN) are rare associations and never been reported previously.

Conclusion

TB is a systemic disease which may give rise to cervical lymphadenitis as an extra-pulmonary manifestation. The most usual signs and symptoms are the appearance of a chronic, painless mass in the neck, which is persistent and usually grows with time. Primary extra-pulmonary tubercular lymphadenitis with presence of phlyctenular conjunctivitis and erythema nodosum is a rare association. Matted firm, non-tender cervical lymphnode in a child is suspicious of tubercular origin, if it is associated with EN it is highly suspicious and if EN and PKC are present, it is highly suggestive of tuberculosis.

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Review Article

Acinetobacter: An Emerging Threat to Hospitalized Patients

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Abstract

Acinetobacter baumannii(A. baumannii) has emerged as one of the most important opportunistic pathogens associated with healthcare-associated infections worldwide. Its remarkable ability to survive in hospital environments, acquire antimicrobial resistance determinants, and cause outbreaks in intensive care units has made it a major public health concern. This review summarizes the taxonomy, epidemiology, virulence mechanisms, antimicrobial resistance patterns, clinical significance, current therapeutic approaches, and future treatment prospects of *Acinetobacter* species, with particular emphasis on multidrug-resistant (MDR) A. baumannii. A comprehensive review of published literature was conducted, focusing on global and regional epidemiology, molecular mechanisms of pathogenicity and resistance, diagnostic methods, and emerging therapeutic strategies against MDR and carbapenem-resistant *A. baumannii*. *A. baumannii* is a leading cause of ventilator-associated pneumonia, bloodstream infections, urinary tract infections, and wound infections, particularly among critically ill and immunocompromised patients. Its pathogenicity is mediated by multiple virulence factors, including outer membrane proteins, capsular polysaccharides, lipopolysaccharides, fimbriae, and biofilm formation. The organism demonstrates extraordinary genomic plasticity, enabling the acquisition and dissemination of resistance genes through plasmids, transposons, integrons, and insertion sequences. Consequently, MDR, extensively drug-resistant (XDR), and pan-drug-resistant (PDR) strains have become increasingly prevalent worldwide. Although carbapenems remain effective against susceptible isolates, treatment options for resistant strains are limited. Novel agents such as sulbactam-durlobactam, cefiderocol, abaucin, antimicrobial peptides, and phototherapy represent promising future interventions. MDR A. baumannii continues to pose a significant challenge to modern healthcare systems. Strengthened infection control practices, antimicrobial stewardship programs, continuous surveillance, and the development of innovative therapeutic strategies are essential to mitigate the growing threat of this highly adaptable pathogen.

Keywords: *Acinetobacter baumannii*; Multidrug Resistance; Carbapenem-Resistant *Acinetobacter baumannii (CRAB);* Antimicrobial Resistance; Healthcare-Associated Infections; Biofilm Formation; Virulence Factors.

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Introduction

Acinetobacter represents a heterogeneous group of free-living saprophytes that are widely distributed in nature and commonly present in diverse environmental niches.[1] Members of this genus are often part of the normal flora of the human skin[2], mucous membranes and pharyngeal and respiratory secretions.[2,3] They are opportunistic pathogens capable of causing a broad spectrum of infections, including pneumonia, septicemia and wound infections.[4]

In hospitalized individuals, this species primarily colonizes the skin, oropharynx and gastrointestinal tract.[5] These organisms have been recovered from various body sites of healthy individuals, including the forehead, nose, ear, throat, trachea, conjunctiva, hand, vagina and perineum-most frequently inhabiting moist areas such as the axillae, groin and web spaces.[6] *Acinetobacter* spp. have also been isolated from a wide range of animals, including birds, fish and rainbow trout, as well as from food sources such as raw vegetables, fruits, milk and dairy products.[7, 8]

One of the most remarkable features of *A. baumannii* is its ability to survive under desiccated conditions for prolonged periods. This resilience enables it to persist on reusable medical devices such as ventilator tubing, arterial pressure monitoring systems, humidifiers, washbasins, plastic urinals and respirometers.[8]

A. baumannii infections principally occur in healthcare settings, such as hospitals, long-term care facilities, and ICUs. It can cause a range of infections, including bloodstream infections, pneumonia, urinary tract infections, wound infections, and infections of surgical sites. They tend to affect individuals with compromised immune systems, such as individuals who are critically ill, have underlying medical conditions, or have undergone invasive procedures. These infections are troublesome because they can be difficult to treat, particularly when the bacteria are resistant to multiple antibiotics.[9]

It has been demonstrated to be a cause of community-acquired respiratory tract infections, including pneumonia, among immunocompetent individuals residing in tropical regions, in addition to intensive care unit patients. Furthermore, among the most frequent sources of infection among troops who suffered trauma during the Vietnam, Afghanistan, and Iraq conflicts is *Acinetobacter*. Notwithstanding these noteworthy correlations, the extent of the expanding worldwide pandemic of *Acinetobacter* ICU-acquired infections in critically ill patients is incomparable.[10] One of the most concerning aspects of *Acinetobacter* infections is that many strains are resistant to multiple antibiotics. This is due in part to the overuse of antibiotics, which has allowed the bacterium to develop resistance mechanisms. Because of its multidrug resistance, it has been termed an "ESKAPE" pathogen (*Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Enterobacter sp*).[11]

To determine the prevalence and patterns of antibiotic resistance of *Acinetobacter* in critically ill patients throughout the globe, surveillance data were also reviewed along with other prospective and retrospective investigations of ICU-acquired infections. *Acinetobacter* infections are most common in hospitalized patients, especially those who are critically ill or who have weakened immune systems. They are often referred to as nosocomial or hospital-acquired infections. *A. baumannii* can survive on surfaces and medical equipment, allowing it to persist and spread within healthcare environments. Prolonged stays in the intensive care unit are closely linked to the development of infections acquired there in, which is associated to worse outcomes such as higher rates of morbidity and mortality.

Current Taxonomy: *Acinetobacter* species are short, plump, Gram-negative coccobacilli, measuring 1.0–1.5 μm in width and 1.5–2.5 μm in length during exponential growth; they adopt a coccoid form in the stationary phase and may form pairs or elongated chains.[12] The taxonomic classification is as follows:

- Domain: Bacteria
- Phylum: Proteobacteria
- Class: Gammaproteobacteria
- Order: Pseudomonadales
- Family: Moraxellaceae
- Genus: *Acinetobacter*

The genus is highly diverse and its taxonomy has been greatly refined through genomic methods.

Epidemiology

A. baumannii is primarily a healthcare-associated pathogen responsible for a variety of nosocomial infections, including septicaemia, bacteraemia, ventilator- associated pneumonia, wound infections, endocarditis, meningitis and urinary tract infections.[13] Outbreaks are commonly reported in intensive care and burn units, particularly among patients requiring mechanical ventilation.[8]

Global Epidemiology of *Acinetobacter species*

A. baumannii is widely distributed in water and soil, as well as in numerous healthcare settings, where it frequently colonizes hospitalized patients.[8,14] Epidemiological studies have documented the presence of multidrug-resistant *A. baumannii* across multiple regions worldwide, including Europe, North America, Argentina, Brazil, China, Taiwan, Hong Kong, Japan and Korea, often in association with nosocomial infections.[8] Community-acquired pneumonia caused by *A. baumannii* has been reported primarily in tropical areas, particularly during warm and humid months.[8,15]

In addition to *A. baumannii*, *Acinetobacter courvalinii (A. courvalinii)* has been identified as an opportunistic human pathogen. The first clinical isolation of *A. courvalinii* was reported from the urine of an eight-year-old boy with a neurogenic bladder in Russia.[16] More recently, a strain of *A. courvalinii* was isolated in a hospital in Ottawa, Canada, marking the first clinical report of this species in the country.[17]

South Asia Epidemiology of *Acinetobacter spp.* Carbapenem-resistant Gram-negative bacteria, particularly the *Acinetobacter baumannii–calcoaceticus* complex, are highly prevalent in South and Southeast Asia. These regions, which account for over one-third of the global population and host several major medical tourism destinations, face considerable challenges due to the high burden of antimicrobial resistance. In India, carbapenem resistance among *A. baumannii* isolates typically exceeds 40%, with OXA-type carbapenemases being the dominant resistance mechanism.[18,19]

In Pakistan, carbapenem resistance rates in *A. baumannii* range from 62% to 100% among clinical isolates 20. In Bangladesh, a study conducted in a university hospital ICU found that *A. baumannii* was isolated from approximately one-third of clinical samples, and two-thirds of these isolates were resistant to carbapenems.[21]

These data underscore the critical need for continuous regional surveillance, molecular detection of resistance genes, and stringent infection control practices to limit the spread of carbapenem-resistant *A. baumannii* in healthcare settings. [25]

Epidemiology of Outbreaks

A notable characteristic of *Acinetobacter baumannii* is its propensity to cause hospital outbreaks, driven by its multidrug resistance and remarkable ability to survive desiccation on surfaces.[26] Specific resistant clones are often responsible for these outbreaks. In Europe, three major clones, designated as I, II and III, have been identified and have caused geographically distinct outbreaks within healthcare institutions. In most outbreak settings, the majority of *A. baumannii* isolates typically belong to a single clone.[27,28]

Clinical Significance

A. baumannii is a foremost cause of nosocomial infections, incorporating bloodstream infections, ventilator-associated pneumonia, surgical site infections, and urinary tract infections. It creates a significant challenge in healthcare surroundings due to its capability to acquire antibiotic resistance mechanisms.[29] The following is an overview of the clinical significance of Acinetobacter, supported by references:

- Healthcare-associated Infections (HAIs): *A. baumannii* is associated with to a range of healthcare-associated infections, including bloodstream infections, ventilator-associated pneumonia, urinary tract infections, surgical site infections, and catheter-related infections.[30,31] These infections primarily affect persons with compromised immune systems, such as acutely ill patients, those who go through invasive procedures, and individuals with prolonged hospital stays.[32]
- Antibiotic Resistance: *Acinetobacter sp.* has an increased unsavory reputation due to its capability to grow resistance to multiple antibiotics, including carbapenems, which are commonly used as a last resort for treating multidrug-resistant infections. The development of carbapenem-resistant *A. baumannii* (CRAB) has presented noteworthy trials in clinical settings, limiting treatment options, and contributing mortality rates.[33, 34]
- Outbreaks and Clonal Spread: *Acinetobacter* occurrences have been reported in healthcare facilities internationally, often concerning multidrug-resistant strains. These outbreaks are repeatedly accompanied by the clonal distribution of specific strains within a healthcare setting, indicating the significance of infection control measures to avoid transmission.[35, 36]
- Community-Acquired Infections: Although less common, *Acinetobacter* infections can also appear in the group, remarkably in individuals with underlying risk factors or preceding healthcare coverage. Community-acquired strains may exhibit antibiotic resistance, further complicating.[37]

- Wound Infections in Combat Casualties*: A. baumannii* has been an alarm in army healthcare settings due to its capability to be a source of severe wound infections, remarkably in combat fatalities. These infections have determined resistance to multiple antibiotics, posing significant challenges for treatment.[38, 39]

Virulence Factors of *Acinetobacter species*

Acinetobacter is considered to be an organism of low virulence.[8,40] Despite extensive research into the virulence potential of this emerging pathogen, little is still known about its true pathogenic capacity and virulence factors. Virulence factors help bacteria colonize epithelial surfaces, evade and inhibit the host immune response through biofilm formation and obtain nutrition from the host.[41,42] The major virulence factors of *Acinetobacter* include cell surface hydrophobicity, outer membrane proteins (OMPs), capsular polysaccharides and lipopolysaccharides, biofilm formation. Among these, OmpA has been determined to contribute significantly to the pathogenic potential of the organism.[43] OmpA binds to host epithelial cells and mitochondria, inducing mitochondrial dysfunction and swelling. This is followed by the release of cytochrome c, a heme protein, which leads to apoptosome formation and subsequent apoptosis of the host cell.[43] OmpA, being the most abundant surface protein of the pathogen, also contributes to resistance against complement-mediated killing and biofilm formation.[44, 45]

Acinetobacter species expresses surface capsular polysaccharides that serve as targets for protective antibody-based interventions. Antibiotic-induced overproduction of capsular polysaccharides increases resistance to complement-mediated killing. The lipopolysaccharides (endotoxins) are potent stimulators of circulating leukocytes inducing the release of pro-inflammatory mediators such as TNF-α and IL-8 from macrophages.[8,46] These endotoxins are toxic to neutrophils, inhibiting their migration and phagocytic activity. [8,15,40]

The organism also produces various extracellular enzymes, cytotoxins and vascular permeability factors that contribute to tissue damage, particularly in respiratory tract infections.[8,47] Bacterial attachment is believed to be an early and critical step in Gram-negative nosocomial pneumonia.[48] Type 1 fimbriae are adhesive virulence factors involved in adherence and colonization.[49,50]

One of the major factors contributing to the chronicity, persistence and antimicrobial resistance of *Acinetobacter* infections is its remarkable ability to colonize and form biofilms on both biotic and abiotic surfaces.[51] The biofilm formation rate in *A. baumannii* (80–91%) is significantly higher than that observed in other species (5–24%).[52] Biofilm development in *A. baumannii* involves multiple virulence determinants, including outer membrane protein A (OmpA), biofilm-associated protein (Bap), chaperone–usher pilus (Csu), extracellular exopolysaccharide (EPS),two-component regulatory system (BfmS/BfmR), poly-β-(1,6)-N-acetylglucosamine (PNAG) and quorum-sensing systems.[51,53] Other virulence-related enzymes secreted by the bacterium include esterases, aminopeptidases and acid phosphatases, which assist in host tissue invasion and nutrient acquisition.[8,15]

2.11 Species Identification

In 1986, DNA-DNA hybridization was used to delineate species within the *Acinetobacter* genus.[54] Identification of *Acinetobacter* species is challenging due to the lack of standardized techniques. Initially, species were distinguished based on phenotypic characteristics such as growth temperature, colony morphology, growth medium and glucose non-fermentation. The *Acinetobacter calcoaceticus–baumannii*(ACB) complex encompasses closely related species, including *A. pittii*, *A. nosocomialis,* and *A. calcoaceticus* has been expanded to incorporate more recently described species such as *A. seifertii* and *A. lactucae*.[55] Members of this complex exhibit high phenotypic and genotypic similarity, sharing comparable colony morphology, biochemical characteristics and other laboratory traits.[56,57] Due to this similarity, accurate species-level identification within the genus requires molecular approaches.[58] Common genotypic techniques include amplified 16S rRNA gene restriction analysis, high-resolution fingerprinting via amplified fragment length polymorphism (AFLP), sequencing of the 16S–23S rRNA intergenic spacer region, rpoB gene sequencing and gyrB multiplex PCR.[7,33] The OXA-51-like gene serves as a species-specific genetic marker intrinsic to *A. baumannii*.[59]

One notable lineage, the haemolytic clade, is characterized by strong haemolytic activity on sheep erythrocytes and in some strains, proteolytic activity. [60]

Antimicrobial resistance

Over the past three decades, *Acinetobacter baumannii* has progressively acquired resistance to newly

developed antimicrobial agents, leading to the emergence of multidrug-resistant (MDR) strains. These MDR strains are now recognized as major nosocomial pathogens worldwide.[8,61]

Criteria for defining MDR, XDR and PDR in *Acinetobacter* spp. [62]

- MDR (Multidrug-resistant): Non-susceptible to at least one agent in three or more antimicrobial categories.
- XDR (Extensively drug-resistant): Non-susceptible to at least one agent in all but two or fewer antimicrobial categories (i.e., susceptible to only one or two categories).
- PDR (Pan-drug-resistant): Non-susceptible to all agents in all antimicrobial categories.
- This species exhibit remarkable genetic adaptability, being naturally transformable Gram-negative bacteria capable of acquiring foreign resistance genes through transformation, conjugation and transduction.[63] Mobile genetic elements such as plasmids, transposons and integrons play a central role in resistance dissemination.[26] Class I and II integrons are strongly associated with multidrug resistance and are frequently integrated into the chromosome, promoting clonal spread of resistance determinants. Insertion sequences (IS elements) also enhance β-lactamase expression and acquisition of additional resistance phenotypes. [31,63]

Mechanisms of Antibiotic Resistance in *A. baumannii*

The major mechanisms of antimicrobial resistance in *Acinetobacter baumannii* include the following:

1. Enzymatic inactivation of antibiotics
2. Reduced permeability or restricted entry of antibiotics into the bacterial cell
3. Alteration of target sites or cellular functions due to mutations.[64]

A. baumannii is gaining popularity due to a growth in antimicrobial resistance and the emergence of strains that are resistant to nearly all existing medicines.[26,65] This organism is naturally resistant to many antibiotics, including aminopenicillins, third generation cephalosporins (Ceftazidime), chloramphenicol, Imipenem, Chloramphenicol, Ciprofloxacin, Doripenem, and Tobramycin. Its resistance mechanisms involve β-lactamase production, efflux pumps, porin mutations, and aminoglycoside-modifying enzymes, making treatment options increasingly limited. The rapid evolution of MDR *A. baumannii* highlights the urgent need for novel therapeutic strategies and strict antibiotic stewardship to control its spread. A study was conducted on the isolation, characterization, and antibacterial susceptibility of *Acinetobacter* species obtained from a tertiary care hospital. The study found varying resistance levels across different antibiotics. Aminopenicillins showed the lowest resistance at 26.6%, while imipenem resistance was alarmingly high at 76.6%, indicating the widespread presence of carbapenemase enzymes. Similarly, ceftazidime resistance was recorded at 70%, suggesting the role of extended-spectrum β-lactamases. Other antibiotics, including chloramphenicol (63.3%), ciprofloxacin (60%), doripenem (60%), and tobramycin (66.6%), also exhibited high resistance rates. These findings highlight the increasing challenge of multidrug-resistant *Acinetobacter baumannii* infections and emphasize the urgent need for alternative treatment strategies and effective antibiotic stewardship program.[27.66] It also has a remarkable ability to develop resistance mechanisms to broad-spectrum-lactams, aminoglycosides, fluoroquinolones, and tetracyclines, Numerous investigations have found an increase in the number of *A. baumannii* strains that are resistant to these drugs. MDR isolates from geographically different locations have also been shown to be clonally related, whereas susceptible strains are genotypically heterogeneous, implying that the problem of resistance may be associated with a limited number of successful *A. baumannii* lineages. Resistance to carbapenems, which were introduced in 1985 and have been the most important drugs for the treatment of MDR *A. baumannii* infections for many years, is of special concern. Even though clinical *A. baumannii* were shown to be invariably susceptible to these drugs in early studies.[28,67] Hospital outbreaks caused by carbapenem-resistant strains had already been reported by the early 1990s.[29, 68] indicating that *A. baumannii* can cause infections that are completely resistant to the currently available antimicrobial arsenal.

Antimicrobial Therapy

Acinetobacter baumannii is classified by the Infectious Disease Society of America as a "red alert" pathogen due to its significant threat to the effectiveness of current antimicrobials.[7] With rising resistance, only a limited number of drugs can reliably treat MDR *Acinetobacter* infections, making them difficult to manage and often leading to adverse patient outcomes. Carbapenems,

such as imipenem/cilastatin and meropenem, remain the drugs of choice for severe infections caused by susceptible *Acinetobacter* isolates. However, infections with carbapenem-resistant strains are increasingly common. Treatment of these infections requires the use of older drugs like colistin, less commonly used agents such as sulbactam, or drugs with limited clinical experience such as tigecycline. Combination antimicrobial therapy is frequently employed to manage infections caused by multidrug-resistant strains. [69]

Future Treatment Options

New Antibiotics

The application of deep learning has enabled the discovery of *Abaucin*, a structurally novel, narrow-spectrum antibiotic with potent activity against *Acinetobacter baumannii*.[70] This molecule selectively disrupts lipoprotein trafficking by targeting the LolE-mediated pathway, exploiting a unique feature of the *A. baumannii* lipoprotein transport system. The study highlights the growing role of artificial intelligence in antibiotic discovery, providing a promising molecular scaffold for combating multidrug-resistant *A. baumannii* while minimizing off-target effects on commensal flora. [70]

The treatment arsenal for carbapenem-resistant *Acinetobacter baumannii–calcoaceticus* complex (ABC) has been transformed by the phase 3 ATTACK trial, which led to the approval of sulbactam-durlobactam (SUL-DUR).[71] This β-lactam/β-lactamase inhibitor combination demonstrated non-inferior 28-day all-cause mortality compared to colistin and a substantially lower incidence of nephrotoxicity (13% vs. 38%).[71] In a retrospective cohort study of 104 adults with carbapenem-resistant *Acinetobacter baumannii* bloodstream infections, cefiderocol was evaluated against colistin. Patients treated with cefiderocol showed higher clinical cure rates (66% vs. 44.4%) and fewer adverse events, primarily due to reduced acute kidney injury. The findings highlight cefiderocol as a valuable therapeutic option, particularly for frail patients or those at high risk of nephrotoxicity. [72]

Antimicrobial Peptides (AMPs)

The escalating threat of multidrug-resistant *Acinetobacter baumannii*, particularly carbapenem-resistant strains (CRAB), underscores a critical need for novel therapeutic agents beyond last-resort polymyxins.[73] Some AMPs, like the stapled peptide L8S1, function by potentiating conventional antibiotics such as rifampicin, enhancing their penetration by disrupting the outer membrane.[74] Other peptides, including the cyclic peptide B2, adopt a targeted approach by inhibiting essential outer membrane proteins like BamA, leading to bacterial death and showing efficacy in murine lung infection models.[75]

A significant challenge for AMPs is their susceptibility to proteolytic degradation, which can be mitigated through engineering strategies like hydrocarbon stapling to improve in vivo stability.[76] Recent discoveries continue to expand this arsenal; for instance, the peptide DvAMP exhibits potent activity against CRAB by disrupting membrane integrity, binding to lipopolysaccharides and phospholipids and inducing lethal oxidative stress, demonstrating significant efficacy in a mouse pneumonia model.[73] Similarly, Octopromycin, a peptide derived from Octopus minor, has been shown to inhibit biofilm formation and disrupt bacterial membranes in *A. baumannii*, proving effective in zebrafish infection models with low toxicity. [77]

A common and effective mechanism among many of these peptides is the permeabilization of the bacterial membrane, as seen with B2 and DvAMP, which leads to a loss of membrane potential and cell death.[75,73] Crucially, these advanced AMPs are designed not only for high antimicrobial and antibiofilm activity but also for low hemolytic activity and high serum stability, addressing key translational barriers.[73,75] The success of these peptides in various animal models, from zebrafish to mice, confirms their therapeutic potential and in vivo safety.[73,74]

Phototherapy: Phototherapy involves the use of a photosensitizer in combination with light and oxygen to produce reactive oxygen species, which can damage bacterial DNA and disrupt membranes. Currently, this approach is largely restricted to topical applications due to potential local tissue injury. Among studied photosensitizers, tetra pyrrole porphyrins and phenothiazinium salts have demonstrated the most activity against Acinetobacter. [78]

Standard precautions

Includes hand hygiene, proper and consistent use of gloves and appropriate use of gowns and eye protection.

Contact precautions

Involves using dedicated patient care equipment and wearing gowns and gloves for healthcare personnel.

Cohorting patients

Grouping colonized and infected patients within a designated unit or section of a unit to prevent cross-transmission.

Antimicrobial stewardship

Programs designed to promote judicious use of antimicrobials and prevent the emergence of resistance.

Given the wide range of resistance associated with *Acinetobacter*, the function of avoiding the pathogen's spread to additional patients is critical. According to the Centers for Disease Control and Prevention (CDC) infection control recommendations, hospitals with high rates of multidrug-resistant *Acinetobacter* should implement more aggressive infection control measures to control and prevent further nosocomial transmission.[79] Although difficult, strong infection control techniques can effectively control *Acinetobacter* infection outbreaks. Increased staff education, single-use items for specific patients, hand hygiene, cohorting, and isolation are all more likely to be effective measures. Antibiotic control programs appear to be effective in modifying the development of antibiotic resistance under restriction. [80] Controlling the use of ciprofloxacin and ceftazidime, for example, has been linked to a rise in Acinetobacter-associated imipenem and amikacin resistance.[80] Antibiotic control strategies can also change (select for other) microorganisms that cause illnesses in hospitals. Because antibiograms cannot always predict the clonality of an epidemic strain, *Acinetobacter* isolates should be molecularly typed. *A. baumannii* has been known to propagate clonally (from one clone to another) in several hospitals in Europe and Asia. This strain was limited to colistin and tigecycline resistance. [81]

Future Challenges

The control of multidrug resistance and its spread in *A. baumannii* is a difficult task. While multiple drug resistance in this organism is developing and carbapenem resistance is rapidly expanding across the continent, there is a steep decline in the discovery of novel antimicrobial agents that can manage MDR *A. baumannii*. There is no new medicine in the pipeline, and none of the FDA approved antimicrobial agents evaluated had a significant effect on MDR *A. baumannii* control. Existing antibiotics have also failed to limit resistance development and effectively eliminate MDR forms. A logical synergistic approach to several combination medicines, while effective, requires greater in-depth understanding and rigorous trials to control likely outbreaks. The development of pan-drug resistance variations must be avoided, and efforts must be made to find new *anti-Acinetobacter* drugs.

Conclusions

Microbiological monitoring plays a crucial role in tracking bacterial trends and antibiotic resistance patterns in hospitals. It helps in identifying emerging resistance mechanisms, shaping antimicrobial stewardship policies, and contributing epidemiological data for infection control strategies. This review highlights that longer hospital stays, ICU admissions, total parenteral nutrition, invasive procedures such as endotracheal intubation and nasogastric tube insertion, and prior antibiotic use are significant risk factors for *Acinetobacter* infections. MDR *Acinetobacter* species, particularly in hospital ICUs, present a serious global public health challenge, leading to high mortality rates. The geographical variability in resistance patterns underscores the importance of local surveillance in guiding appropriate treatment strategies. With limited treatment options available for MDR organisms, further pharmacokinetic and pharmacodynamic studies are essential to optimize combination therapies until novel, more effective drugs are introduced into clinical practice. Strengthening infection control measures, enhancing antimicrobial stewardship, and fostering research on alternative therapeutic strategies will be key to combating the growing threat posed by MDR *Acinetobacter* infections.

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Abstracts

The Burden of Anemia on Clinical Outcomes in Patients Undergoing Transcatheter Aortic Valve Replacement: A Nationwide Analysis

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Background: Anemia is a common comorbidity among patients undergoing Transcatheter Aortic Valve Replacement (TAVR), affecting nearly one-third of this population. Anemia has been associated with increased mortality, procedural complications, and adverse outcomes. Anemia in TAVR patients can arise from pre-existing conditions or procedural factors, such as periprocedural bleeding, hemolysis, and the use of antiplatelet or anticoagulant therapy. Despite its prevalence, the impact of anemia on TAVR outcomes remains uncertain.

Purpose: This study provides a nationwide perspective on anemia's role in TAVR outcomes, addressing gaps in existing research. Findings may inform risk stratification, perioperative care strategies, and resource allocation. Improving anemia management could enhance patient outcomes and reduce healthcare burdens.

Methods: We stratified patients who underwent TAVR in the national inpatient sample database from 2016 to 2020 by the presence or absence of anemia. Multivariable logistic regression was performed, adjusting for age, gender, race, income, insurance, comorbidity score, hospital location, and bed size. The primary outcome was mortality and postprocedural bleeding. Secondary outcomes were cardiac arrest (CA), cardiogenic shock (CS) and acute heart failure. A p-value < 0.05 was considered significant. All analyses were performed in STATA.

Results: Among 296,740 TAVR cases, 32% (n=94,920) had a history of anemia (TAVRAN), and these patients were older (79.06 ± 8.85 vs. 78.78 ± 8.39 years, p < 0.001), more likely to be female (48.9% vs. 42.5%, p < 0.001), and had higher rates of hypertension (81.9% vs. 74%, p < 0.001), peripheral vascular disease (11.1% vs. 9.7%, p < 0.001), chronic obstructive pulmonary disease (25.6% vs. 21.3%, p < 0.001), and pulmonary hypertension (11.7% vs. 8.7%, p < 0.001). TAVRAN patients experienced worse postprocedural outcomes, including higher in-hospital mortality (2.23% vs. 0.95%, AOR 1.22, 95% CI: 1.03–1.45, p = 0.024), increased risk of postprocedural bleeding (3.87% vs. 1.21%, AOR 2.94, 95% CI: 2.56–3.39, p < 0.001), greater likelihood of cardiac arrest (1.49% vs. 0.63%, AOR 1.55, 95% CI: 1.25–1.93, p < 0.001), higher rates of cardiogenic shock (3.76% vs. 1.14%, AOR 1.69, 95% CI: 1.43–1.99, p < 0.001), and increased incidence of acute heart failure (37.40% vs. 27.74%, AOR 1.22, 95% CI: 1.14–1.30, p < 0.001).

Conclusion: Anemia in TAVR patients is associated with higher comorbidity burdens and adverse clinical outcomes, including increased mortality and procedural complications. These findings highlight the importance of identifying and managing anemia in TAVR patients, necessitating tailored perioperative strategies to optimize outcomes. Future research should focus on improving anemia management to enhance procedural success rates.

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Clinical Outcomes of Laparoscopic Versus Open Appendectomy

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Background: Appendectomy, being the most common surgical procedure performed in general surgery, is still being performed by both open and laparoscopic methods due to a lack of consensus as to which is the most appropriate method. Because further trials are necessary and few such studies have been performed in developing

countries, we decided to evaluate the outcomes of the 2 procedures to share our experience with the international community.

Methods: Consecutive patients with suspected acute appendicitis who underwent laparoscopic (LA) (n=48) and open (n=52) appendectomy (OA) over a period of 3 years were studied. Clinical outcomes were compared between the 2 groups in relation to operative time, analgesia used, length of hospital stay, return to work, resumption of a regular diet, and postoperative complications.

Results: Mean age of patients was 25.8 years in the laparoscopic and 25.5 years in the open group. Patient demographics were similar in both groups (P>0.05). There was significantly less need for analgesia (1.0±0.5 in LA and 1.5±0.6 doses in OA), a short hospital stay (1.4±0.7 in LA and 3.4±1.0 days in OA), early return to work (12.6±3.3 in LA and 19.1±3.1 days in OA), and less time needed to return to a regular diet (20.1±2.9 in LA and 22.0±4.7, P<0.05 in OA) in the laparoscopic appendectomy group. Operative time was significantly shorter (54.9±14.7 in LA and 13.6±12.6 minutes in OA) in the open group. Total number of complications was less in the laparoscopic group; however, there was no statistically significant difference.

Conclusion: The laparoscopic technique is a safe and clinically beneficial operative procedure. It provides certain advantages over open appendectomy, including short hospital stay, decreased requirement of postoperative analgesia, early food tolerance, and earlier return to normal activities. Where feasible, laparoscopy should be undertaken as the initial procedure of choice for most cases of suspected appendicitis.

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News

Kidney Week 2025

Attendant Name	:	Assoc. Prof. Dr. A.S.M. Julfekar Helal
Department	:	Department of Nephrology, Ad-din Women's Medical College
Program	:	Kidney Week 2025: 58th Annual Meeting
Venue	:	Houston, Texas
Date	:	November 6-9, 2025

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