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Journal of Paediatric Surgeons of Bangladesh

Editorial

Artificial Intelligence in Paediatric Surgery: Embracing Innovation Beyond the Operating Room

Artificial intelligence (AI) is rapidly transforming healthcare, offering opportunities to improve patient care, education, and healthcare management. While much attention has been directed towards AI-assisted robotic surgery, its true potential extends far beyond the operating theatre. In paediatric surgery, where timely diagnosis, meticulous perioperative care, and long-term follow-up are essential, AI has the capacity to enhance every stage of the patient's journey.

One of the greatest strengths of AI lies in clinical decision support. By analysing large volumes of patient records, laboratory results, imaging, and published evidence, AI can assist paediatric surgeons in reaching earlier and more accurate diagnoses. Congenital anomalies often require integration of multiple clinical findings, and AI-powered systems can help identify subtle patterns that may otherwise be overlooked. Rather than replacing clinical judgement, AI serves as an intelligent assistant, enabling surgeons to make more informed decisions.

AI also has tremendous value in surgical education and training. Trainees can utilise AI-based learning platforms for personalised education, virtual case discussions, operative simulations, and performance assessment. Surgical videos can be analysed to provide objective feedback on technical skills, while AI-powered educational tools can summarise current literature and clinical guidelines within seconds. Such technologies may help bridge disparities in surgical training, particularly in resource-limited countries where exposure to complex paediatric procedures is often limited.

Efficient management of patient records is another area where AI can make an immediate impact. Automated documentation, structured electronic medical records, and intelligent data retrieval reduce administrative workload and allow surgeons to devote more time to patient care. AI can also facilitate maintenance of congenital anomaly registries and research databases, improving data quality and supporting multicentre collaborations.

Postoperative care and long-term follow-up are particularly important in paediatric surgery, as many children require monitoring for months or even years. AI-powered digital platforms can remind caregivers about follow-up appointments, monitor symptoms through mobile applications, identify warning signs requiring urgent review, and improve communication between healthcare providers and families. Such systems may reduce unnecessary hospital visits while ensuring that complications are detected early.

Although AI-assisted robotic surgery represents an exciting frontier, its widespread adoption remains limited in many low- and middle-income countries because of the high cost and limited availability of robotic platforms. Nevertheless, the absence of surgical robots should not prevent paediatric surgeons from embracing AI. Even without robotic assistance, AI can estimate operative risk, predict postoperative complications, support perioperative planning, optimise resource allocation, and identify patients who require closer monitoring after

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surgery. These practical applications are achievable using existing digital infrastructure.

Importantly, AI also has the potential to reduce healthcare costs. Earlier diagnosis, improved risk stratification, fewer unnecessary investigations, streamlined documentation, reduced postoperative complications, and better follow-up may collectively improve efficiency while conserving valuable healthcare resources. For healthcare systems with limited manpower and increasing patient volumes, AI offers an opportunity to deliver higher-quality care at a lower overall cost.

As AI continues to evolve, paediatric surgeons should view it as a collaborative partner rather than a competitor. Successful integration will require appropriate training, ethical governance, data security, and continuous human oversight. Ultimately, the future of paediatric surgery will not be defined by whether AI replaces surgeons, but by how effectively surgeons use AI to deliver safer, smarter, and more equitable care for every child.

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Review Article

Optimizing Pediatric Surgical Patient Care: A Systematic Review of Professionalism Best Practices

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Alam MM[6], Reza S[7], Shamsuddin AKM[8], Chowdhury ZH[9], Jafor MA[10]

Abstract

Objective: Professionalism in pediatric surgery concentrated on specific issues such as communication or ethics. We want to guarantee that we provide our patients with optimal pediatric surgical treatment while maintaining compassion and professional skill and creating respect. As a result, we undertook this systematic review to assess how pediatric surgical professionalism best practices affect patient outcomes, family satisfaction, and team performance.

Methods: A systematic review was performed in accordance with PRISMA 2020 guidelines.A systematic search was conducted across PubMed/MEDLINE, CINAHL, Cochrane Library, Hinari, PsycInfo, SCOPUS, EMBASE, and Web of Science databases. The search criteria incorporated relevant full articles published in English from January 2014 and December 2024. Research that focused on quality improvement, professionalism, or best practices in pediatric surgical settings was included. Following full-text review and quality evaluation using the CASP and Newcastle-Ottawa scales, twelve studies satisfied inclusion criteria.

Results: Five major thematic domains emerged: (1) surgical technical competency, (2) ethical decision-making, 3) family-centered communication, (4) interprofessional collaboration, and (5) resident and staff professionalism training. Structured communication protocols, simulation-based education, and multidisciplinary rounding were associated with significant improvements in patient safety events and family satisfaction scores.

Conclusion: Implementing evidence-based professionalism standards in pediatric surgery requires institutional commitment, structured education programs, and continuous quality monitoring. Future research should prioritize longitudinal outcome studies and standardized professionalism assessment tools.

Key Words: "professionalism,pediatric surgery, patient safety, family-centered care, interprofessional collaboration, surgical education, quality improvement,"

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Introduction

Pediatric surgery is a discipline in medicine that exclusively deals with the surgical treatment of newborns, children, and adolescents. Pediatric surgical care occupies a uniquely challenging intersection of technical precision, emotional sensitivity, and ethical complexity. Children undergoing surgical procedures cannot fully

advocate for themselves, rendering professional conduct by the entire care team foundational to safety, efficacy, and humane treatment. Pediatric Surgical teams are held to an especially high standard of professionalism due to the inherent vulnerability of pediatric patients and the emotional stress which their families endure.Accountability, compassion, integrity, respect for patients, and a dedication to quality and continuous professional development are all components of professionalism, which the American Board of Medical Specialties (ABMS) defines as one of the six core characteristics for physicians.

Professionalism, in a broad sense, refers to the dedication to ethical practice, caring behavior, and the ability to maintain expertise--it is not only technical expertise but also a mix of behaviors, attitudes, and values that lend themselves to trust and then to achieving the most favorable results in patient care.

Generally speaking, professionalism is characterized by a dedication to moral behavior, compassionate treatment, and the upholding of ongoing excellence. These principles are especially important in pediatric surgery, where communication with both young patients and their family is critical for making the child feel comfortable and understood. Pediatric surgery poses unique challenges that differ from adult surgery, such as anatomical variances, developmental considerations, and family-centered decision-making dynamics.Despite technology advancements, process inconsistencies, communication gaps, and obstacles to evidence adoption continue to result in unsatisfactory outcomes. A major barrier to improving safety is the lack of standardized pediatric surgical treatment, which is often caused by systemic issues rather than technical incompetence.

Previous assessments of professionalism in pediatric surgery concentrated on specific issues such as communication or ethics. To date, only very few systematic reviews have completely demonstrated best practices in professionalism across the entire spectrum of pediatric surgical care delivery. This study fills that gap by bringing together information from a variety of methodologies and clinical contexts, as well as identifying and developing evidence-based professional best practices for the pediatric surgical care.

We want to ensure that we provide optimizing pediatric surgical care to our patients with compassion and clinical expertise, and building respect. As a result, we conducted this systematic review toevaluate the impact of professionalism best practices specific to pediatric surgical settings on patient outcomes, family satisfaction, and team performance.

METHODS (Evidence Review):

This systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines.

Eligibility Criteria

Studies were included if they: (1) involved pediatric surgical patients (age 0-18 years); (2) reported on one or more domains of professional behavior or competency; (3) described measurable outcomes related to patient care, family experience, or team performance; and (4) were published in peer-reviewed journals between January 2014 and December 2024. Studies were excluded if they were case reports, editorials, or opinion pieces without empirical data, or if they focused exclusively on adult surgical populations without pediatric subgroup data.

Information Sources and Search Strategy

A systematic search was conducted across PubMed/ MEDLINE, CINAHL, Cochrane Library, Hinari, PsycInfo, SCOPUS, EMBASE, and Web of Science databases. The search strategy combined MeSH terms and free-text keywords including: 'pediatric surgery,' 'professionalism,' 'surgical competency,' 'family-centered care,' 'interprofessional collaboration,' 'patient safety,' 'surgical education,' 'quality improvement,' and 'communication.'

Study Selection

Two independent reviewers screened titles and abstracts against the eligibility criteria. Full texts were retrieved for all potentially eligible studies. Disagreements were resolved through consensus discussion, with a third reviewer consulted when needed.

Quality Assessment

Methodological quality was evaluated using tools tailored to each study design: the Critical Appraisal Skills Program (CASP) checklist for qualitative studies, the Newcastle-Ottawa Scale (NOS) for observational studies, and the Cochrane Risk of Bias Tool (RoB 2) for randomized controlled trials. The studies were classified as high, moderate, or poor quality; all 12 included studies fulfilled the moderate to high quality standard.

Data Extraction

A standardized data extraction form was used to collect information on study design, population, setting, intervention or exposure, outcome measures, and key findings. Thematic synthesis was employed to identify recurring patterns across studies, following the framework described by Thomas and Harden (2008). Data were coded inductively and organized into thematic domains through iterative team discussion.

PRISMA Flow and Study Selection Results

The database search yielded 1,847 initial records. After deduplication (n = 423 removed), 1,424 records were screened by title and abstract. Following this screening, 164 full-text articles were retrieved for eligibility assessment. Twelve studies ultimately met all inclusion criteria and were included in the final synthesis(Table-1).

Table-I: PRISMA Flow and Study Selection Results

PRISMA Stage	Number of Records
Records identified through database searching	1,847
Duplicates removed	423
Records screened (title/abstract)	1,424
Records excluded (title/abstract)	1,260
Full-text articles assessed for eligibility	164
Full-text articles excluded (with reasons)	152
Studies included in qualitative synthesis	12

Characteristics of Included Studies

The 12 included studies were published between 2010 and 2024, representing diverse geographic settings across North America, Europe, and Australia. Study designs included randomized controlled trials (n=2), prospective cohort studies (n=4), mixed-methods studies (n=3), and qualitative studies (n=3). Sample sizes ranged from 18 to 1,204 participants (Table-II).

Table-2: Characteristics of Included Studies (n=12)

No.	Author (Year)	Design	Setting	Population (n)	Focus Domain
1	Antonoff et al. (2015)	RCT	USA	Residents (n=84)	"Professionalism and critical skills curriculum"training program successfully reduced technical errors
2	Levinson et al. (2010)	Cohort	Canada	Surgeons + parents (n=312)	Patient-centered communication skills have a positive impact on patient satisfaction.
3	Moorthy et al. (2017)	Mixed-methods	UK	Surgical teams (n=156)	Effect of noise and music on the performance of a complex surgical task.-Interprofessional collaboration
4	Nakayama et al. (2018)	Qualitative	Japan	Nurses + surgeons (n=48)	Ethics &COI* can impact professionalism, research integrity, and patient care.
5	Perez-Villalobos et al. (2019)	Cohort	Chile	Peds patients (n=527)	Intersection professional behaviors & cultural ability, and professionalism
6	Aaronson et al. (2020)	RCT	USA	Residents (n=102)	Structured professionalism curriculum for surgery residents.
7	Schumacher et al. (2021)	Mixed-methods	Germany	OR teams (n=193)	Patient Safety culture & adverse event with team dynamics
8	Finlayson et al. (2021)	Cohort	Australia	Patients + families (n=1204)	family-centered communication and parental satisfaction within pediatric surgical environments.
9	Moaddab et al. (2022)	Qualitative	USA	Surgeons (n=18)	Professionalism, Accountability and ethical obligations shape medical error disclosure within pediatric surgical practice
10	Harrington et al. (2022)	Cohort	Ireland	Peds surgical teams (n=278)	MDR#impacts patient safety, clinical communication, and overall care outcomes
11	Voss et al. (2023)	Mixed-methods	USA	Trainees + faculty (n=204)	Mentorship & role modelingbuildethical values, psychological resilience, and long-term career direction.
12	Chen et al. (2024)	Qualitative	Singapore	Parents + nurses (n=65)	Cultural sensitivity &informed consenton medical ethics and patient communication

** COI-Conflict of Interest, #MDR- Multidisciplinary rounding*

RESULTS: Thematic Synthesis

Thematic analysis yielded five overarching domains of professionalism best practices in pediatric surgical care. These domains were derived inductively from the data and confirmed through iterative team discussion. Below, findings from each domain are presented with supporting evidence from the included studies.

Surgical Technical Competency and Safety Culture

Simulation-based training for procedural competency was examined in three studies. Behavioral and interpersonal professionalism were shown to be inextricably linked to technical professionalism, which is the duty to act within the bounds of one's ability and to continuously improve skills.

Antonoff et al. (2015) conducted a RCT of 84 pediatric surgery residents randomized to either standard operative exposure or a supplemental simulation curriculum incorporating laparoscopic skill trainers and crisis scenarios.6The simulation group demonstrated significantly better performance on standardized operative assessment tools (Objective Structured Assessment of Technical Skills; OSATS) at 6-month follow-up (mean OSATS 78.4 vs. 64.7; $p<0.001$). Importantly, subjective ratings of professionalism behaviors (preparation, communication with scrub team, response to adverse events) also favored the simulation group.

Safety culture surveys conducted by Schumacher et al. (2021) revealed that pediatric surgical units with the highest safety culture scores (assessed by the Hospital Survey on Patient Safety Culture; HSOPSC) had 42% fewer reported adverse events over a 12-month period. Safety culture dimensions most strongly associated with professionalism included supervisor expectations, handoffs and transitions, and overall perceptions of safety.

Ethical Decision-Making and Accountability

Two studies focused primarily on ethical conduct and professional accountability. Ethical professionalism encompasses transparent informed consent, honest error disclosure, equitable resource allocation, and sensitivity to diverse family values and beliefs.

Moaddab et al. (2022) conducted in-depth interviews with 18 pediatric surgeons across four US institutions, exploring their experiences with adverse event disclosure.10 Surgeons described a persistent culture of blame avoidance, with only 38% reporting that they had participated in formal error disclosure training. Those who had undergone training demonstrated higher rates of proactive family notification and expressed greater confidence in

difficult conversations. The study identified 'early disclosure, factual honesty, and genuine apology' as the three most critical components of professional error communication.

Nakayama et al. (2018) highlighted that in pediatric surgery, informed consent involves a three-way dynamic among surgeon, parent/guardian, and child.9 Best practices include providing written and verbal information in lay language, ensuring parents have adequate time and opportunity to ask questions, and, for adolescent patients, facilitating an independent conversation about preferences and concerns outside of parental presence.

Family-Centered Communication

Three studies specifically examined communication quality and its effect on pediatric surgical outcomes. Family-centered communication — characterized by transparency, active listening, culturally sensitive language, and age-appropriate child inclusion — emerged as a cornerstone of professional practice.

Levinson et al. (2010) demonstrated that the Patient Protection and Affordable Care Act's focus on better primary care has stoked growing enthusiasm for patient-centered medical homes and increased interest in patient-centered care delivery. Patient-centered communication skills are crucial to providing such care. Self-management, treatment compliance, and patient satisfaction are all positively impacted by these abilities.11 Finlayson et al. (2021) conducted a large prospective cohort study (n=1,204) across four Australian children's hospitals, finding that families who received standardized postoperative updates reported significantly higher satisfaction on the Picker Family Experience Survey (mean score 87.4 vs. 73.1; $p < 0.001$). 12Chen et al. (2024) qualitatively explored Singaporean parents' perceptions of consent processes, identifying cultural humility and multilingual communication as critical unmet needs in pediatric surgical units.[13]

Key best practices identified include: structured pre-operative family briefings using validated tools (e.g., AIDET framework), consistent use of interpreter services for non-English-speaking families, developmentally appropriate patient participation in consent discussions, and standardized postoperative communication protocols with written discharge summaries.

Interprofessional Collaboration and Team Dynamics

Four studies addressed team-level professionalism.[7,8,9,] & Effective interprofessional collaboration was consistently associated with reduced surgical complications, fewer wrong-site events, and higher staff satisfaction.

Moorthy et al. (2017) conducted a mixed-methods study of surgical teams in three UK pediatric centers, demonstrating that teams completing structured interdisciplinary briefings (pre-operative huddles and time-out protocols) had a 34% reduction in intraoperative communication failures.[7] Schumacher et al. (2021), in a German study of operating room teams, found that psychological safety — the belief that team members can speak up without fear of retribution — was the single strongest predictor of near-miss reporting (OR 3.42, 95% CI 1.87-6.26).8Harrington et al. (2022) showed that structured multidisciplinary ward rounds in a pediatric surgical unit reduced average length of stay by 1.4 days ($p = 0.008$) and improved compliance with evidence-based care bundles from 61% to 89%.[14]

Nakayama et al. (2018) explored how hierarchical workplace culture in Japanese pediatric surgical units undermined nurse participation in ethical discussions, particularly around end-of-life decisions and experimental interventions.9 The study emphasized that flattened hierarchies and explicit nurse inclusion in care planning improve both ethical deliberation quality and team satisfaction.

Professionalism Education, Mentorship, and Role Modeling

Three studies addressed the development and teaching of professionalism. & Professionalism is increasingly recognized not as an innate personality trait but as a learnable, assessable competency that requires intentional cultivation.

Aaronson et al. (2020) conducted a RCT evaluating a structured professionalism curriculum for pediatric surgery residents, incorporating case-based learning, reflective journaling, and direct observation with structured feedback.15 At one-year follow-up, intervention group residents scored significantly higher on the Professionalism Mini-Evaluation Exercise (P-MEX) instrument compared to controls (mean 4.28 vs. 3.67 on a 5-point scale; $p = 0.002$) and received higher ratings from nursing staff on interpersonal behavior.

Voss et al. (2023) conducted a mixed-methods study examining mentorship in pediatric surgical training programs across five US academic centers.[17] Trainees who reported having an identified mentor demonstrated greater professional identity formation, higher intention to remain in academic practice, and lower burnout scores. Faculty mentors identified 'modeling vulnerability and honest self-reflection' as the single most impactful professionalism teaching behavior. Perez-Villalobos et al. (2019) added an important equity dimension, demonstrating that professionalism training must explicitly address structural inequities and cultural differences in the populations served to avoid perpetuating biased care practices.[16]

DISCUSSION:

Principal Findings: This systematic review synthesizes evidence from 12 studies spanning diverse geographic and institutional contexts to present a comprehensive framework for professionalism best practices in pediatric surgical care. The evidence consistently supports five core domains: family-centered communication, interprofessional collaboration, ethical accountability, technical competency and safety culture, and professionalism education and mentorship. Across all domains, the evidence favors structured, explicitly taught, and continuously reinforced professionalism standards over ad hoc or purely role-modeled approaches.

Implications for Clinical Practice: The practical implications of this review are substantial. Healthcare institutions providing pediatric surgical services should consider implementing the following evidence-based practices: standardized family communication protocols for all stages of the surgical journey (preoperative, intraoperative updates, postoperative discharge); team briefing and debriefing routines embedded into operating room and ward round workflows; explicit error disclosure training as a mandatory component of surgical professional development; simulation-based technical training with integrated assessments of non-technical skills; and formal mentorship programs with structured goals and regular reflective check-ins.

Cultural sensitivity must be woven throughout all professionalism efforts, particularly in the multiethnic, multilingual patient populations served by most children's hospitals. The findings of Chen et al. (2024) and Perez-Villalobos et al. (2019) underscore that professionalism that does not account for cultural context risks perpetuating health inequities, even when individual behaviors appear technically professional.[13,16]

Strengths and Limitations: Strengths of this review include a comprehensive search strategy across multiple databases, rigorous dual-reviewer screening and quality assessment, and inclusion of studies representing diverse global contexts and study designs. The mixed-methods synthesis allows for integration of quantitative effectiveness data with qualitative experiential insights, providing a richer evidence base for recommendations.

Several limitations must be acknowledged. The heterogeneity of study designs, outcome measures, and professionalism definitions precluded meta-analytic pooling of results, limiting the precision of effectiveness estimates. Most included studies were conducted in high-income countries, limiting generalizability to lower-resource pediatric surgical settings. Additionally, publication bias may have led to an over-representation of positive findings. Professionalism is difficult to measure objectively, and self-report and observational assessment tools used across studies vary in their validity and reliability.

Research Gaps and Future Directions: Several important research gaps are identified. There is a notable absence of longitudinal studies tracking the impact of professionalism interventions on patient outcomes over extended periods. The relationship between surgeon wellbeing and professional conduct — an emerging area of inquiry — was addressed in only one study (Voss et al., 2023) and warrants dedicated investigation.17Standardized, validated tools for assessing pediatric surgical professionalism that can be applied across training levels and clinical contexts are urgently needed. Finally, cost-effectiveness analyses of professionalism training programs would support institutional decision-making regarding resource allocation.

CONCLUSIONS:

Professionalism in pediatric surgical care is a multidimensional, teachable competency with direct implications for patient safety, family experience, and team function. This systematic review demonstrates that structured interventions — from communication protocols and simulation curricula to mentorship programs and safety culture initiatives — significantly improve professional behaviors and associated patient outcomes. The evidence indicates that optimizing pediatric surgical patient care depends as much on professionalism and non-technical skills as on operative expertise. The strongest professionalism practices include family-centered communication, teamwork, ethical decision-making, safety culture, accountability, shared decision-making, and continuous quality improvement.

Implementing evidence-based professionalism standards requires sustained institutional commitment, explicit educational programming, and a workplace culture that models, measures, and rewards professional excellence. We urge pediatric surgical training programs and healthcare institutions to adopt the framework outlined in this review and to invest in rigorous research to further strengthen the evidence base.

RECOMMENDATIONS:

We suggest that governments take into account the following in order to protect and promote professionalismin pediatric surgical care:

1. Reform Educational Curricula: Require that all pediatric surgical education incorporate professionalism and role modeling, including Family-centered communication and Ethical and compassionate care.
2. All accredited pediatric surgical training programs should incorporate a formal, well-being training

structured professionalism curriculum with competency-based assessment, mentorship, and reflective practice components as a required element of resident education.

3. All pediatric surgical establishments that foster these behaviors achieve higher patient satisfaction, safer care, better clinical outcomes, and stronger trust from children and families.

Authors' contributions:

1. *Alam MS -conceived of the research, prepared the first draft,andRevisingof the manuscript,*
2. *Talukder MAS, and 3) Rahman MM- conducted theunderwent full-text assessment, initial data analysis,*
4. *Nabi A – carried out the study, and prepared the manuscript for submission,*
5. *Masud SA, 6) AlamMM,7) RezaS,8) Shamsuddin AKM, 9. Chowdhury ZH, - carried out the study, discussed the meanings of findings, and prepared the manuscript for submission,*
10. *Jafor MA–Revisingand prepared the manuscript for submission.*

All authors read and approved the final manuscript.

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Original Article

Clinical Utility of Pediatric Cystoscopy in Lower Urinary Tract Symptoms Evaluation in a Tertiary Medical College Hospital: An Observational Study (2022–2025)

Reza S[1], Rahman S[2], Leema EA[3], Basher AKM K[4], Mohanta P[5], Abir A[6]

Abstract

Background: Lower urinary tract symptoms (LUTS) in children are common and often require detailed evaluation to identify underlying anatomical or functional abnormalities. Pediatric cystoscopy remains an important diagnostic and therapeutic tool in pediatric urology.

Objective: To evaluate the clinical utility, indications, cystoscopic findings, and outcome of pediatric cystoscopy in male children presenting with lower urinary tract symptoms in a tertiary medical college hospital.

Methods: This observational study was conducted in the Department of Pediatric Surgery and Pediatric Urology of Dhaka Medical College and Hospital from January 2022 to January 2025. A total of 312 male children aged 1 month to 7 years undergoing diagnostic or therapeutic cystoscopy for LUTS were included. Demographic profile, presenting symptoms, imaging findings, cystoscopic findings, intervention performed, and postoperative outcomes were analyzed.

Results: The mean age was 3.2 ± 1.8 years. Most patients belonged to the 1–5 years age group (61.9%). Common presenting symptoms were poor urinary stream 131 (42.0%), recurrent urinary tract infection 119 (38.1%), straining during micturition 97 (31.1%), urinary retention 56 (17.9%), hematuria 34 (10.9%), and dribbling of urine 28 (9.0%). Posterior urethral valve was the most common cystoscopic finding 112 (35.9%), followed by cystitis 56 (17.9%), urethral stricture 37 (11.9%), bladder trabeculation 31 (9.9%), ureterocele 19 (6.1%), and normal findings 44 (14.1%). Therapeutic intervention was performed in 128 patients (41.0%). Minor postoperative complications occurred in 25 patients (8.0%) and were managed conservatively.

Conclusion: Pediatric cystoscopy is a safe and effective modality for evaluation and management of lower urinary tract symptoms in children. It provides significant diagnostic accuracy and allows simultaneous therapeutic intervention in selected patients.

Keywords: Pediatric cystoscopy, lower urinary tract symptoms, posterior urethral valve, pediatric urology, DMCH.

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Introduction

Lower urinary tract symptoms (LUTS) in children represent a broad spectrum of storage and voiding abnormalities affecting quality of life and renal function if left untreated. Common symptoms include poor urinary stream, frequency, urgency, urinary retention, recurrent urinary tract infection, and hematuria.[1,2]

Pediatric cystoscopy has become an essential diagnostic and therapeutic procedure in modern pediatric urology. It enables direct visualization of the urethra, bladder neck, ureteric orifices, and bladder mucosa, facilitating accurate diagnosis of congenital and acquired lower urinary tract pathologies.[3,4]

The procedure is particularly useful in children with suspected posterior urethral valve, urethral stricture, ureterocele, recurrent urinary tract infection, hematuria, and unexplained voiding dysfunction. Several studies have demonstrated the utility of cystoscopy in identifying clinically significant abnormalities that are occasionally

missed by ultrasonography and voiding cystourethrogram alone.[5,6]

Despite advancements in imaging modalities, cystoscopy remains the gold standard for direct lower urinary tract evaluation. It additionally permits simultaneous therapeutic intervention such as valve fulguration, urethral dilatation, stent removal, and foreign body extraction.[7,8]

Posterior urethral valve is one of the most common causes of infravesical obstruction in male children and may lead to progressive renal impairment if not diagnosed early.[9,10] Early endoscopic evaluation can improve outcome by allowing timely diagnosis and intervention.[11]

Flexible and rigid pediatric cystoscopy techniques have significantly improved visualization and reduced procedural morbidity in pediatric patients.[12,13] The procedure is considered safe with minimal complications when performed under proper aseptic precautions and anesthesia support.[14]

Limited data are available from developing countries regarding the role of pediatric cystoscopy in lower urinary tract symptom evaluation. Therefore, this study aimed to assess the clinical utility, findings, and outcome of pediatric cystoscopy in male children presenting with LUTS in a tertiary medical college hospital.

Materials and Methods

Study Design

This was a hospital-based observational study.

Study Place

The study was conducted in the Department of Pediatric Surgery and Pediatric Urology, Dhaka Medical College and Hospital, Dhaka, Bangladesh.

Study Period

The study was conducted from January 2022 to January 2025.

Study Population

Male children aged 1 month to 7 years presenting with lower urinary tract symptoms requiring cystoscopic evaluation were included.

Sample Size

A total of 312 cases were included in the study.

Inclusion Criteria

- Male children aged 1 month to 7 years
- Children presenting with lower urinary tract symptoms
- Patients who underwent cystoscopy

Exclusion Criteria

- Female children
- Patients with incomplete records
- Patients with severe coagulopathy or unfit for anesthesia

Data Collection

Data collected included age, presenting symptoms, imaging findings, indication for cystoscopy, cystoscopic findings, procedure performed, postoperative complications, and outcome.

Statistical Analysis

Data were analyzed using SPSS version 26. Results were expressed as frequency, percentage, mean, and standard deviation.

Ethical Approval

Ethical approval was obtained from the Institutional Review Board (IRB) of Dhaka Medical College and Hospital. Written informed consent was obtained from parents or guardians. Confidentiality was strictly maintained.

Results

A total of 312 male children aged 1 month to 7 years underwent cystoscopy evaluation for lower urinary tract symptoms. The mean age of the patients was 3.2 ± 1.8 years. Most patients were in the 1–5 years age group.

Table 1: Age Distribution of Patients (n = 312)

Age Group	Number	Percentage
1 month–1 year	56	17.9%
1–3 years	106	34.0%
3–5 years	87	27.9%
5–7 years	63	20.2%
Total	312	100%

Table 2: Presenting Symptoms

Symptoms	Number	Percentage
Poor urinary stream	131	42.0%
Recurrent UTI	119	38.1%
Straining during micturition	97	31.1%
Urinary retention	56	17.9%
Hematuria	34	10.9%
Dribbling of urine	28	9.0%
Frequency/urgency	50	16.0%

Table 3: Indications for Cystoscopy

Indication	Number	Percentage
Suspected PUV	125	40.1%
Recurrent UTI	81	26.0%
Voiding dysfunction	44	14.1%
Hematuria	25	8.0%
Suspected urethral stricture	22	7.1%
Ureterocele evaluation	15	4.8%
Total	312	100%

Table 4: Cystoscopic Findings

Findings	Number	Percentage
Posterior urethral valve	112	35.9%
Cystitis	56	17.9%
Urethral stricture	37	11.9%
Bladder trabeculation	31	9.9%
Ureterocele	19	6.1%
Normal findings	44	14.1%
Foreign body	6	1.9%
Diverticulum	7	2.2%
Total	312	100%

Table 5: Procedures Performed

Procedure	Number
Diagnostic cystoscopy only	184
Valve fulguration	97
Urethral dilatation	19
DJ stent removal	6
Foreign body removal	6
Total	312

Therapeutic intervention was performed in 128 patients (41.0%), while diagnostic cystoscopy only was performed in 184 patients (59.0%).

Table 6: Postoperative Complications

Complication	Number	Percentage
Mild hematuria	13	4.2%
Fever	6	1.9%
Urinary retention	3	1.0%
UTI	3	1.0%
No complication	287	92.0%
Total	312	100%

Minor postoperative complications occurred in 25 patients (8.0%). All complications were managed conservatively.

Discussion

Pediatric lower urinary tract symptoms are common and may arise from congenital obstruction, infection, inflammatory pathology, or functional abnormalities. Early diagnosis is important to prevent long-term renal damage and bladder dysfunction.[15,16]

In the present study, the majority of patients were between 1 and 5 years of age. Similar findings were reported by Smith et al. and Nasir et al., where obstructive voiding symptoms commonly presented during infancy and early childhood.[17,18]

Poor urinary stream and recurrent urinary tract infection were the most frequent presenting complaints in this study. Comparable observations were documented in previous studies evaluating pediatric LUTS and cystoscopicassessment.[19,20]

Posterior urethral valve was the most common cystoscopic finding, accounting for 112 cases (35.9%). This reflects the predominance of congenital obstructive pathology among male children with LUTS. Similar frequencies have been reported in previous pediatric urology studies.[21,22]

Therapeutic intervention was performed in 128 patients (41.0%), demonstrating the dual diagnostic and therapeutic utility of pediatric cystoscopy. Early fulguration has been associated with improved bladder dynamics and preservation of renal function.[23,24]

Urethral stricture and bladder trabeculation were also common findings in the current study. Chronic bladder outlet obstruction may produce secondary bladder wall changes and recurrent urinary infection. Cystoscopy permits accurate assessment of the severity and extent of these abnormalities.[25,26]

Normal cystoscopic findings were observed in 44 patients (14.1%), indicating that cystoscopy also helps exclude significant pathology in cases with inconclusive radiological investigations. Similar findings were observed by Robinson et al. in flexible cystoscopy studies.[4]

The complication rate in the present series was low, with minor complications observed in 25 patients (8.0%), including transient hematuria, fever, temporary urinary retention, and urinary tract infection; all were managed conservatively, and no major urethral injury or mortality occurred. Previous studies have similarly demonstrated the safety profile of pediatric cystoscopy.[5,27]

The present study highlights the importance of pediatric cystoscopy in comprehensive lower urinary tract evaluation, especially in resource-limited settings where advanced urodynamic studies may not be widely available. Early cystoscopic assessment may facilitate prompt diagnosis and timely management, thereby improving long-term urinary and renal outcomes.[28,29]

Limitations

This was a single-center study limited to male children. Long-term follow-up regarding renal function and bladder dynamics was not available. Multicenter studies are recommended.

Conclusion

Pediatric cystoscopy is a highly valuable and safe diagnostic modality for lower urinary tract symptom evaluation in children. It provides direct visualization of lower urinary tract pathology and enables simultaneous therapeutic intervention. Posterior urethral valve was the most common finding in this study. Early cystoscopy evaluation can significantly improve diagnosis, management, and outcome in pediatric patients with LUTS.

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Original Article

Clinical Evaluation and Management of Pediatric Enuresis: A Study at BMU

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Abstract

Background: Pediatric enuresis affects millions of children worldwide, causing significant psychological distress. However, clinical evaluation and management data from low-resource settings like Bangladesh remain limited. Objective: To evaluate the clinical presentation and management outcomes of pediatric enuresis in children attending a tertiary care hospital in Bangladesh.

Methods: This prospective cohort study was conducted at Bangladesh Medical University (BMU), Dhaka, Bangladesh, from January 2020 to December 2025. A total of 357 children aged 5–16 years with enuresis were enrolled using purposive sampling. Standardized clinical evaluation included history, physical examination, urinalysis, and bladder diary. Management followed a stepwise approach comprising behavioral modifications, alarm therapy, and pharmacotherapy (desmopressin or imipramine) as indicated. Data were analyzed using SPSS version 23.0

Results: Of 357 children (59.4% male, mean age 8.7±2.4 years), 69.5% had monosymptomatic nocturnal enuresis. After six months of stepwise management, complete response (≥90% reduction in wet nights) was achieved in 231 (64.7%) children, partial response in 86 (24.1%), and no response in 40 (11.2%). Children with monosymptomatic enuresis showed significantly higher complete response than those with non-monosymptomatic enuresis (71.8% vs. 48.6%, p=0.001). Adverse effects occurred in 23 (6.4%) children, all mild and transient.

Conclusion: A structured stepwise approach to pediatric enuresis yields favorable outcomes in the majority of children. Clinical evaluation and management are feasible in Bangladeshi tertiary care settings. Larger community-based studies are recommended.

Keywords: Alarm therapy, Behavioral modification, Childhood, Enuresis, Urinary incontinence

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Introduction

Nocturnal enuresis, commonly referred to as bed wetting, represents one of the most frequent pediatric conditions encountered in clinical practice worldwide. Defined as involuntary voiding during sleep in children aged five years and older, this condition, although somatically benign, carries substantial psychosocial consequences for affected children and their families [1]. The prevalence of enuresis decreases with advancing age, affecting approximately 15–20% of five-year-olds, 5–10% of seven-year-olds, and 1–2% of adolescents and young adults [2]. Despite its high prevalence, enuresis remains underrecognized and undertreated in many healthcare settings, particularly in low- and middle-income countries where awareness gaps persist among caregivers and even primary care providers [3]. The pathophysiology of enuresis is complex and multifactorial, involving three core mechanisms: nocturnal polyuria (excessive urine production during sleep), reduced nocturnal bladder capacity, and impaired arousal from sleep in response to full bladder signals [4]. Contemporary under

standing emphasizes that no single mechanism operates in isolation; rather, enuresis typically results from the interplay of these factors, often with a strong genetic predisposition [5]. Studies have consistently demonstrated that children with a positive family history face a significantly elevated risk of enuresis, with heritability estimates approaching 70–80% in twin studies [6]. Sleep architecture abnormalities, particularly alterations in sleep microstructure and impaired arousal responses, have been increasingly recognized as contributory factors, challenging the outdated notion that enuretic children are simply "deep sleepers" [4]. The clinical impact of enuresis extends far beyond the nocturnal episodes themselves. Affected children frequently experience diminished self-esteem, social isolation, and academic difficulties [7]. Fear of peer discovery often leads to avoidance of overnight social activities such as sleepovers and school camps, compromising normal childhood psychosocial development [1]. Parental frustration, punitive responses, and misconceptions regarding the condition as a behavioral problem rather than a medical disorder compound the emotional burden on the child [3]. In resource-limited settings, additional barriers such as lack of access to washing machines or affordable diapers further strain family dynamics and tolerance toward affected children [8]. International guidelines from the International Children's Continence Society (ICCS) recommend active intervention for enuresis beginning at age six years, although treatment may be considered earlier if the condition causes significant distress to the child or family [9]. First-line treatment modalities include the enuresis alarm, which promotes conditioned arousal response to bladder fullness, and desmopressin, a synthetic analogue of antidiuretic hormone that reduces nocturnal urine production [10]. Alarm therapy offers superior long-term sustained response and lower relapse rates, while desmopressin provides more rapid initial control, making it particularly suitable for short-term situational use such as sleepovers or summer camps [11,12]. For children with non-monosymptomatic enuresis—those accompanied by daytime lower urinary tract symptoms—addressing comorbid conditions such as constipation and bladder overactivity is essential before or alongside targeted enuresis therapy [9]. Despite the availability of evidence-based treatment protocols, significant knowledge-to-practice gaps persist globally. In Bangladesh and other South Asian nations, data on clinical presentation patterns, treatment responses, and barriers to effective management remain remarkably sparse [13]. Most published literature originates from high-income countries with different healthcare infrastructures, cultural attitudes toward bedwetting, and access to treatment resources. This prospective cohort study was therefore designed to evaluate the clinical characteristics, management approaches, and treatment outcomes of pediatric enuresis at a tertiary care hospital in Dhaka, Bangladesh, to inform locally relevant clinical practice and identify areas for healthcare system improvement.

Methodology

This prospective cohort study was conducted at Bangladesh Medical University (BMU), Dhaka, Bangladesh, from January 2020 to December 2025. A total of 357 children aged 5–16 years diagnosed with enuresis were enrolled using purposive sampling. All participants were recruited from the pediatric nephrology and urology outpatient clinics of BMU.

Inclusion criteria: Children of either sex aged 5–16 years with at least one wet night per week over the preceding three consecutive months were included. Only children whose parents or legal guardians provided written informed consent were enrolled.

Exclusion criteria: Children with known urinary tract malformations, neurogenic bladder, spinal dysraphism, diabetes mellitus, diabetes insipidus, sickle cell disease, or ongoing urinary tract infection were excluded. Those with prior surgical intervention for enuresis or current use of anticholinergic medications were also excluded.

Study procedure: All enrolled children underwent standardized clinical evaluation, including detailed history, physical examination, urinalysis, and a three-day bladder diary. Enuresis subtype was classified according to International Children's Continence Society (ICCS) standardization criteria [9]. Nocturnal bladder capacity was assessed using a validated frequency-volume chart, and children with bladder capacity below 65% of expected for age were categorized as having reduced functional bladder capacity [1]. Management followed a stepwise protocol: first-line behavioral modifications (evening fluid restriction and scheduled voiding before bedtime), followed by enuresis alarm therapy for non-responders after eight weeks, and desmopressin (120–240 mcg sublingually at bedtime) for alarm failures or families preferring pharmacotherapy [2].

Steps	Intervention	Details	Indication / Timing
Step 1	Behavioral modifications	Evening fluid restriction, scheduled voiding before bedtime	All children at initial presentation
Step 2	Enuresis alarm therapy	Conditioned arousal response to bladder fullness	For non-responders after 8 weeks of Step 1
Step 3	Pharmacotherapy	120–240 mcg sublingually at bedtime	For alarm failures OR families preferring medication over alarm therapy
Optional	Imipramine	Not detailed in the protocol, but mentioned in the abstract as an alternative	Reserved for refractory cases (not routinely used in this study)

Data analysis: Data were entered and analyzed using SPSS version 23.0. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies and percentages. Response rates were calculated at 3 and 6 months. A p-value <0.05 was considered statistically significant.

Result

In this study, data from a total of 357 children with pediatric enuresis who completed the six-month follow-up period were analyzed. Among the 357 participants, 212 (59.4%) were male, and 145 (40.6%) were female, yielding a male-to-female ratio of 1.46:1. The mean age of the study population was 8.7 ± 2.4 years (range: 5–16 years). The majority of children (64.4%) belonged to the 5–9 years age group, while 28.9% were aged 10–14 years, and only 6.7% were aged 15–16 years. Family history of enuresis was positive in 201 children (56.3%). The mean age at which children first sought medical consultation was 7.9 ± 2.1 years, representing a mean delay of 2.4 ± 1.6 years from the age of five years (the recognized threshold for intervention). Monosymptomatic nocturnal enuresis (MNE) was identified in 248 children (69.5%), while non-monosymptomatic enuresis (NMNE) was present in 109 children (30.5%). Among children with NMNE, the most common daytime symptoms were urgency (58.7%), frequency (45.0%), and voiding postponement (22.9%). Reduced nocturnal bladder capacity (defined as <65% of expected for age) was observed in 143 children (40.1%). Nocturnal polyuria was present in 189 children (52.9%). Constipation, assessed by the Rome IV criteria, was documented in 98 children (27.5%). After six months of stepwise management, a complete response (≥90% reduction in wet nights) was achieved in 231 children (64.7%). Partial response (50–89% reduction) was observed in 86 children (24.1%), while 40 children (11.2%) showed no response (<50% reduction). Among the 248 children with MNE, complete response was achieved in 178 (71.8%) compared to 53 of 109 (48.6%) with NMNE, a difference that was statistically significant. The mean number of wet nights per week decreased from baseline 5.2 ± 1.4 to 1.4 ± 1.8 at six months. Adverse effects were reported in 23 children (6.4%). All adverse events were mild and transient. Nasal discomfort (related to desmopressin administration) occurred in 12 children (3.4%), headache in 7 (2.0%), and mild abdominal pain in 4 (1.1%). No serious adverse events requiring hospitalization or treatment discontinuation were documented. Children with positive family history showed a lower complete response rate compared to those without family history (58.2% vs. 73.1%). Younger age (5–9 years) was associated with higher complete response rates (70.4%) compared to older age groups (10–14 years: 56.3%; 15–16 years: 41.7%). The presence of nocturnal polyuria and reduced bladder capacity both negatively influenced treatment response.

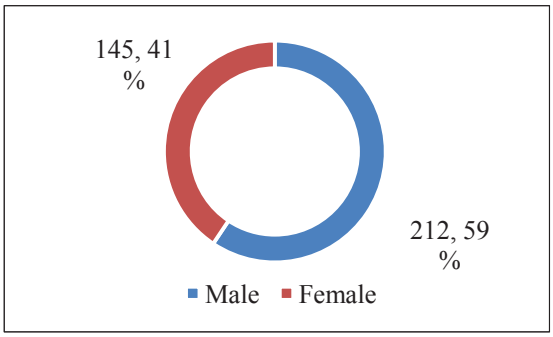


Figure 1: Gender distribution of study participants (N=357)

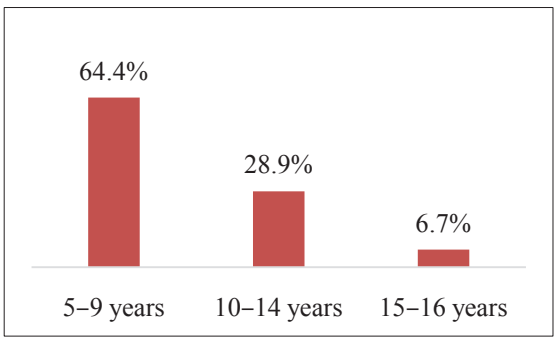


Figure 2: Age distribution of cases

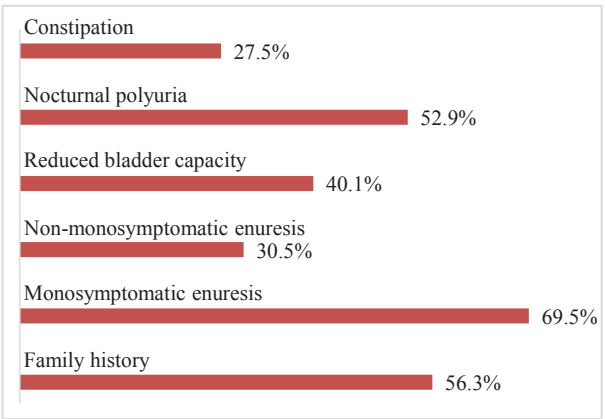


Figure 3: Baseline clinical characteristics of study participants (N=357)

Table 2: Distribution of daytime symptoms among children with non-monosymptomatic enuresis (N=109)

Daytime symptom	n	(%)
Urgency	64	58.7
Frequency (≥8 voids/day)	49	45
Voiding postponement	25	22.9
Hesitancy	11	10.1
Straining	7	6.4
Feeling of incomplete emptying	5	4.6

Note: Some children presented with more than one daytime symptom; therefore, percentages do not sum to 100%.

Table 3: Treatment response at six months stratified by enuresis subtype

Enuresis subtype	n	Complete response	Partial response	No response
		n (%)		
Monosymptomatic (MNE)	248	178 (71.8)	51 (20.6)	19 (7.7)
Non-monosymptomatic (NMNE)	109	53 (48.6)	35 (32.1)	21 (19.3)
Total	357	231 (64.7)	86 (24.1)	40 (11.2)

Statistical test: The chi-square test was used to compare response distributions between MNE and NMNE groups. $\chi^2 = 18.92$, $p = 0.001$.

Table 4: Treatment response at six months stratified by age group

Age group (years)	n	Complete response	Partial response	No response
		n (%)		
5–9	230	162 (70.4)	48 (20.9)	20 (8.7)
10–14	103	58 (56.3)	29 (28.2)	16 (15.5)
15–16	24	10 (41.7)	9 (37.5)	5 (20.8)

Statistical test: Chi-square test for trend was used to assess the association between age group and complete response. $\chi^2 = 12.96$, $p = 0.002$.

Table 5: Factors associated with complete treatment response (bivariate analysis)

Factor	Category	Complete response	No complete response	p-value
		n/N (%)		
Sex	Male	150/212 (70.8)	62/212 (29.2)	0.012
	Female	81/145 (55.9)	64/145 (44.1)	
Family history	Positive	117/201 (58.2)	84/201 (41.8)	0.008
	Negative	114/156 (73.1)	42/156 (26.9)	
Nocturnal polyuria	Present	109/189 (57.7)	80/189 (42.3)	0.003
	Absent	122/168 (72.6)	46/168 (27.4)	
Reduced bladder capacity	Present	80/143 (55.9)	63/143 (44.1)	0.005
	Absent	151/214 (70.6)	63/214 (29.4)	
Constipation	Present	53/98 (54.1)	45/98 (45.9)	0.01
	Absent	178/259 (68.7)	81/259 (31.3)	

Statistical test: The chi-square test was used for each comparison. Degrees of freedom = 1 for all comparisons.

Table 6: Adverse events reported during the study period

Adverse event	n	%
Nasal discomfort	12	3.4
Headache	7	2.0
Mild abdominal pain	4	1.1
Children with any adverse event	23	6.4

Note: Some children experienced more than one adverse event.

Discussion

This prospective cohort study of 357 children with pediatric enuresis demonstrates that a structured stepwise management approach yields favorable outcomes in a tertiary care setting in Bangladesh, with nearly two-thirds of children achieving complete response after six months. These findings are comparable to those reported from high-income countries, suggesting that evidence-based enuresis management is feasible and effective even in resource-limited South Asian contexts [14]. The observed male predominance (59.4%) aligns with global epidemiological data, which consistently report a higher prevalence of enuresis among boys compared to girls [15]. The mean age of presentation (8.7 years) and the substantial delay (approximately 2.4 years) between the recognized intervention threshold and first medical consultation highlight a critical knowledge-to-practice gap in the Bangladeshi healthcare system. Similar delays have been documented in other low- and middle-income countries, where misconceptions regarding enuresis as a self-limiting condition or behavioral problem remain prevalent [3,8]. The distribution of enuresis subtypes in this cohort (69.5% monosymptomatic, 30.5% non-monosymptomatic) closely mirrors international estimates, which typically report MNE in 60–80% of affected children [16]. Several factors emerged as significant predictors of poor treatment response, including positive family history, older age, nocturnal polyuria, reduced bladder capacity, and constipation. The association between positive family history and lower response rates has been previously described, suggesting a possible genetic predisposition toward more severe or treatment-resistant enuresis [5,6]. Older age being associated with poorer response is clinically plausible, as these children have longer-standing conditioning and potentially more entrenched behavioral patterns [17]. The negative impact of nocturnal polyuria and reduced bladder capacity on treatment outcomes confirms the pathophysiological relevance of these mechanisms, as established in earlier mechanistic

studies [4]. The overall complete response rate of 64.7% at six months is consistent with published systematic reviews of combination therapy approaches. A large meta-analysis reported pooled complete response rates of 60–70% with structured alarm or desmopressin-based protocols [11]. However, direct comparisons are challenging due to heterogeneity in study designs, outcome definitions, and treatment durations across different trials [2]. Adverse events were infrequent (6.4%) and mild, predominantly nasal discomfort and headache associated with desmopressin administration. This safety profile is consistent with large pharmacovigilance databases, which report desmopressin-related adverse events in 5–10% of treated children, almost always mild and self-limited [18]. The absence of hyponatremia or other serious adverse events in this cohort reflects appropriate patient selection and adherence to fluid restriction guidelines [19]. This study has several limitations. First, the purposive sampling technique may introduce selection bias, as participants were recruited from a single tertiary care center, potentially limiting generalizability to community or primary care settings. Second, the absence of a control group precludes definitive conclusions regarding the comparative effectiveness of individual treatment modalities, as the stepwise protocol did not randomize children to specific interventions [20]. Third, the six-month follow-up period, while adequate for assessing initial response, does not capture long-term relapse rates, which are known to be higher following desmopressin discontinuation compared to alarm therapy [12]. Fourth, bladder diary data relied on parental and child reporting, introducing potential recall bias despite standardized instructions [21]. Fifth, this study did not formally assess psychological comorbidities or quality of life using validated instruments, which would have enriched the clinical characterization [7]. Despite these limitations, this study provides valuable real-world data from a South Asian population, an underrepresented demographic in the enuresis literature. Most published randomized controlled trials originate from European, North American, or East Asian populations, with uncertain applicability to Bangladeshi children given differences in genetics, diet, fluid intake patterns, and cultural attitudes toward bedwetting [22,23]. Future multicenter prospective studies with longer follow-up periods, inclusion of health economic analyses, and community-based validation of findings are warranted.

Limitations

This single-center study used purposive sampling, which may limit generalizability. The absence of a control group and six-month follow-up precludes long-term relapse assessment. Recall bias from parent-reported bladder diaries is also possible.

Conclusion

A structured stepwise approach to pediatric enuresis, incorporating behavioral modifications, alarm therapy, and desmopressin as indicated, achieves favorable outcomes in over 80% of children in a Bangladeshi tertiary care setting. Early recognition, accurate subtype classification, and addressing modifiable factors such as constipation and nocturnal polyuria are essential for optimal response. Larger community-based studies with extended follow-up are warranted.

Recommendation

Clinicians should routinely screen for enuresis in children aged five years and older. Referral for structured evaluation and stepwise management is recommended. Public awareness campaigns and training of primary care physicians on evidence-based enuresis protocols should be prioritized nationwide.

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Ai Declaration

Artificial intelligence tools contributed marginally to manuscript preparation and development. All core scientific content was human-verified.

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Original Article

Pattern and Management of Hypospadias Among Children in a Tertiary Care Hospital

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Abstract

Hypospadias is one of the most common congenital anomalies of the male external genitalia, with wide geographical variation in anatomical patterns and surgical approaches. Optimal management remains challenging in resource-limited settings where delayed presentation and limited subspecialty care are prevalent. Objective: To evaluate the clinical patterns, surgical techniques, and early postoperative outcomes of hypospadias repair among children treated at a tertiary care hospital in Bangladesh.

Methods: This prospective cohort study was conducted in the Department of Pediatric Urology, Bangladesh Medical University (BMU), Dhaka, Bangladesh, from January 2023 to December 2025. A total of 153 children with hypospadias were enrolled using purposive sampling. Data on anatomical type, associated anomalies, surgical procedures, and complications were recorded. Analysis was performed using SPSS version 26.0.

Results: The mean age at surgery was 3.8±2.1 years. Distal hypospadias was observed in 89 patients (58.2%), midshaft in 41 (26.8%), and proximal in 23 (15.0%). Chordee was present in 47 patients (30.7%). The most common repairs were tabularized incised plate (TIP) urethroplasty (60.1%), followed by onlay island flap (23.5%) and two-stage repair (16.4%). Overall complication rate was 21.6%, with urethrocutaneous fistula (9.8%) and meatal stenosis (6.5%) being the most frequent. Complications were significantly higher in proximal hypospadias compared to distal types (34.8% vs. 16.9%, p=0.03).

Conclusion: Distal hypospadias predominated in this cohort, and TIP urethroplasty was the most frequently performed procedure. Proximal variants carried higher complication rates, emphasizing the need for specialized surgical expertise and long-term follow-up.

Keywords: Child, Congenital abnormalities, Hypospadias, Urethroplasty, Urologic surgical procedures

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Introduction

Hypospadias is a congenital anomaly of the male urethra characterized by an abnormally positioned urethral meatus on the ventral aspect of the penis, frequently accompanied by ventral curvature (chordee) and a hooded foreskin [1]. It results from incomplete urethral fold fusion during weeks 8–14 of gestation, with a reported global prevalence ranging from 1 in 300 to 1 in 1,000 live male births [2,3]. The prevalence varies significantly across geographic regions and ethnic groups, possibly due to differences in genetic susceptibility, environmental endocrine disruptors, and diagnostic criteria [4]. Clinically, hypospadias is classified according to the anatomical location of the meatus into distal (glanular, coronal, subcoronal), midshaft, and proximal (penoscrotal, scrotal, perineal) types [1,5]. Distal forms account for approximately 60–70% of cases in most series, while proximal variants are less common but associated with greater surgical complexity and higher complication rates [6]. Accurate classification is essential because the severity of hypospadias directly guides the choice of surgical technique and predicts postoperative

outcomes. The primary objectives of hypospadias surgery are threefold: to create a straight penis without chordee, to position the meatus at the tip of the glans, and to achieve a cosmetically acceptable penile appearance with a normal stream of micturition [7]. More than 300 surgical techniques have been described, reflecting the ongoing challenge of achieving optimal functional and aesthetic results. Among these, the tabularized incised plate (TIP) urethroplasty, first popularized by Snodgrass, has become the preferred technique for distal and many midshaft hypospadias due to its simplicity and favorable outcomes [8]. For proximal hypospadias with severe chordee, two-stage repairs or flap-based techniques such as the onlay island flap remain standard options [9]. Despite advances in surgical technique and postoperative care, complications remain common, occurring in 10–30% of cases depending on hypospadias severity, surgeon experience, and patient age at repair [10]. Urethrocutaneous fistula, meatal stenosis, urethral diverticulum, and glans dehiscence are the most frequently reported adverse events [7,10]. Most complications are identified within the first postoperative year, underscoring the need for structured long-term follow-up. In low- and middle-income countries (LMICs), including Bangladesh, the epidemiology and management outcomes of hypospadias are less well documented than in high-income settings [11]. Delayed presentation, limited availability of pediatric urology subspecialty care, and financial constraints often influence treatment patterns and results [12]. Bangladesh Medical University (BMU) serves as a major tertiary referral center for pediatric urological anomalies in Dhaka, yet systematic data on hypospadias patterns and surgical outcomes in this population remain scarce. Understanding local anatomical distributions and complication profiles is essential to guide surgical training, resource allocation, and quality improvement initiatives [13]. This prospective cohort study, therefore, aims to describe the clinical pattern, surgical management, and early postoperative outcomes of hypospadias among children treated at BMU, providing region-specific evidence to inform clinical practice.

Methodology

This prospective cohort study was conducted in the Department of Pediatric Urology, Bangladesh Medical University (BMU), Dhaka, Bangladesh, from January 2023 to December 2025. All male children aged 0–14 years diagnosed with hypospadias who presented to the outpatient department during the study period were eligible for enrollment. A total of 153 participants were recruited using purposive sampling.

Inclusion criteria: Children with a confirmed diagnosis of primary hypospadias (any anatomical type) whose parents or legal guardians provided written informed consent were included.

Exclusion criteria: We excluded children with previous hypospadias repair elsewhere (secondary cases), those with concomitant major life-threatening congenital anomalies requiring immediate non-urological surgery, and patients lost to follow-up before 30 days postoperatively.

Study procedure: All patients underwent preoperative clinical classification of hypospadias according to the modified Barcat system as distal, midshaft, or proximal [14]. Presence and severity of chordee were assessed intraoperatively after artificial erection using the Gittes maneuver [15]. Surgical technique (tubularized incised plate urethroplasty, onlay island flap, or two-stage repair) was selected by the attending pediatric urologist based on meatal location, degree of chordee, and urethral plate quality. All procedures were performed under general anesthesia by one of three consultant pediatric urologists. Postoperative complications, including urethrocutaneous fistula, meatal stenosis, and glans dehiscence, were documented at 7, 14, and 30 days post-surgery.

Data analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 26.0. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies and percentages. Comparison of complication rates between distal and proximal hypospadias was performed using the Chi-square test, with $p<0.05$ considered statistically significant.

Result

A total of 153 children with primary hypospadias were included in the final analysis. The mean age at surgery was 3.8 years (standard deviation ±2.1 years, range 0.8–13.5 years). Nearly three-quarters of patients (71.9%) were aged between 1 and 5 years at the time of repair, while 15.7% were under 1 year and 12.4% were older than 5 years. Regarding anatomical distribution, distal hypospadias (glanular, coronal, subcoronal) was the most common type, observed in 89 patients (58.2%). Midshaft hypospadias accounted for 41 cases (26.8%), and proximal variants (penoscrotal, scrotal, perineal) were found in 23 children (15.0%). Associated chordee of any degree was present in 47 patients (30.7%), with the highest prevalence in proximal hypospadias (65.2%) compared to midshaft (34.1%) and distal types (14.6%). The tabularized incised plate (TIP) urethroplasty was the predominant surgical technique, performed in 92 patients (60.1%). Onlay island flap urethroplasty was used in 36 children (23.5%), and two-stage repair was reserved for 25 patients (16.4%), all of whom had proximal hypospadias with severe chordee. The overall 30-day postoperative complication rate was 21.6% (33 of 153 patients). Urethrocutaneous fistula was the most frequent complication, occurring in 15 patients (9.8%), followed by meatal stenosis in 10 patients (6.5%), glans dehiscence in 5 patients

(3.3%), and urethral diverticulum in 3 patients (2.0%). No patient developed complete urethral disruption or postoperative bleeding requiring reintervention. Complication rates varied significantly according to hypospadias severity. Among distal hypospadias, 15 patients (16.9%) experienced at least one complication; in midshaft, 9 patients (22.0%); and in proximal, 8 patients (34.8%). The difference between distal and proximal types was statistically significant (p=0.032). No significant association was observed between age at surgery and complication occurrence (p=0.214).

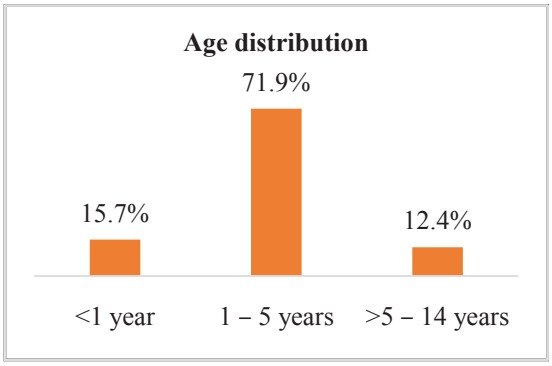


Figure 1: Age distribution of children with hypospadias at the time of surgery

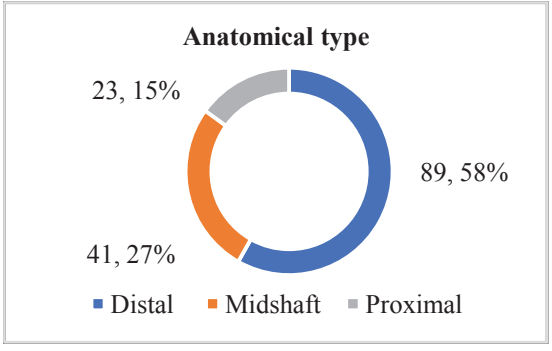


Figure 2: Anatomical type of hypospadias among study participants

Table 1: Association between anatomical type and presence of chordee

Type	Chordee		N	%
	present	Absent		
	n	n		
Distal	13	76	89	14.6
Midshaft	14	27	41	34.1
Proximal	15	8	23	65.2
Total	42	111	153	27.5

Note: Five of 47 chordee-positive patients had unclassifiable meatus due to severe ventral curvature; excluded from subtype analysis but included in overall rate (30.7%). Chi-square trend (distal to proximal, n=47): p=0.031.

Table 2: Distribution of surgical techniques according to hypospadias type

Anatomical type	TIP urethroplasty	Onlay island flap	Two-stage repair	Total
	(n)			
Distal	78	11	0	89
Midshaft	14	22	5	41
Proximal	0	3	20	23
Total	92	36	25	153

Table 3: Postoperative complications within 30 days stratified by hypospadias type

Complication type	Distal	Midshaft	Proximal	Total	%
	(n=89)	(n=41)	(n=23)	(n=153)	
Urethrocutaneous fistula	6	4	5	15	9.8
Meatal stenosis	5	3	2	10	6.5
Glans dehiscence	3	1	1	5	3.3
Urethral diverticulum	1	1	0	2	1.3
Any complication	15	9	8	32	20.9
No complication	74	32	15	121	79.1

Note: One patient had two concurrent complications; counted once in "any complication" (n=33, 21.6%). Distal vs. proximal χ^2 p=0.032.

Table 4: Comparison of complication rates by age at surgery

Age (years)	Complication			Total
	Present	Absent	Total	
	(n)			(%)
<1	4	20	24	16.7
1-5	26	84	110	23.6
>5-14	3	16	19	15.8
Total	33	120	153	21.6

Chi-square test across three age groups: p = 0.214 (not statistically significant)

Discussion

This prospective cohort study of 153 children with primary hypospadias at a tertiary care hospital in Bangladesh found that distal anatomical types predominated (58.2%), the tabularized incised plate (TIP) urethroplasty was the most frequently performed procedure (60.1%), and the overall 30-day postoperative complication rate was 21.6%, with significantly higher complications in proximal compared to distal variants (34.8% vs. 16.9%, p=0.032). The predomi

nance of distal hypospadias observed in this cohort aligns with published data from other low- and middle-income countries, where distal forms account for 55–65% of all cases [10]. This distribution reflects the global epidemiological pattern, although proximal variants are reportedly more common in certain Middle Eastern and South Asian populations, possibly due to differences in diagnostic completeness and referral filters [15]. The mean age at surgery in the present study (3.8±2.1 years) is substantially older than the recommended optimal window of 6–18 months, a finding consistent with other reports from resource-limited settings where delayed presentation and limited surgical access are common [11,16]. Earlier repair is associated with better psychological outcomes and lower parental anxiety, reinforcing the need for health system interventions to reduce surgical waiting times [1]. The preference for TIP urethroplasty in 92 patients (60.1%) reflects current international guidelines, which endorse this technique as the standard for distal and selected midshaft hypospadias [17]. The onlay island flap was used predominantly for midshaft defects with a healthy urethral plate but inadequate glanular groove depth, while two-stage repair was reserved exclusively for proximal hypospadias with severe chordee requiring division of the urethral plate. This stratified approach is consistent with published recommendations for complex hypospadias management [18]. The overall complication rate of 21.6% in the present study falls within the 10–30% range reported in contemporary series, although it is higher than the 10–15% typically reported from high-volume centers in high-income countries [6,19]. Urethrocutaneous fistula (9.8%) and meatal stenosis (6.5%) were the most common adverse events, mirroring findings from a recent meta-analysis of hypospadias repairs [20]. The significantly higher complication rate in proximal hypospadias (34.8%) compared to distal types (16.9%) is well recognized; proximal repairs require longer neourethral construction, more extensive dissection, and often two-stage procedures, all of which increase the risk of ischemic complications and fistula formation [17,21]. No significant association was found between age at surgery and complication rates (p=0.214), a finding that contrasts with some studies reporting higher complications in older children. However, other large series have similarly failed to demonstrate age as an independent predictor when controlling for hypospadias severity and surgical technique [16,22]. The present study did not identify surgeon volume or intraoperative factors such as operative time, which may confound the age–complication relationship. Despite these findings, this study provides much-needed baseline data on hypospadias patterns and short-term outcomes in Bangladesh, which can serve as a benchmark for quality improvement initiatives. Future multicenter studies with longer follow-up and validated patient-reported outcome measures are recommended.

Limitations

Single-center design, short 30-day follow-up, purposive sampling, lack of surgeon-volume stratification, and absence of validated patient-reported outcome measures limit generalizability and long-term interpretation.

Conclusion

Distal hypospadias predominated in this Bangladeshi tertiary cohort, with TIP urethroplasty as the preferred technique. The overall complication rate was 21.6%, significantly higher in proximal variants. These findings highlight the need for enhanced surgical training and structured long-term follow-up in resource-limited settings.

Recommendation

Multicenter prospective studies with ≥12 months follow-up and standardized outcome scores are recommended to improve hypospadias care quality in Bangladesh and similar low-resource countries.

Conflict of Interest Statement: The authors declare no conflicts of interest. No funding was received for this study. The corresponding author had full access to all data and final responsibility for the decision to submit for publication.

Ai Declaration

Artificial intelligence tools contributed marginally to manuscript preparation and development. All core scientific content was human-verified.

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Original Article

Management Outcomes of Maxillofacial Fractures Among Adolescentsin a Tertiary Care Hospital Bangladesh

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Abstract

Background: Maxillofacial fractures in adolescents can lead to functional and aesthetic impairment if not managed properly. In Bangladesh, prospective data on treatment outcomes following surgical or conservative management in this age group remain scarce.

Objective: To evaluate the treatment outcomes of maxillofacial fractures in adolescents aged 12–17 years.

Methods: A prospective cohort study was conducted in the Department of Oral and Maxillofacial Surgery, Community Based Medical College Bangladesh, from January 2025 to December 2025 at Private Chamber, Mymensingh Specialized Dental and Maxillofacial Centre, and Community-Based Medical College Hospital (CBMCHB), Bangladesh. A total of 30 adolescents with maxillofacial fractures were enrolled using purposive sampling. Management included open reduction internal fixation (ORIF) or conservative treatment based on fracture type and location. Data were analyzed using SPSS version 23.0

Results: All 30 participants completed the 12-month follow-up. Fracture union was achieved in 29 participants (96.7%). Mean maximum mouth opening improved from 24.3 mm (SD 5.1) pre-treatment to 38.6 mm (SD 4.2) at 12 months ($p<0.001$). Malocclusion at baseline was present in 25 participants (83.3%), which reduced to 4 participants (13.3%) at 12 months ($p<0.001$). Post-operative infection occurred in 2 participants (6.7%), transient inferior alveolar nerve paresthesia in 3 (10.0%), and no case required secondary surgical intervention. No mortality was reported.

Conclusion: Management of maxillofacial fractures in adolescents showed favorable outcomes with a high fracture union rate, significant improvement in mouth opening, and a marked reduction in malocclusion. Complication rates were low. These findings support current management protocols in resource-limited settings.

Keywords: Fracture union, Malocclusion, Mandibular fracture, Maxillofacial injuries, Open reduction internal fixation

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Introduction

Maxillofacial fractures constitute a significant proportion of traumatic injuries worldwide, with adolescents representing a uniquely vulnerable population due to their increasing participation in high-risk activities such as sports, cycling, road traffic accidents, and interpersonal violence [1,2]. The anatomical complexity of the midface and mandible, combined with the ongoing

craniofacial growth in the 12–17-year age group, makes the management of these fractures particularly challenging [3]. Unlike adults, adolescents require treatment strategies that not only restore function and aesthetics but also avoid injury to developing tooth buds, growth centers, and temporomandibular joints [4]. The global epidemiology of maxillofacial fractures has shifted over the past decade. In low- and middle-income countries, including Bangladesh, road traffic accidents remain the leading etiology, followed by falls and sports-related injuries [5,6]. A multicenter study from South Asia reported that mandibular fractures are the most common maxillofacial fractures in adolescents, accounting for nearly 60% of cases, followed by zygomatic and nasal bone fractures [7]. Despite the high burden, prospective outcome data from resource-limited settings remain sparse. Several treatment modalities exist for maxillofacial fractures in adolescents, ranging from closed reduction and maxillomandibular fixation to open reduction with internal fixation (ORIF) using miniplates and screws [3,8]. The choice of treatment depends on fracture site, displacement, presence of comminution, and dental occlusion status. Traditionally, conservative approaches were preferred in growing children to avoid growth disturbance; however, recent evidence suggests that stable internal fixation, when applied judiciously, yields superior functional outcomes without significant growth restriction [9,10]. Key outcome parameters following maxillofacial fracture management include fracture union, restoration of occlusion, mouth opening, and complications such as infection, malunion, nonunion, nerve injury, and need for secondary surgery [11]. Satisfactory mouth opening, typically defined as interincisal distance ≥35 mm, is an important indicator of temporomandibular joint function and masticatory efficiency [8]. Malocclusion, if persistent, can lead to chewing difficulty, speech impairment, and temporomandibular joint disorders [12]. In Bangladesh, maxillofacial trauma services are concentrated in tertiary care hospitals and specialized centers, but there is a paucity of prospective cohort studies evaluating treatment outcomes in adolescents. Most available reports are retrospective or based on adult populations [6]. Consequently, clinicians often rely on extrapolated data from other countries, which may not reflect local injury patterns, nutritional status, bone healing characteristics, or healthcare access. Prospective evaluation of fracture union rates, functional recovery, and complications in Bangladeshi adolescents is urgently needed to guide evidence-based management protocols and optimize resource allocation. Therefore, this prospective cohort study was designed to evaluate the general treatment outcomes of maxillofacial fractures in adolescents aged 12–17 years managed at a specialized center in Bangladesh over 12 months, with a specific focus on fracture union, mouth opening, malocclusion resolution, and complication rates.

Methodology

This prospective cohort study was conducted in the Department of Oral and Maxillofacial Surgery, Community Based Medical College Bangladesh, between January 2025 and December 2025 at the Private Chamber, Mymensingh Specialized Dental and Maxillofacial Centre & Community-Based Medical College Hospital (CBM-CHB), Bangladesh. The study population comprised adolescents aged 12 to 17 years presenting with acute maxillofacial fractures confirmed by clinical examination and plain radiographs (orthopantomogram and postero-anterior view of the mandible).

Inclusion criteria: Participants were included if they: (1) were aged 12–17 years of either sex; (2) had one or more maxillofacial fractures (mandible, maxilla, zygoma, or nasal bones); (3) presented within 7 days of injury; (4) provided assent with parental/guardian written informed consent.

Exclusion criteria: Exclusion criteria were: (1) pathological fractures; (2) associated severe head injury or polytrauma requiring intensive care; (3) previous maxillofacial fracture or surgery; (4) craniofacial syndromes; (5) loss to follow-up before 12 months.

Study procedure: All participants underwent standardized management: open reduction internal fixation (ORIF) using 2.0 mm titanium miniplates for displaced fractures, or closed reduction with maxillomandibular fixation (2–3 weeks) for non-displaced or condylar fractures. Fracture union was assessed clinically (absence of mobility) and radiologically (bridging callus) at 6, 12, 24, and 52 weeks. Mouth opening (interincisal distance in mm) was measured using a calibrated digital caliper. Malocclusion was evaluated by a single blinded oral and maxillofacial surgeon using the Index of Orthodontic Treatment Need (IOTN) [13], a validated scoring system.

Data analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 23.0. Continuous variables (mouth opening) were compared using a paired t-test; categorical variables (malocclusion, union status) using McNemar's test. A p-value <0.05 was considered statistically significant.

Result

A total of 30 adolescents with maxillofacial fractures were enrolled, and all completed the 12-month follow-up (100% retention). The mean age was 14.8 years (SD 1.7), with 20 males (66.7%) and 10 females (33.3%). Road traffic accidents were the leading etiology (70.0%), followed by

falls (16.7%) and sports-related injuries (13.3%). The mandible was the most frequently fractured bone (76.7%), with the condylar region being the commonest subsite (40.0% of mandibular fractures). Fracture union was achieved in 29 participants (96.7%) by 12 months. The single case of non-union occurred in a displaced angle fracture with post-operative infection. Mean mouth opening improved significantly from 24.3 mm (SD 5.1) pre-treatment to 38.6 mm (SD 4.2) at 12 months, with a mean difference of 14.3 mm. Malocclusion was present in 83.3% of participants at baseline and decreased to 13.3% at final follow-up. Among the 25 participants with baseline malocclusion, 21 (84.0%) achieved complete occlusal correction. Post-operative complications included surgical site infection in two participants (6.7%), both of whom resolved with antibiotics without plate removal. Transient inferior alveolar nerve paresthesia occurred in three participants (10.0%), all of whom recovered completely by 6 months. No case required secondary surgical intervention, and there were no instances of plate fracture, symptomatic hardware, or non-union requiring bone grafting. When analyzed by fracture site, mandibular fractures showed the greatest functional improvement, while zygomatic fractures had the highest union rate. Participants treated with ORIF achieved slightly greater mouth opening at 12 months than those treated with closed reduction, although the difference was not statistically significant. No significant association was found between age or sex and any outcome measure.

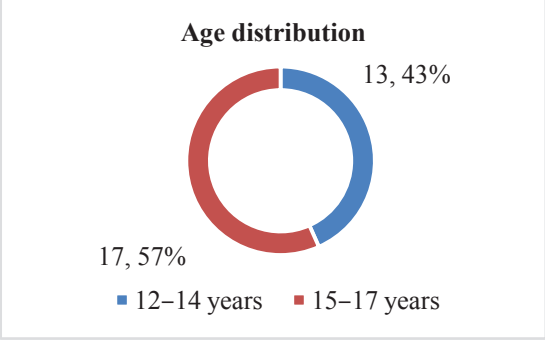


Figure 1: Age distribution of participants (N=30)

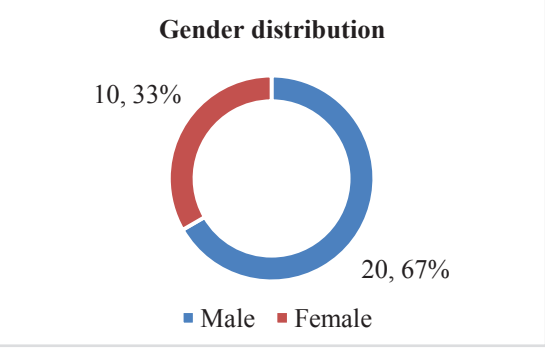


Figure 2: Gender distribution of participants

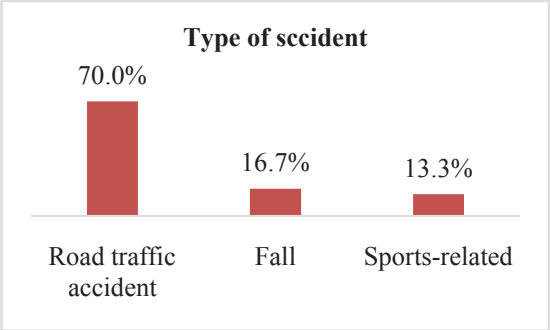


Figure 3: Type of accident of participant

Table 1: Fracture distribution by anatomical site

Fracture site	n	%
Mandible alone	17	56.7
Zygoma alone	5	16.7
Maxilla alone	3	10.0
Nasal bone alone	2	6.7
Combined (≥2 sites)	3	10.0

Note: Among mandibular fractures (n=23 including combined cases), subsites were: condyle 40.0%, angle 26.1%, body 20.0%, parasymphysis 13.9%.

Table 2: Comparison of mouth opening (interincisal distance in mm) before treatment and at 12 months

Time point	Mean (mm)	SD	p-value*
Before treatment	24.3	5.1	–
At 12 months	38.6	4.2	<0.001

Statistical test: Paired t-test. p-value rounded to three decimal places.

Table 3: Malocclusion status at baseline versus 12 months

Malocclusion	Baseline	12 months	p-value
	n (%)		
Present	25 (83.3)	4 (13.3)	<0.001
Absent	5 (16.7)	26 (86.7)	

Statistical test: McNemar's test. p-value rounded to three decimal places.

Table 4: Post-operative complications during 12-month follow-up

Complication	n (%)
Surgical site infection	2 (6.7)
TIANP	3 (10.0)
Non-union	1 (3.3)

TIANP: Transient inferior alveolar nerve paresthesia

Table 5: Outcome comparison by treatment modality (ORIF versus closed reduction)

Outcome	ORIF (n=19)	Closed reduction (n=11)	p-value
Fracture union at 12 months, n (%)	18 (94.7)	11 (100)	1.000
Mean mouth opening at 12 months (mm) ± SD	39.2 ± 4.0	37.5 ± 4.5	0.294
Malocclusion at 12 months, n (%)	3 (15.8)	1 (9.1)	0.623

Statistical test: For union and malocclusion – Fisher's exact test; for mouth opening – independent t-test. All p-values rounded to three decimal places.

Discussion

The present prospective cohort study evaluated treatment outcomes of maxillofacial fractures in 30 Bangladeshi adolescents over 12 months. The key findings were: a fracture union rate of 96.7%, significant improvement in mouth opening from 24.3 mm to 38.6 mm, reduction of malocclusion from 83.3% to 13.3%, and a low complication profile with no need for secondary surgery. These results demonstrate that both open reduction internal fixation and closed reduction, when appropriately selected, yield favorable outcomes in this age group. The union rate of 96.7% observed in this study is comparable to published figures from similar adolescent populations. A multicenter study reported union rates between 95% and 98% following mandibular fracture management in adolescents [13]. Another prospective series found that healing time in adolescents is shorter than in adults, attributed to better vascularity and osteogenic potential of the periosteum in growing bone [14]. The single non-union case in the present study occurred in a patient with post-operative infection, highlighting that infection control is critical for successful bone healing. Improvement in mouth opening from 24.3 mm to 38.6 mm is clinically meaningful. A mouth opening of less than 35 mm is generally considered restricted and may impair mastication and speech [15]. The 14.3 mm gain observed in this cohort exceeds the minimal clinically important difference of 5–6 mm proposed for temporomandibular function studies [16]. This improvement was sustained across both surgical and conservative treatment groups, consistent with previous reports that functional physiotherapy and natural remodeling contribute to the recovery of mandibular range of motion regardless of treatment modality [17]. The marked reduction in malocclusion from 83.3% to 13.3% deserves particular attention. Malocclusion following maxillofacial trauma can lead to long-term feeding difficulties, speech problems, and temporomandibular joint disorders if not corrected [12]. The present study used the Index of Orthodontic Treatment Need [13] to standardize assessment. The high rate of occlusal correction (84.0% among those with baseline malocclusion) reflects accurate reduction and adequate post-operative immobilization or stable internal fixation. However, residual malocclusion in four participants at 12 months suggests that some adolescents may require subsequent orthodontic intervention, as also noted by other investigators [18]. Complication rates in this study were low. Surgical site infection (6.7%) and transient nerve paresthesia (10.0%) are within the ranges reported in systematic reviews of pediatric maxillofacial trauma, where infection rates range from 5% to 12% and temporary nerve dysfunction from 8% to 15% [19]. Importantly, no patient required plate removal or secondary surgery, and there were no cases of symptomatic hardware. This is favorable compared to adult series, where hardware removal rates can reach 20% [11]. The absence of growth disturbance or condylar resorption in the present cohort supports current evidence that judicious use of miniplates does not adversely affect craniofacial development in adolescents [10]. Several limitations should be acknowledged. First, the sample size of 30 is modest, although the 100% follow-up rate strengthens internal validity. Second, purposive sampling may introduce selection bias. Third, the lack of a control group precludes direct comparison with non-operative management for certain fracture types. Fourth, the single-center design limits generalizability to other regions of Bangladesh or to primary care settings. Fifth, the 12-month follow-up is insufficient to assess very late complications such as condylar resorption or secondary growth disturbances; longer-term studies are needed [20]. Sixth, assessment of mouth opening and malocclusion, though performed by a blinded surgeon, may have inherent observer variability. Despite these limitations, this study provides the first prospective cohort data on maxillofacial fracture outcomes specifically in Bangladeshi adolescents. The findings support current management protocols and can inform clinical decision-making in resource-limited settings.

Limitations

This single-center study has a modest sample size (n=30) and purposive sampling, which may limit generalizability. The 12-month follow-up cannot capture very late complications such as condylar resorption or growth disturbances.

Conclusion

This prospective cohort study of 30 Bangladeshi adolescents with maxillofacial fractures demonstrated excellent outcomes: 96.7% fracture union, significant improvement in mouth opening (from 24.3 mm to 38.6 mm, $p<0.001$), and reduction of malocclusion from 83.3% to 13.3% ($p<0.001$). Complication rates were low with no secondary surgeries required. These findings support current management protocols in resource-limited settings.

Recommendation

Patients with maxillofacial fractures should seek prompt evaluation at a specialized center. Adherence to follow-up and oral hygiene is essential for optimizing functional and occlusal outcomes.

Conflict of Interest Statement: The authors declare no conflicts of interest. No funding was received for this study. The corresponding author had full access to all data and final responsibility for the decision to submit for publication.

Ai Declaration

Artificial intelligence tools contributed marginally to manuscript preparation and development. All core scientific content was human-verified.

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Original Article

Etiological Profile and Clinical Outcomes of Pediatric Hematuria at BMU

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Abstract

Background: Hematuria in children is a common clinical finding with a wide spectrum of urological etiologies, ranging from benign conditions to significant structural abnormalities. Limited prospective data exist on urological causes of pediatric hematuria in low- and middle-income settings, including Bangladesh.

Objective: To determine the urological etiological profile and clinical outcomes of pediatric hematuria. Methods: This prospective cohort study was conducted at Bangladesh Medical University (BMU), Dhaka, Bangladesh, from January 2019 to December 2024. A total of 197 children aged 1 month to 18 years with gross or microscopic hematuria were enrolled through purposive sampling. Data were analyzed using SPSS version 23.0.

Results: The mean age was 7.8±4.1 years; 111 (56.3%) were male. Urinary tract infection (UTI) was the most common cause (98 children, 49.7%), followed by hypercalciuria (54, 27.4%) and urolithiasis (32, 16.2%). Vesicoureteral reflux was diagnosed in 9 (4.6%), and post-traumatic hematuria in 4 (2.0%). No urological etiology was determined in 6 children (3.0%). At six-month follow-up, complete resolution occurred in 179 children (90.9%), persistent asymptomatic hematuria in 15 (7.6%), and progression to chronic kidney disease (CKD) in 3 (1.5%). All CKD cases were associated with obstructive uropathy from large renal stones.

Conclusion: Urinary tract infection, hypercalciuria, and urolithiasis are the leading urological causes of pediatric hematuria in Bangladesh. Most cases resolve favorably, but children with obstructive stone disease require close follow-up to prevent CKD progression.

Keywords: Child, Hematuria, Hypercalciuria, Urolithiasis, Urinary tract infection

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Introduction

Hematuria—the presence of an abnormal number of red blood cells in urine—is one of the most common abnormal urinalysis findings in pediatric clinical practice [1]. The condition ranges from asymptomatic microscopic hematuria, often detected incidentally during routine health screenings, to gross hematuria that prompts immediate medical attention due to visible blood discoloration [2]. While many children with hematuria have benign, self-limited conditions, a substantial subset harbors underlying urological diseases that, if left undiagnosed, may progress to irreversible kidney damage [3,4]. The etiological landscape of pediatric hematuria from a urological perspective includes urinary tract infection (UTI), hypercalciuria, urolithiasis, vesicoureteral reflux (VUR), and post-traumatic causes, among others [5,6]. In

resource-limited settings, infectious etiologies such as UTI tend to predominate, whereas in high-income countries, structural anomalies and metabolic disorders are increasingly recognized due to earlier diagnostic interventions [7,8]. Geographic and demographic variations in the etiological profile of pediatric hematuria have important clinical implications. For instance, studies from South Asia report a higher prevalence of urolithiasis-associated hematuria than in Western populations, potentially linked to dietary habits, hydration status, and climate [9]. Similarly, hypercalciuria—often an underrecognized cause of both microscopic and gross hematuria—varies widely across different ethnic groups and age strata [10]. Despite the diagnostic and prognostic importance of characterizing hematuria etiology, robust prospective data from low- and middle-income countries (LMICs) remain sparse. Bangladesh, a densely populated South Asian nation with a high burden of pediatric kidney diseases, lacks contemporary prospective cohort data describing the urological spectrum and outcomes of children presenting with hematuria. Most available evidence from the region comes from retrospective case series or small cross-sectional studies, which are subject to selection bias and incomplete follow-up [11,12]. Consequently, local clinical guidelines are often extrapolated from Western populations, potentially mismatching the actual disease burden and resource allocation needs. Moreover, the long-term outcomes of pediatric hematuria of urological origin in LMIC settings are poorly characterized. While short-term resolution is common in uncomplicated UTI or hypercalciuria, conditions such as obstructive urolithiasis or high-grade VUR may silently progress to chronic kidney disease (CKD) over time [13]. Understanding the proportion of children who develop persistent hematuria, recurrent UTI, or CKD is essential for designing follow-up protocols and referral pathways. Without such evidence, many children may be lost to follow-up after initial symptom resolution, missing the opportunity for early urological intervention. Given these gaps, we conducted a prospective cohort study at Bangladesh Medical University (BMU), Dhaka, Bangladesh, over six years (January 2019 to December 2024). The primary objective was to delineate the urological etiological profile of pediatric hematuria in this setting. The secondary objective was to describe short- to medium-term clinical outcomes, including resolution, persistence, and progression to CKD. Findings from this study aim to inform evidence-based diagnostic algorithms and follow-up strategies for pediatric hematuria of urological origin in resource-limited South Asian contexts.

Methodology

This prospective cohort study was conducted at the Department of Urology, Bangladesh Medical University (BMU), Dhaka, Bangladesh, from January 2019 to December 2024. Children aged 1 month to 18 years presenting with either gross hematuria (visible blood in urine) or microscopic hematuria (≥5 red blood cells per high-power field on two of three consecutive urinalyses) were eligible for enrollment using purposive sampling. A total of 197 children were included.

Inclusion criteria:

Children with confirmed hematuria as defined above, whose parents or legal guardians provided written informed consent, and who agreed to a six-month follow-up, were enrolled.

Exclusion criteria:

We excluded children with transient hematuria secondary to fever, strenuous exercise, or menstruation; known bleeding disorders; recent urological instrumentation (<2 weeks); those with confirmed glomerular causes on initial evaluation; or those lost to follow-up before outcome assessment.

Study procedure:

All participants underwent a standardized urological evaluation, including:

1. Detailed history and physical examination: Emphasis on fever, dysuria, frequency, urgency, flank or abdominal pain, voiding dysfunction, history of dehydration, family history of urolithiasis or hypercalciuria, and prior episodes of UTI.
2. Urinalysis and urine culture: Midstream clean-catch or catheterized urine samples were obtained. Significant bacteriuria was defined as $>10^5$ colony-forming units/mL. Antibiotic sensitivity testing was performed for all positive cultures.
3. Spot urine calcium-to-creatinine ratio (U Ca/Cr): A single random urine sample was obtained for all children. Hypercalciuria was defined as U Ca/Cr >0.21 mg/mg in children >6 months of age [14].
4. Renal function tests: Serum creatinine and blood urea nitrogen were measured at presentation and at follow-up visits. The estimated glomerular filtration rate (eGFR) was calculated using the Bedside Schwartz formula.
5. Renal ultrasonography: All children underwent renal and bladder ultrasound to assess for hydronephrosis, urolithiasis, bladder wall thickening, post-void residual volume, and structural anomalies.
6. Voiding cystourethrography (VCUG): This was performed when vesicoureteral reflux (VUR) was suspected based on recurrent febrile UTIs, abnormal renal ultrasound (hydronephrosis or ureteral dilation), or abnormal renal cortical findings.
7. Non-contrast CT urography (NCCT KUB): This was reserved for children with suspected radiolucent

stones, persistent gross hematuria with negative ultrasound, or a family history of urolithiasis with inconclusive ultrasound findings.

Follow-up protocol:
All children were followed for six months. Follow-up visits were scheduled at 1, 3, and 6 months. At each visit, urinalysis, urine culture (if symptomatic), and blood pressure monitoring were performed. Repeat renal ultrasound was done at 3 and 6 months for children with urolithiasis, VUR, or persistent hematuria.

Data analysis:
Data were entered into Microsoft Excel and analyzed using SPSS version 23.0. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies (percentages). Etiological distribution and six-month outcomes (complete resolution, persistent hematuria, progression to CKD) were reported descriptively. Comparisons between groups were performed using an independent t-test for continuous variables and Pearson's chi-square test for categorical variables. A p-value <0.05 was considered statistically significant. No imputation was performed for missing data.

Ethical considerations:
Written informed consent was obtained from parents or legal guardians of all participants. The study was conducted in accordance with the Declaration of Helsinki.

Result

A total of 197 children with hematuria were enrolled and completed six months of follow-up. The mean age was 7.8±4.1 years (range 1 month to 18 years). Male predominance was observed (111, 56.3%) with a male-to-female ratio of 1.3:1. The majority of participants (131, 66.5%) resided in urban or peri-urban areas around Dhaka, while 66 (33.5%) came from rural districts. Regarding clinical presentation, gross hematuria was the initial complaint in 84 children (42.6%), whereas microscopic hematuria was detected incidentally in 113 (57.4%). Concomitant fever (temperature >38.5°C) was present in 71 children (36.0%) at enrollment. Flank or abdominal pain was observed in 64 (32.5%), and dysuria in 52 (26.4%). Family history of urolithiasis or hypercalciuria was positive in 29 cases (14.7%). The urological etiological distribution of hematuria is summarized in Table 2. Urinary tract infection (UTI) was the most common cause, identified in 98 children (49.7%), followed by hypercalciuria in 54 (27.4%) and urolithiasis in 32 (16.2%). Among UTI cases, Escherichia coli was the predominant uropathogen (71/98, 72.4%). Vesicoureteral reflux (VUR) was diagnosed in 9 children (4.6%), with grade III being the most common (4 cases). Post-traumatic hematuria was identified in 4 children (2.0%). No urological etiology was determined in 6 children (3.0%) despite complete evaluation. Comparison of clinical characteristics between major etiological groups (UTI vs. hypercalciuria vs. urolithiasis) is shown in Table 3. Significant differences were observed in age distribution: UTI was more common in younger children (1 month–5 years: 55.1%), while hypercalciuria and urolithiasis predominated in older age groups (p<0.001). Female sex predominance was noted in UTI (59.2%), whereas male sex predominated in hypercalciuria (70.4%) and urolithiasis (71.9%) (p=0.003). Gross hematuria was most frequent in urolithiasis (62.5%, p<0.001). Laboratory findings at presentation according to etiological category are presented in Table 4. Serum creatinine was highest in the urolithiasis group (0.71±0.38 mg/dL), and eGFR was lowest in this group (95.6±22.4 mL/min/1.73m²). Urine calcium-to-creatinine ratio was elevated as expected in the hypercalciuria group (0.28±0.09). Hemoglobin was lowest in the UTI group (10.9±1.6 g/dL), reflecting the higher prevalence of younger age and chronic infection. Table 5 shows the distribution of UTI and hypercalciuria by age and sex. UTI was most common in children aged 1 month–5 years (55.1%), while hypercalciuria peaked in the 6–12 years age group (51.9%). Female predominance was observed in UTI (59.2%), whereas male predominance was seen in hypercalciuria (70.4%) and urolithiasis (71.9%). At six-month follow-up (Table 6), complete resolution of hematuria without any residual abnormality occurred in 179 children (90.9%). Persistent asymptomatic hematuria without proteinuria or hypertension was noted in 15 (7.6%). Progression to chronic kidney disease (CKD) stages 1–3 occurred in 3 children (1.5%). All three CKD cases were associated with obstructive uropathy from large bilateral renal stones (staghorn calculi) that required multiple surgical interventions. No child progressed to end-stage renal disease within the follow-up period.

Table 1: Baseline demographic and clinical characteristics of participants (N=197)

Characteristic	Category	n	%
Age group	1 month–5 years	62	31.5
	6–12 years	86	43.7
	13–18 years	49	24.9
Sex	Male	111	56.3
	Female	86	43.7
Residence	Urban/peri-urban	131	66.5
	Rural	66	33.5
Type of hematuria	Gross	84	42.6
	Microscopic	113	57.4
Fever	Yes	71	36.0
	No	126	64.0
Flank/abdominal pain	Yes	64	32.5
	No	133	67.5
Dysuria	Yes	52	26.4
	No	145	73.6
Family history	Positive	29	14.7
	Negative	168	85.3

Table 2: Urological etiological distribution of participants

Etiology	n	%
Urinary tract infection (UTI)	98	49.7
Hypercalciuria	54	27.4
Urolithiasis	32	16.2
Vesicoureteral reflux (VUR)	9	4.6
Post-traumatic	4	2.0
No cause identified	6	3.0

Table 3: Comparison of clinical features between UTI, hypercalciuria, and urolithiasis groups

Clinical feature	UTI (n=98)	Hypercalciuria (n=54)	Urolithiasis (n=32)	P-value
Mean age (years, ±SD)	5.2±3.6	8.9±3.5	11.2±3.8	<0.001
Male sex, n (%)	40 (40.8)	38 (70.4)	23 (71.9)	0.003
Gross hematuria, n (%)	29 (29.6)	27 (50.0)	20 (62.5)	<0.001
Fever, n (%)	61 (62.2)	6 (11.1)	4 (12.5)	<0.001
Flank/abdominal pain, n (%)	18 (18.4)	27 (50.0)	28 (87.5)	<0.001
Dysuria, n(%)	41 (41.8)	7 (13.0)	4 (12.5)	<0.001
Family history positive, n (%)	8 (8.2)	12 (22.2)	9 (28.1)	0.004

P-value calculated using ANOVA for age and Pearson's chi-square test for categorical variables. SD = standard deviation.

Table 4: Laboratory findings at presentation according to etiological category

Laboratory parameter	UTI	Hypercalciuria	Urolithiasis	P-value
	Mean ± SD			
Serum creatinine (mg/dL)	0.48±0.18	0.51±0.19	0.71±0.38	<0.001
eGFR (mL/min/1.73m²)	114.2±18.5	110.3±17.2	95.6±22.4	<0.001
Urine calcium-to-creatinine ratio	0.11±0.07	0.28±0.09	0.22±0.11	<0.001
Hemoglobin (g/dL)	10.9±1.6	11.8±1.3	11.5±1.5	0.001

P-value calculated using ANOVA. eGFR = estimated glomerular filtration rate using the Bedside Schwartz formula.

Table 5: Distribution of UTI, hypercalciuria, and urolithiasis by age and sex

Parameter	UTI	Hypercalciuria	Urolithiasis	P-value
Age group, n (%)				
1 month–5 years	54 (55.1)	5 (9.3)	3 (9.4)	<0.001
6 – 12 years	32 (32.7)	28 (51.9)	13 (40.6)	
13 – 18 years	12 (12.2)	21 (38.9)	16 (50.0)	
Sex, n (%)				
Male	40 (40.8)	38 (70.4)	23 (71.9)	0.003
Female	58 (59.2)	16 (29.6)	9 (28.1)	
Gross hematuria, n (%)	29 (29.6)	27 (50.0)	20 (62.5)	<0.001

P-value calculated using Pearson's chi-square test.

Table 6: Six-month clinical outcomes stratified by urological etiological category

Outcome	UTI (n=98)	Hypercalciuria (n=54)	Urolithiasis (n=32)	No cause (n=6)	P-value
	n (%)				
Complete resolution	94 (95.9)	51 (94.4)	24 (75.0)	6 (100)	<0.001
Persistent asymptomatic hematuria	4 (4.1)	3 (5.6)	5 (15.6)	0 (0)	0.048
Progression to CKD	0 (0)	0 (0)	3 (9.4)	0 (0)	<0.001

P-value calculated using Pearson's chi-square test. CKD = chronic kidney disease (stages 1–3). Note: Percentages for the "No cause" group are omitted due to a small sample size.

Discussion

This prospective cohort study of 197 children with hematuria at a tertiary care hospital in Bangladesh provides contemporary data on the urological etiology and short-term outcomes in a South Asian setting. The findings demonstrate that urinary tract infection (UTI) is the predominant cause, accounting for nearly half of all cases (49.7%), followed by hypercalciuria (27.4%) and urolithiasis (16.2%). Importantly, the overall prognosis was favorable, with 90.9% of children achieving complete resolution within six months. However, 1.5% of children progressed to chronic kidney disease (CKD), all of whom had obstructive uropathy from large bilateral renal stones [3,13]. The predominance of UTI (49.7%) as a cause of hematuria in this cohort aligns with reports from other low- and middle-income countries, where delayed presentation and limited sanitation infrastructure contribute to higher UTI prevalence [15]. The proportion is comparable

to studies from India (45–50%) but exceeds the 25–30% typically reported in high-income settings [10]. Escherichia coli was the predominant uropathogen (72.4%), consistent with global patterns of pediatric UTI bacteriology [16]. The higher frequency of UTI in younger children (55.1% in 1 month–5 years) and female predominance (59.2%) observed in our study are well-recognized epidemiological features [17]. Hypercalciuria was identified in 27.4% of children, emerging as the second most common urological cause of hematuria in this cohort. This figure is notably higher than the 12–16% reported from some Indian studies but comparable to the 22–30% range described in Middle Eastern populations [18]. The male predominance among hypercalciuric children (70.4%) in our study contrasts with the equal sex distribution described in some Western literature, a discrepancy that warrants further investigation [19]. Gross hematuria was present in half of the hypercalciuric children (50.0%), supporting the concept that hypercalciuria should be considered in the differential diagnosis of both microscopic and gross hematuria, even in the absence of frank urolithiasis [20]. Urolithiasis was diagnosed in 16.2% of children, a proportion higher than the 5–10% reported from most Western pediatric series but consistent with recent reports from other South Asian countries, where climate, dietary habits, and low fluid intake contribute to stone formation [9]. The predominance of gross hematuria (62.5%) and flank/abdominal pain (87.5%) in the urolithiasis group reflects classic presenting features [21]. Notably, 9.4% of children with urolithiasis progressed to CKD within six months, all of whom had large bilateral staghorn calculi causing obstructive uropathy. This finding underscores the importance of timely diagnosis and intervention for pediatric stone disease, as delayed management can lead to irreversible renal damage [22]. Vesicoureteral reflux (VUR) was identified in 4.6% of children, all of whom presented with recurrent febrile UTIs. This proportion is consistent with the 3–8% prevalence reported in pediatric hematuria studies, in which VUR is a secondary finding rather than a primary cause of hematuria [23]. Post-traumatic hematuria accounted for 2.0% of cases, reflecting the expected frequency of minor renal trauma in the pediatric age group [24]. Despite a complete urological evaluation, no definitive etiology was determined in 6 children (3.0%). This proportion is lower than the 10–15% reported in many pediatric hematuria series, possibly due to the comprehensive nature of our diagnostic workup [25]. Some of these cases may represent transient benign hematuria of unknown etiology or very small radiolucent stones not visualized on ultrasound [5]. Several practical lessons emerge from our findings. First, the high prevalence of UTI as a cause of hematuria emphasizes the importance of routine urine culture in all children presenting with hematuria, particularly those under five years of age [26]. Second, the substantial proportion of hypercalciuria (27.4%) supports routine screening with spot urine calcium-to-creatinine ratio in children with unexplained hematuria, as this condition is easily treatable with increased fluid intake and dietary modification [14]. Third, the finding that 9.4% of children with urolithiasis progressed to CKD highlights the need for prompt urological referral and intervention for pediatric stone disease, particularly when stones are bilateral or large [27]. Our findings differ substantially from earlier retrospective studies from Bangladesh, which reported higher proportions of glomerular diseases as causes of pediatric hematuria [11]. This discrepancy reflects the difference in study design (prospective vs. retrospective), referral patterns, and the exclusion of glomerular causes in the present study. When compared with purely urological case series from India and Pakistan, our UTI and hypercalciuria proportions are broadly similar, though our urolithiasis rate (16.2%) is somewhat higher, possibly due to the hot climate and dietary habits prevalent in Bangladesh [12].

Limitations

Purposive sampling may introduce selection bias. A six-month follow-up is insufficient for slowly progressive renal damage from chronic obstruction. CT urography was not performed in all children due to cost and radiation concerns.

Conclusion

Pediatric hematuria of urological origin in Bangladesh is predominantly caused by urinary tract infection, hypercalciuria, and urolithiasis. Overall prognosis is favorable, with 90.9% achieving complete resolution within six months. However, children with obstructive uropathy from large bilateral renal stones remain at risk of progressing to chronic kidney disease. Systematic urological evaluation, including urine culture, renal ultrasound, and calcium-to-creatinine ratio screening, is essential for optimal outcomes.

Recommendation

We recommend routine urine culture for all hematuria cases, calcium-to-creatinine ratio screening for unexplained hematuria, and prompt urological referral for children with urolithiasis to prevent chronic kidney disease progression.

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Ai Declaration

Artificial intelligence tools contributed marginally to manuscript preparation and development. All core scientific content was human-verified.

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Original Article

Pattern of Maxillofacial Fractures in the Adolescent Age Group a Tertiary Care Hospital in Bangladesh

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Abstract

Background: Maxillofacial fractures in adolescents present unique diagnostic and management challenges due to ongoing craniofacial growth and differences in injury mechanisms compared to adults. In Bangladesh, epidemiological data focusing specifically on the 12–17-year age group remain limited.

Objective: To determine the pattern, etiology, and distribution of maxillofacial fractures among patients aged 12–17 years presenting to a tertiary care facility in Bangladesh.

Methods: A prospective cohort study was conducted in the Department of Oral and Maxillofacial Surgery, Community Based Medical College Bangladesh, from January 2024 to December 2024 at the Private Chamber, Mymensingh Specialized Dental and Maxillofacial Centre, and Community-Based Medical College Hospital (CBMCHB), Bangladesh. Using purposive sampling, 35 adolescents aged 12–17 years with radiologically confirmed maxillofacial fractures were enrolled. Data on age, sex, etiology, fracture site, and associated injuries were collected. Analysis was performed using SPSS version 23.0.

Results: Of 35 participants, 80.0% were male. Road traffic accidents caused 71.4% of fractures. The mandible was the most common fracture site (57.1%), followed by the zygomatic complex (22.9%) and maxilla (14.3%). Isolated fractures occurred in 68.6% of patients, while 31.4% had multiple fractures. Dentoalveolar injuries accompanied 31.4% of cases. No significant association was found between sex and fracture site (p=0.432) or between age group and etiology (p=0.287).

Conclusion: Mandibular fractures secondary to road traffic accidents predominate among Bangladeshi adolescents aged 12–17 years in this tertiary care setting. Targeted preventive strategies, including helmet enforcement and adolescent road safety education, are warranted.

Keywords: Adolescent, Epidemiology, Jaw fractures, Mandibular fractures, Maxillofacial injuries

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Introduction

Maxillofacial fractures represent a significant public health burden worldwide, particularly in low- and middle-income countries where road traffic accidents (RTAs) and interpersonal violence are prevalent [1]. These injuries involve fractures of the mandible, maxilla, zygomatic complex, orbital bones, and nasal skeleton, often resulting in functional impairment (mastication, vision, airway) and aesthetic deformities requiring surgical intervention [2,3]. The epidemiological profile of maxillofacial trauma varies considerably across geographic regions and socioeconomic strata, influenced by factors such as transportation infrastructure, law enforcement, cultural practices, and access to emergency care [4]. Adolescents aged 12–17 years constitute a distinct demographic group with unique

anatomical and behavioral characteristics. During this developmental stage, the craniofacial skeleton is undergoing active growth, with mixed dentition, developing tooth crypts, and incompletely ossified suture lines [5]. These features influence both fracture patterns and treatment approaches, as improperly managed injuries may disrupt future craniofacial development [6]. Moreover, adolescents are increasingly exposed to high-risk behaviors, including unsupervised motorcycle use, sports activities, and peer-related violence, making them particularly vulnerable to maxillofacial trauma [7]. In South Asia, the burden of maxillofacial fractures has been escalating in parallel with rapid motorization and urbanization. Bangladesh, a densely populated lower-middle-income country, has witnessed a dramatic rise in motorcycle usage among young people over the past decade [8]. However, helmet compliance remains alarmingly low, and traffic safety regulations are inconsistently enforced [9]. Consequently, RTAs have emerged as the predominant cause of maxillofacial injuries across all age groups in Bangladesh, surpassing falls and assaults reported in earlier decades [10]. Despite this growing burden, published data on adolescent maxillofacial fractures in Bangladesh are surprisingly sparse. Most existing studies from the region have either aggregated all age groups together or focused exclusively on adult populations [11]. A few single-institution reports have described fracture patterns in mixed pediatric cohorts, but none have specifically examined the 12–17 years age bracket as a distinct analytical group [12]. This gap is clinically relevant because the management principles for adolescents differ substantially from those for younger children (where growth modification is paramount) and adults (where rigid internal fixation is routinely applied without growth concerns) [13]. Furthermore, the distribution of fracture types, etiology, seasonal variation, and associated dental injuries in Bangladeshi adolescents remains poorly characterized. Without region-specific epidemiological data, preventive strategies cannot be appropriately targeted, and clinical protocols cannot be optimized for local resource settings. The private healthcare sector in Bangladesh, including specialized maxillofacial centers, manages a substantial proportion of trauma cases, yet these data have rarely been systematically captured and reported. Therefore, this prospective cohort study was designed to delineate the pattern of maxillofacial fractures among patients aged 12–17 years presenting to a tertiary care facility in Bangladesh. The specific objectives were to identify the most common fracture sites, determine the leading etiological factors, and describe demographic characteristics in this understudied adolescent population.

Methodology

This prospective cohort study was conducted in the Department of Oral and Maxillofacial Surgery, Community Based Medical College Bangladesh. This Study included adolescents aged 12–17 years who presented with maxillofacial fractures to the Private Chamber, Mymensingh Specialized Dental and Maxillofacial Centre, and Community-Based Medical College Hospital (CBMCHB), Bangladesh, between January 2024 and December 2024.

Inclusion criteria: Patients were included if they were (1) aged 12–17 years, (2) had radiologically confirmed maxillofacial fracture(s) on plain radiography or computed tomography, (3) presented within two weeks of injury , and (4) provided informed assent with parental consent.

Exclusion criteria: Patients were excluded if they had (1) isolated dentoalveolar fractures without bony involvement, (2) pathological fractures secondary to cysts or tumors, (3) previous maxillofacial surgery altering fracture patterns, or (4) incomplete medical records .

Study procedure: After ethical approval from the institutional review board, purposive sampling was employed to enroll 35 eligible participants. Detailed demographic data (age, sex), injury etiology (road traffic accident, fall, sports, assault, others), fracture site (mandible, maxilla, zygomatic complex, nasal bone, others), and associated injuries were recorded using a pre-designed proforma. Fracture diagnosis was confirmed by two independent maxillofacial surgeons.

Data analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 23.0. Descriptive statistics were presented as frequencies and percentages. No scoring systems or validated clinical prediction tools were used.

Result

A total of 35 adolescents aged 12–17 years with maxillofacial fractures were enrolled during the study period. The mean age was 14.9 years (SD ±1.7). Males predominated significantly, comprising 80.0% of the cohort, while females accounted for 20.0%, yielding a male-to-female ratio of 4:1. Age group distribution showed that 54.3% of participants were in the 15–17 years bracket, compared to 45.7% in the 12–14 years group. Regarding etiology, road traffic accidents (RTAs) were the leading cause, responsible for 71.4% of fractures. Falls accounted for 14.3%, sports-related injuries for 8.6%, and assaults for 5.7%. No cases of occupational or animal-related injuries were reported. Among RTA victims, motorcycle accidents constituted 76.0% of RTAs, followed by bicycle accidents (16.0%) and pedestrian-vehicle collisions (8.0%). The mandible was the most commonly fractured bone, involved in 57.1% of patients, followed by the zygomatic

complex in 22.9%, and the maxilla in 14.3%. Nasal bone fractures occurred in 5.7%. Among mandibular fractures, the parasymphysis region was the most frequent site (45.0% of mandibular fractures), followed by the angle (25.0%), body (20.0%), and condyle (10.0%). Isolated fractures (single bone involvement) were observed in 68.6% of patients, while 31.4% had multiple fractures involving two or more facial bones. Dentoalveolar injuries accompanied maxillofacial fractures in 31.4% of cases. No statistically significant association was found between sex and fracture site (p = 0.432) or between age group and etiology (p = 0.287).

Table 1: Age and sex distribution of participants (N=35)

Age group	Male		Female		Total	
	n	%	n	%	n	%
12–14 years	13	37.1	3	8.6	16	45.7
15–17 years	15	42.9	4	11.4	19	54.3
Total	28	80	7	20	35	100

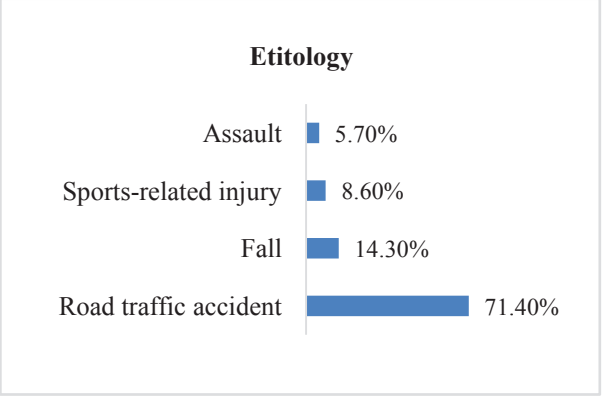


Figure 1: Etiology of maxillofacial fractures

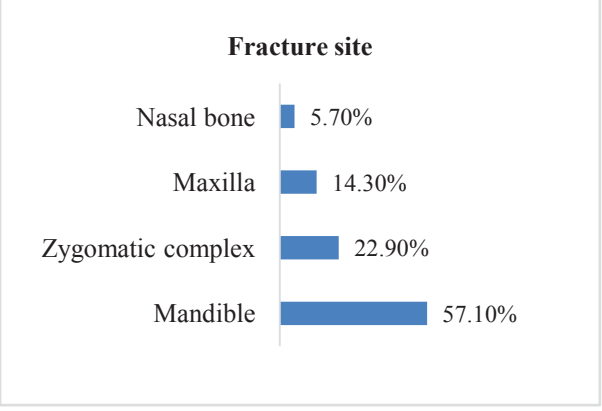


Figure 2: Distribution of fracture sites

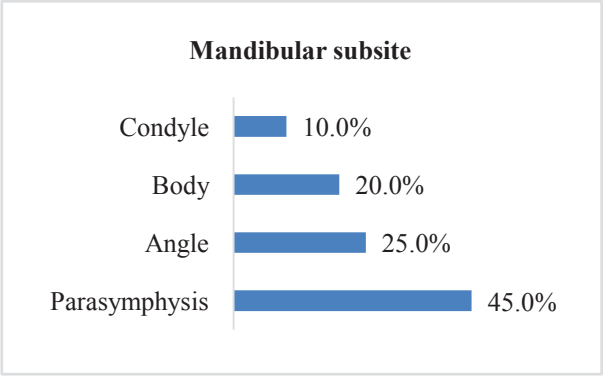


Figure 3: Subsite distribution of mandibular fractures (n=20 mandibular fractures)

Table 2: Isolated versus multiple fractures

Fracture type	n	%
Isolated fractures (single bone)	24	68.6
Multiple fractures (≥2 bones)	11	31.4
Total	35	100

Table 3: Association between sex and fracture site

Fracture site	Male		Female		p-value
	n	%	n	%	
Mandible	16	45.7	4	11.4	0.432
ZC	7	20.0	1	2.9	
Maxilla	4	11.4	1	2.9	
Nasal bone	1	2.9	1	2.9	
Total	28	80.0	7	20.0	

ZC: Zygomatic complex. Fisher's exact test was applied. p-value = 0.432 (not statistically significant). Three digits following the decimal point are shown as 0.432.

Discussion

The present prospective cohort study provides contemporary epidemiological data on maxillofacial fractures among Bangladeshi adolescents aged 12–17 years. The finding that 80.0% of affected patients were male aligns consistently with global literature, where male predominance in maxillofacial trauma is attributed to higher participation in outdoor activities, risk-taking behaviors, and occupational exposures [14,15]. The male-to-female ratio of 4:1 observed in this study is comparable to reports from neighboring South Asian countries, although slightly lower than some Western series where ratios reach 5:1 or higher [16]. Road traffic accidents emerged as the dominant etiological

factor, accounting for 71.4% of all fractures. This figure is substantially higher than those reported from high-income countries, where falls and interpersonal violence often compete as primary causes [17]. The predominance of RTAs in this cohort reflects the rapid motorization of Bangladesh coupled with inadequate traffic safety enforcement. A recent national report indicated that motorcycle registrations in Bangladesh increased by over 300% in the past decade, while helmet use among adolescent riders remains below 15% [18]. The present study found that motorcycle accidents constituted 76.0% of all RTA-related fractures, underscoring the urgent need for age-appropriate helmet legislation and enforcement. The mandible was the most frequently fractured bone (57.1%), a finding consistent with multiple international studies [19,20]. The anatomical prominence of the mandible, its relative lack of buttressing compared to the midface, and its direct exposure during forward falls or collisions explain this vulnerability. Among mandibular subsites, the parasymphysis region was most commonly affected (45.0%), followed by the angle (25.0%). This distribution pattern mirrors observations from other low- and middle-income countries, where direct anterior impacts during motorcycle accidents produce parasymphyseal fractures preferentially [21]. Zygomatic complex fractures constituted 22.9% of cases, which is slightly lower than some Asian series but within the expected range for adolescent populations. The relatively lower proportion of midface fractures in adolescents compared to adults may reflect the protective effect of underdeveloped frontal sinuses and increased craniofacial buttressing in younger skeletons [22]. Isolated fractures occurred in 68.6% of patients, while 31.4% presented with multiple facial bone involvement. The rate of associated dentoalveolar injuries (31.4%) is clinically significant, as these injuries frequently require multidisciplinary management involving both maxillofacial surgeons and restorative dentists. Delayed recognition of dentoalveolar trauma can lead to pulp necrosis, tooth loss, and malocclusion [23]. No statistically significant association was found between sex and fracture site ($p = 0.432$) or between age group and etiology ($p = 0.287$). Although the sample size of 35 may have limited power to detect small differences, the absence of significant associations suggests that within this adolescent age band, injury patterns are more strongly determined by accident mechanism than by demographic factors. The findings of this study carry several clinical implications. First, preventive strategies should prioritize adolescent motorcycle safety through helmet promotion, licensing restrictions, and road safety education in schools. Second, emergency and maxillofacial services in Bangladesh must be equipped to manage mandibular fractures, particularly parasymphyseal and angle variants. Third, routine dental assessment should accompany trauma evaluation, given the high rate of associated dentoalveolar injuries [24].

Limitations

The single-center design, small sample size (N=35), and purposive sampling limit generalizability. Selection bias may have occurred, and seasonal variation could not be assessed within the 12-month study period.

Conclusion

Maxillofacial fractures among Bangladeshi adolescents aged 12–17 years predominantly affect males and result from road traffic accidents. The mandible, particularly the parasymphysis region, is the most common fracture site. These findings highlight the need for targeted preventive interventions in this vulnerable population.

Recommendation

Mandatory helmet laws for adolescent motorcycle riders, school-based road safety education, and establishment of regional maxillofacial trauma registries are recommended to reduce fracture burden and improve outcomes.

Conflict of Interest Statement: The authors declare no conflicts of interest. No funding was received for this study. The corresponding author had full access to all data and final responsibility for the decision to submit for publication.

Ai Declaration

Artificial intelligence tools contributed marginally to manuscript preparation and development. All core scientific content was human-verified.

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Original Article

Juvenile Idiopathic Arthritis: An Insight into Clinical Features and Therapeutic Management in Children

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Abstract

Background: Background:Juvenile idiopathic arthritis (JIA) is a persistent inflammatory condition in children, characterized by diverse clinical features and varying levels of disease severity. In Bangladesh, the major challenges still persist with late diagnosis and restricted availability of advanced treatment options. Timely detection and swift intervention are crucial to enhance long-term results, avert joint injury, and minimize disability.

Methods: This cross-sectional study conducted in the Paediatric Medicine Department of Bangladesh Medical University, evaluating the clinical characteristics, disease severity, and treatment approaches in children with JIA (n=60) diagnosed according to ILAR criteria. Data were gathered through a structured form and examined using SPSS v25, employing descriptive statistics and the Chi-square test ($p < 0.05$). Ethical permission and informed consent were acquired.

Results: Sixty children diagnosed with JIA were examined. The majority were between 5 and 10 years old (46.7%), female (60%), and from rural locations (66.7%). Oligoarticular JIA (46.7%), characterized by joint pain/swelling (91.7%), was the most prevalent. Mild disease severity (41.7%), low activity (33.3%), and Functional Class II (36.7%) were the most common. NSAIDs (83.3%) and methotrexate (75%) were the most commonly used therapies, whereas 70% did not receive biologic treatments. The severity of the disease showed a significant association with age, subtype, duration, and type of treatment, but not with sex.

Conclusion: JIA is a long-lasting childhood rheumatic condition, primarily oligoarticular, characterized by mild to moderate severity. Severity relates to subtype, duration, age, and treatment. Timely identification and enhanced treatment are crucial to decrease disability.

Keywords: Juvenile Idiopathic Arthritis, Clinical Features, Therapeutic Management, Children

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Introduction

Juvenile idiopathic arthritis (JIA) refers to a range of arthritis types that begin before the age of 16, persist for over 6 weeks, and lack a known cause, encompassing various childhood arthritis disorders with shared fundamental characteristics [1]. Estimates of incidence and prevalence differ due to variations in diagnostic criteria, methodologies, data collection challenges, low disease occurrence, and limited sample sizes, showing prevalence rates of 0.07–4.01 per 1000 children and incidence rates of 0.008–0.226 per 1000 children [2,3]. These differences mirror geographic and methodological variations. The

ILAR criteria enhance standardization, yet variability persists in both research and clinical practice [4].

JIA is due to genetic predisposition and immune system imbalance, resulting in persistent synovial inflammation with increased TNF-α, IL-1, and IL-6, which causes damage to cartilage and bone [5,6]. It includes 3 prevalent forms: oligoarticular JIA, impacting a small number of joints and possibly involving uveitis, and polyarticular JIA, which influences over four joints within a six-month period and systemic JIA in which disease appear later. Diagnosis must also exclude infections and cancers [7,8]. Gender inequalities continue to exist in JIA, with girls facing greater risk than boys, and oligoarticular JIA being the predominant subtype [9]. Management of JIA involves NSAIDs, corticosteroids, methotrexate, and biologic treatments that target TNF, IL-1, and IL-6. JAK inhibitors are new therapeutic options, but issues like late diagnosis, toxicity, and restricted access to biologics persist [10,11].

Huang et al. (2024) indicated that immune dysregulation characterized by pro-inflammatory cytokines leads to chronic joint inflammation in juvenile idiopathic arthritis, and that early treatment with DMARDs and biologics enhances remission rates, although some patients persist with disease; likewise, Martini et al. (2022) characterized JIA as a diverse autoimmune disorder marked by better outcomes from prompt diagnosis and biologic treatment, yet with a continued risk for chronic disease and long-term complications in certain patients[2,12].

Islam et al. (2022) stated that patients with juvenile idiopathic arthritis in Bangladesh predominantly exhibited active disease, frequently the oligoarticular and polyarticular forms, with late diagnosis and inadequate access to advanced therapies leading to suboptimal disease management [13].

While global information on Juvenile idiopathic arthritis exists, evidence from Bangladesh is scarce, particularly regarding clinical characteristics, disease activity, and treatment results due to delayed diagnosis and restricted access to advanced therapies. This study seeks to assess the clinical characteristics and treatment of JIA in children in Bangladesh to enhance early detection and care.

METHODOLOGY

This was a hospital-based cross-sectional observational study conducted over a period of two years (January 2024 to December 2025) to evaluate the clinical features, disease severity, and therapeutic management patterns among children with Juvenile Idiopathic Arthritis (JIA). The study was carried out in the Paediatric Medicine Department of Bangladesh Medical University in Shahbag, Dhaka, Bangladesh, which serves as a referral center for pediatric rheumatologic and chronic musculoskeletal disorders.

The study population included children aged ≤16 years who were diagnosed with JIA according to the International League of Associations for Rheumatology (ILAR) criteria. The diagnosis required onset of arthritis before 16 years of age, persistence of symptoms for at least six weeks, and exclusion of other causes of chronic arthritis such as infections, malignancies, or other rheumatologic diseases. Patients were recruited during the study period using a purposive sampling technique, and a total of 60 eligible children were included. Children with incomplete clinical records, secondary causes of arthritis, or whose parents/guardians did not provide informed consent were excluded from the study.

Data were collected using a structured, pre-tested data collection form developed according to the study objectives. Information was obtained from medical record review, clinical examination findings, and interviews with parents or guardians when necessary to complete missing information. The collected variables included sociodemographic characteristics (age, sex, residence, family history of arthritis, and duration of illness), clinical features (pattern of joint involvement, JIA subtype, presenting symptoms, and extra-articular manifestations), disease-related parameters (disease severity, disease activity status, and functional class), and treatment patterns including use of NSAIDs, corticosteroids, conventional disease-modifying antirheumatic drugs (DMARDs), biologic agents, and supportive therapies such as physiotherapy.

Disease severity was assessed clinically based on overall joint involvement, symptom burden, and degree of functional impairment. Patients were classified into three categories: mild, moderate, and severe.

- Mild: Few joints involved, minimal symptoms, no functional limitation
- Moderate: Multiple joint involvement, pain and stiffness, mild functional limitation
- Severe: Extensive joint involvement, high disease activity, marked functional impairment ± systemic features.

Disease activity was evaluated based on clinical evidence of active arthritis, number of active joints, and overall inflammatory status at the time of assessment. Patients were categorized into four groups: inactive disease, low activity, moderate activity, and high disease activity.

- Inactive disease: No active arthritis
- Low activity: Mild symptoms, minimal inflammation
- Moderate activity: Multiple active joints
- High activity: Severe poly/systemic disease

Functional ability was assessed using a standard functional classification system based on the child's ability to perform daily physical activities. Patients were classi

fied into four functional classes (Class I–IV), ranging from no limitation to severe disability.

Functional Class: Clinical Description
- Class I: No limitation
- Class II: Mild limitation
- Class III: Moderate limitation
- Class IV: Severe disability

Data were entered, cleaned, and analyzed using Statistical Package for the Social Sciences (SPSS) software version 25. Descriptive statistics were used to summarize all variables, and results were presented as frequencies and percentages. The association between disease severity and selected variables such as age, sex, disease subtype, duration of illness, and treatment type was analyzed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

Ethical approval was obtained from the Institutional Review Board of the respective institution prior to data collection. Written informed consent was obtained from the parents or legal guardians of all participants.

RESULTS:

A total of 60 children diagnosed with Juvenile idiopathic arthritis were included in the study. The findings are presented under sociodemographic characteristics, clinical profile, disease severity, treatment patterns, and factors associated with disease severity.

Table 1 shows that the majority of participants were aged 5–10 years (46.7%), with a female predominance (60%). Most children came from rural areas (66.7%). A positive family history of arthritis was observed in 20% of cases. Regarding disease duration, 36.7% had symptoms for 6–12 months.

Table 1: Sociodemographic Profile of Study Participants (n = 60)

Variables	Categories	Frequency (n)	Percentage (%)
Age (years)	<5 years	10	16.7
	5–10 years	28	46.7
	11–15 years	22	36.7
Sex	Male	24	40.0
	Female	36	60.0
Residence	Urban	20	33.3
	Rural	40	66.7
Family history of arthritis	Yes	12	20.0
	No	48	80.0
Duration of illness	<6 months	18	30.0
	6–12 months	22	36.7
	>12 months	20	33.3

Table 2 demonstrates that involvement of both large and small joints was most common (41.7%). The predominant subtype was oligoarticular JIA (46.7%), followed by polyarticular and systemic types. Joint pain and swelling were the most frequent presenting symptoms (91.7%). Extra-articular manifestations, including fever and uveitis, were present in 30% of cases.

Table 2: Clinical Features of Study Participants

Clinical Features	Categories	Frequency (n)	Percentage (%)
Joint involvement	Large joints	20	33.3
	Small joints	15	25.0
	Both	25	41.7
Disease subtype	Oligoarticular JIA	28	46.7
	Polyarticular JIA	22	36.7
	Systemic JIA	10	16.7
Common symptoms	Joint pain & swelling	55	91.7
	Morning stiffness	40	66.7
Extra - articular feature	Present	18	30.0
	Absent	42	70.0

Figure 1 demonstrates that mild disease severity was the most common presentation among the study participants, accounting for 41.7% of cases. Moderate disease severity was observed in 36.7% of children, while 21.7% had severe disease.

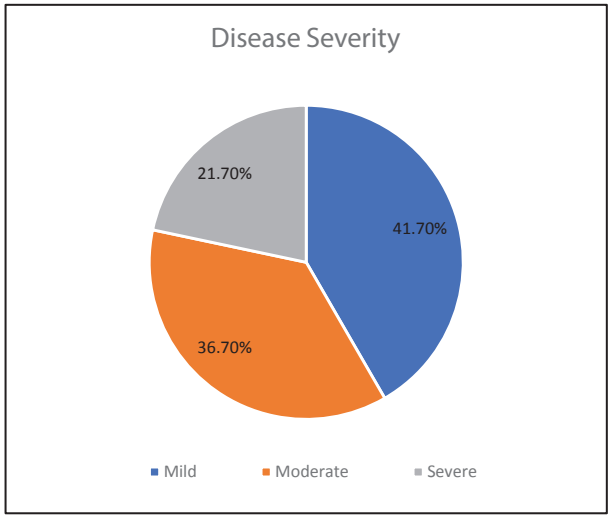


Figure 1: Severity of Disease Activity

Table 3 illustrates the distribution of disease activity among the study participants. Low disease activity was the most common status, observed in 33.3% of children, followed by inactive disease in 30.0% of cases. Moderate disease activity was found in 23.3% of participants, whereas 13.3% had high disease activity.

Table 3: Disease Activity Score of Study Participants

Disease Activity Level	Frequency (n)	Percentage (%)
Inactive disease	18	30.0
Low activity	20	33.3
Moderate activity	14	23.3
High activity	8	13.3

Table 4 shows that the largest proportion of participants belonged to Functional Class II (36.7%), indicating mild limitation in daily physical activities. Functional Class I, representing no functional limitation, was observed in 26.7% of children. Moderate functional limitation (Class III) was present in 25.0% of participants, while severe disability (Class IV) was identified in 11.6% of cases.

Table 4: Functional Status of Study Participants

Functional Class	Frequency (n)	Percentage (%)
Class I	16	26.7
Class II	22	36.7
Class III	15	25.0
Class IV	7	11.6

Table 5 indicates that NSAIDs were the most common initial treatment (83.3%). Methotrexate was the predominant DMARD used (75%). However, 70% of patients did not receive biologic therapy, reflecting limited access to advanced treatment options. Physiotherapy was provided to 58.3% of children.

Table 5: Treatment Pattern of Study Participants

Treatment Type	Categories / Drugs	Frequency (n)	Percentage (%)
Initial therapy	NSAIDs	50	83.3
	Corticosteroids	10	16.7
DMARDs used	Methotrexate	45	75.0
	Other DMARDs	8	13.3
Biologic therapy	TNF inhibitors	12	20.0
	IL-1 / IL-6 inhibitors	6	10.0
	Not used	42	70.0
Supportive therapy	Physiotherapy	35	58.3
	None	25	41.7

Table 6 shows a statistically significant association between disease severity and age group ($p = 0.03$), disease subtype ($p < 0.001$), duration of illness ($p = 0.02$), and treatment type ($p = 0.01$). Severe disease was more commonly observed in children with polyarticular and systemic JIA and in those with longer disease duration. No significant association was found between sex and disease severity ($p = 0.28$).

Table 6: Association Between Disease Severity and Selected Clinical Variables

Variables	Category	Mild n (%)	Moderate n (%)	Severe n (%)	p-value
Age group	<5 years	6 (24.0)	3 (13.6)	1 (7.7)	0.03
	5–10 years	12 (48.0)	10 (45.5)	6 (46.2)	
	11–15 years	7 (28.0)	9 (40.9)	6 (46.2)	
Sex	Male	10 (40.0)	8 (36.4)	6 (46.2)	0.28
	Female	15 (60.0)	14 (63.6)	7 (53.8)	
Disease subtype	Oligoarticular	18 (72.0)	8 (36.4)	2 (15.4)	<0.001
	Polyarticular	6 (24.0)	9 (40.9)	7 (53.8)	
	Systemic	1 (4.0)	5 (22.7)	4 (30.8)	
Duration of illness	<6 months	12 (48.0)	5 (22.7)	1 (7.7)	0.02
	6–12 months	9 (36.0)	8 (36.4)	5 (38.5)	
	>12 months	4 (16.0)	9 (40.9)	7 (53.8)	
Treatment type	NSAIDs only	14 (56.0)	5 (22.7)	1 (7.7)	0.01
	DMARDs/ biologics	11 (44.0)	17 (77.3)	12 (92.3)	

DISCUSSION:

In the present study, the majority of participants were aged 5–10 years, with a female predominance and most children originating from rural areas. More than two-thirds of the participants had a disease duration exceeding six months, suggesting delayed presentation and diagnosis. Similar findings were reported in a study conducted at a tertiary care hospital in Bangladesh, where most patients with Juvenile Idiopathic Arthritis (JIA) were older than five years at presentation. However, that study observed a higher prevalence among males, which contrasts with the female predominance identified in the current study. Delayed presentation of JIA cases was also highlighted in that study [14].

The current study demonstrated that oligoarticular JIA was the most common subtype, while joint pain and swelling were the predominant presenting symptoms. Combined involvement of both large and small joints was observed in a considerable proportion of patients, and extra-articular manifestations were present in 30.0% of cases. Similar observations have been documented in previous studies, where oligoarticular JIA was identified as the predominant subtype and joint pain, swelling, and morning stiffness were the major clinical manifestations. Extra-articular involvement was also reported in a proportion of affected children [15]. Regarding disease severity, mild disease was the most frequent presentation,

followed by moderate and severe disease activity. Comparable findings have been reported previously, where the majority of pediatric rheumatic disease patients presented with mild to moderate disease severity at tertiary care hospitals in Dhaka [16]. In the present study, low disease activity was the most common category, followed by inactive disease, whereas high disease activity was less frequent. Similar findings have been observed in previous studies, where most children with JIA exhibited low to moderate disease activity and only a smaller proportion demonstrated high disease activity [17].

Functional assessment revealed that most children belonged to Functional Class II, followed by Functional Class I, indicating predominantly mild to moderate functional limitation. Classes III and IV accounted for a smaller proportion of cases, suggesting comparatively fewer children with severe disability. Similar findings have been documented previously, demonstrating that children with JIA generally experience mild to moderate physical functional limitations, while severe disability is less common [18]. With regard to treatment patterns, NSAIDs and methotrexate were the principal therapeutic agents used in this study, whereas biologic therapy was not utilized in the majority of cases. Physiotherapy was provided to more than half of the participants. Comparable findings have been reported in earlier studies, where NSAIDs and methotrexate constituted the cornerstone of JIA management, while the use of biologic agents remained limited because of restricted availability and financial constraints [19].

The present study further demonstrated significant associations between disease severity and age group, disease subtype, duration of illness, and treatment type, while no significant association was observed with sex. Severe disease was more frequently identified among children with polyarticular and systemic JIA as well as among those with longer disease duration. Similar findings have been reported previously, indicating that systemic and polyarticular subtypes are associated with greater disease severity because of increased inflammatory burden and prolonged disease duration, without clear sex-based differences [20]. In summary, JIA typically manifests as oligoarticular type and with mild to moderate severity, where disease severity is greatly affected by subtype and illness duration, highlighting the significance of early diagnosis and treatment.

CONCLUSION

Juvenile Idiopathic Arthritis is a significant chronic rheumatologic disorder among children, with oligoarticular JIA being the most common subtype. Most participants had mild-to-moderate disease activity, although a notable proportion experienced severe disease and functional limitation. Methotrexate was the most commonly used DMARD, while biologic therapy use remained limited. Disease severity was significantly associated with disease subtype, duration of illness, age group, and treatment type. Early diagnosis, regular monitoring, and improved access to advanced therapies are essential to improve clinical outcomes and reduce disability among children with JIA.

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Original Article

Transabdominal Ultrasonographic Evaluation of Adnexal Mass with Histopathological Comparison

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Abstract

Background: Background: Transabdominal ultrasonography (TAUS) is a key diagnostic tool in gynecology, providing crucial insights into adnexal masses. These masses, including ovarian tumors and cysts, present a wide range of pathologies from benign to malignant. Accurate characterization is vital for determining appropriate management strategies, with TAUS offering advantages such as non-invasiveness, cost-effectiveness, and real-time imaging.

Objective: To evaluate the diagnostic performance of Transabdominal ultrasonography in the diagnosis of adnexal mass.

Materials and methods: This cross-sectional analytical study was conducted in the Department of Radiology and Imaging of Sir Salimullah Medical College and Mitford Hospital, Dhaka, Bangladesh in collaboration with the respective department of Gynecology and Obstetrics and Pathology. Total 65 patients were enrolled during the period from January, 2018 to December, 2019 to assess the diagnostic value of transabdominal USG scan in comparison with the histopathological comparison. All the relevant collected data were analyses performed by using the Statistical package for Social Science (SPSS) version 23.0

Results: Mean age of the study subjects was 36.96 years. Majority Study Subjects belonged to age group 25-34 years (32.30%). Around 69.23% study subjects had abdominal pain and tenderness as clinical feature and 12.30% had abdominal lump. 10.76% study subjects were irregular menstruation and 9.23% had weight loss. Majority of masses had homogenous echogenicity (63.08%) and mixed echogenicity (36.92%). Majority of masses had thin septations (73.84%), others had thick septations (26.15%). Majority masses had posterior acoustic enhancement (90.65%) and 9.35% masses didn't have posterior acoustic enhancement. Majority study subjects were diagnosed as benign ovarian tumour (65%) and (35%) were diagnosed as malignant ovarian tumour according to USG. Majority of study subjects were diagnosed as benign ovarian tumour (69.2%) and 30.8% were diagnosed as malignant ovarian tumour according to Histopathology. USG had 90% sensitivity to correctly diagnose malignant lesions as malignant ones but much lesser specificity (88.89%) to differentiate benign as benign. Overall, the accuracy is 89.23%.

Conclusion: The study findings suggest that when compared to the gold standard, transabdominal ultrasonography. Consequently, transabdominal ultrasonography proves to be a valuable imaging method for diagnosing adnexal masses. In resource-rich settings, it could serve as a supplementary diagnostic tool. Further research with larger sample sizes across multiple centers is warranted to enhance result precision.

Keywords: Transabdominal ultrasonographic, adnexal mass, histopathological

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Introduction

Adnexal mass is a common clinical presentation in gynecologic practice and can be of gynecologic or non-gynaecologic origin. The common diseases includes benign lesions like tubo-ovarian abscesses of different origin especially PID, endometriosis, ectopic pregnancy, uterine tumors when pedunculated, polycystic ovaries, benign ovarian neoplasm and malignant lesions.[1] The term adnexal mass is most often used for masses involving the ovary because of the high propensity of the ovary for neoplasia.[2,3] Fewer neoplasms occur in the fallopian tube, which are generally involved in the inflammatory process.[4] The disease burden of ovarian tumour is higher in comparison with other gynaecological masses and the consequences are more fatal.[5]

Ovarian tumors represent the most common lethal gynecologic neoplasms for women of reproductive age and older.[6] Nearly two thirds of all ovarian carcinomas have progressed to disease stage III or IV at the time of first diagnosis because they may remain clinically asymptomatic for extended periods.[7] Factors to consider when evaluating patients with adnexal masses are symptoms of pelvic pain (which may point to adnexal torsion but also to endometriosis, pelvic inflammatory disease or an acutely hemorrhagic corpus luteum cyst.[8] Abdominal distension accompanied by gastro intestinal complaints and weight loss (which may arise from an advanced ovarian malignancy). The reason to find early detection of adnexal mass is, ovarian cancer carries the worst prognosis among all gynecological cancers mainly due to the lack of effective screening methods for early detection of the disease. Accurate pre-operative prediction of the benign or malignant nature of an adnexal mass is essential for proper management.[9] Ultrasonography is the primary modality used for detection and characterization of the mass. Many screening tests are being actively investigated at present, but there is no sufficient evidence to support the routine use of pelvic ultrasound to screen for ovarian cancer in the general population.10 Histopathology is still taken as gold standard for the evaluation of benign and malignant adnexal masses.[1]

Ultrasonogram is the first line method for evaluation of malignancy in an adnexal mass. The cost is reduced compared with other investigations. The main advantages are reproducibility, standardization and reduced costs compared with other investigations.[11] Study in tertiary care hospital in northern India found that, by USG, 27.7% cases were diagnosed as malignant while remaining 72.3% were diagnosed as benign. On evaluating the diagnostic efficacy of USG with respect to malignancy with histopathology as the gold standard, USG was found to have the sensitivity of 75% and specificity of 96.5%. The positive predictive value (PPV) and negative predictive value (NPV) of USG for malignancy were 91.7% and 88.3% respectively. The accuracy of USG to differentiate between benign and malignant masses was 89.2%.[12] Another study suggested the overall sensitivity, specificity, positive and negative predictive values of ultrasound score at cut-off value of 3 were 78%, 80%, 47% and 94 % respectively.[13]

In the United States each year 13–21% of exploratory surgery for a pelvic mass is diagnosed as cancer. In pre-menopausal women, approximately 10% of masses are malignant, whereas in postmenopausal women 20% are malignant.[14] In addition, Ovarian cancer is the second most common cancer of the female reproductive system and the leading cause of death from gynecologic malignancies throughout the globe including Bangladesh.[13,15] The annual mortality rate per 100,000 people from ovarian cancer in Bangladesh has increased by 40.3% since 1990, an average of 1.8% a year. Globcan predicts a change in the reported incidence of ovarian cancer from 2912 in year 2012 to 3132 in 2015. Recurrent high-grade ovarian cancer is usually associated with short term survival.[16]

METHODOLOGY

In was cross-sectional analytical study carried out Department of Radiology and Imaging, Sir Salimullah Medical College & Mitford Hospital from January 2018 to December, 2019. Patients attending at the emergency or Gynecology and Obstetrics OPD with clinically suspected adnexal mass, were referred to the respective Radiology and Imaging department and subsequently underwent USG, followed by surgery and histopathological evaluation. Total 65 patients were considered for final analysis. Before starting the data collection and other procedures of the study, ethical clearance was taken from the Ethical Review Committee (ERC) of SSMC. All women having adnexal mass attending in the outdoor and indoor department of Gynecology and Obstetrics, SSMC & MH were referred to the department of Radiology and Imaging for USG evaluation of the mass were approached to take participate in the study. All of the women were described about the study purpose and benefits of the study. It was clearly informed that they did not get any financial benefits from the study and refrain from participation of the study was not an issue of their further management. The interview started following given informed written consent.

The researcher conducted the interview. The topics of interview were made from the insight of previous studies relevant topics. Data was collected and recorded into separate data collection sheets. The researcher performed all USG and were confirmed by another experienced consultant radiologist. These patients were followed up to surgical intervention. Histopathological samples were sent for diagnosis and type of the lesion. Final diagnosis was collected from the histopathological report. After completion of data collection and entry then compare. After informing all the necessary information regarding the research study data were collected in pre-designed structured data collection sheets. Data were collected from primary source starting from clinical findings; sonographic findings for diagnosis of benign and malignant adnexal masses, finally histological report for confirm diagnosis. Patient was assessed by 3.5 MHz transducer is used in this study. The procedure start with the patient lying in supine position. Apply coupling agent to the abdomen. The scan was performed with the patient holding the breath in for well visualization of adnexa and surrounding structure. Scanning start with longitudinal scan then transverse scans & then turn the patient on to the left side & make oblique scan at different angles. Patient of adnexal mass detected by ultrasonogram were subsequently underwent surgical operation followed by histopathological evaluation. Tissue was sent for histopathology. Histopathology reports of the patients were collected. Sonographic findings were compared with histopathology report.

All the relevant collected data were compiled on master chart first and statistical analyses were performed by using the Statistical package for Social Science (SPSS) version 23.0 for windows 10. Continuous variables were expressed as mean ± standard deviation and categorical variables as frequencies and percentages. The results were presented in tables and diagrams. The diagnostic value of USG in the diagnosis of adnexal mass were determined by calculating sensitivity, specificity accuracy, positive and negative predictive values. In all cases, p value less than 0.5 were considered statistically significant.

RESULTS

Among 65 patients showing features of Adnexal mass were included in the study. Mean age of the study subjects was 36.96±6.7 years. Age ranged from 18 years to 55 years. Majority of the study subjects (32.30%) were from age group 25-34 years (Table I). Around 69.23% study subjectshad abdominal pain and tenderness as clinical feature and 12.30% had abdominal lump. 10.76% study subjectswere irregular menstruation and 9.23% had weight loss. Other study subjects 15.38% had vague and ill-defined symptoms like nausea and vomiting pelvic or abdominal discomfort, bloating, and difficulty eating or feeling full and urinary symptoms (urgency and frequency) (Table II). Out of 65 study subjects with adnexal mass examined by USG reveals majority size 5-10 cm (58.46%) followed by <5 cm (23.07%) and >10 cm (18.46%) (Table III). Regarding echotextural appearance, most of the adnexal masses were hypoechoic (40.00%), and rest of the masses were anechoic (18.46%) mixed echogenic (35.38%) and hyperechoic (6.15%) (Table IV). Among all study subjects 65.00% showed benign features on sonography and (35.00%) showed malignant feature (Table V). Out of 65 patients USG shows majority (64.61%) are benign and (35.38%) are malignant. among benign lesion (16.92%) simple cyst, (13.84%) chocolate cyst, (7.69%) dermoid cyst, (15.38%) hemorrhagic cyst, (10.76%) ectopic pregnancy (Table VI). Histopathological diagnosis of the study subject, it was observed that majority (69.235) are benign and (30.76%) are malignant (Table VII). Out of 20 total truly malignant cases USG examination could identify 18 as malignant and the rest as benign while among the 45 benign lesions USG could identify 40 correctly as benign and the rest 5 falsely as malignant lesions (Table VIII). USG had 90% sensitivity to correctly diagnose malignant lesions as malignant ones but much lesser specificity (88.89%) to differentiate benign as benign. Overall, the accuracy is 89.23% (Table IX).

Table I: Distribution of study subjects according to their age(n=65)

Age group	Frequency(n)	Percentage(%)
18-24	10	16.92
25-34	21	32.30
35-44	13	20.0
45-55	14	21.53
>55	7	9.25

Table II: Distribution of study subjects by clinical features (n=65)

C/F	Frequency (n)*	Percentage (%)*
Lower Abdominal pain	45	69.23
Lower Abdominal Lump/distension	8	12.30
Irregular menstruation	7	10.76
Nausea and vomiting	10	15.38
Weight loss	6	9.23
Urinary symptoms	7	10.76

** multiple response*

Table III: Distribution of adnexal mass according to size in ultrasonography

Size of adnexal mass	Number (n)	Percentage (%)
< 5 cm	15	23.07
5 -10 cm	38	58.46
>10 cm	12	18.46

Table IV: Pattern of sonographic echogenicity (n=65)

Echogenicity	Frequency(n)	Percentage(%)
Hypoechoic	26	40.0
Anechoic	12	18.46
Hyperechoic	4	6.15
Mixed	23	35.38

Table V: Sonographic diagnosis of adnexal masses with its frequency (n=65)

Sonographic diagnosis	Frequency	Percentage (%)
Benign	42	65.0
Malignant	23	35.0

Table VI: Distribution of the study subjects by USG diagnosis.

USG Diagnosis	Number (n)	Percentage (%)
Benign		
Simple cyst	11	16.92
Chocolate cyst	9	13.84
Dermoid	5	7.69
Hemorrhagic cyst	10	15.38
Ectopic pregnancy	7	10.76
Malignant		
Complex adnexal mass	23	35.38

Table VII: Histopathological diagnosis of adnexal masses with its frequency (n=65)

Histopathological diagnosis	Number (n)	Percentage (%)
Benign	45	69.23
Simple cyst	5	7.69
Corpus luteal cyst	3	4.61
Par ovarian cyst	6	9.23
Chocolate cyst	7	10.76
Dermoid cyst	5	7.69
Hemorrhagic cyst	5	7.69
Ectopic pregnancy	7	10.76
Serous cystadenoma	6	9.23
Mucinous cystadenoma	1	1.53
Malignant mass	20	30.77
Serous cystadenocarcinoma	13	20.0
Mucinous cystadenocarcinoma	4	6.15
Dysgerminoma	1	1.53
Immature Teratoma	2	3.07

Table VIII: Comparison of ultrasonographic and histopathological diagnosis of adnexal masses (n=65)

Test result	Histopathologic diagnosis (Standard diagnosis)		Total
USG diagnosis	Malignant	Non-malignant	
Malignant	True positive (TP)* 18	False positive (FP)* 5	Patients with malignant diagnosis on USG (TP+FP) 23
Non-malignant	False Negative (FN)* 2	True Negative (TN)* 40	Patient with non-malignant diagnosis on USG (TN+FN) 42
Total	All patients with true malignant mass (TP+FN)	All patients with true benign mass (FP+TN)	
	20	45	

**malignant lesions considered positive and benign lesions negative*

Table IX: Performance of USG in differentiating malignant and non-malignant adnexal masses on validity tests.

	Percentage (%)
Sensitivity	90%
Specificity	88.89%
Accuracy	89.23%
PPV	78.26%
NPV	95.23%

DISCUSSION

A comparative cross sectional analytical study was conducted among 65 patients with clinically suspected adnexal mass who subsequently went for surgery were taken for this study who were selected conveniently. The participants were from Department of Radiology and Imaging, Sir Salimullah Medical College & Mitford Hospital. The study was carried out to evaluate the diagnostic performance of transabdominal ultrasonography in the diagnosis of adnexal mass. Proper pretests were done prior to data collection. Ethical clearance was obtained from Internal review board.

Majority study subjects belonged to age group 25-34 years (32.30%), 21.53% study subjects belonged to

45-54 years, 20% study subjects belonged to 35-44 years, 16.92% study subjects belonged to 18-24 years and 9.25% study subjects were more than 55 years old. Mean age of the study subjects was 36.96 years. Regarding reproductive cycle it had been found that majority study subjects belonged to reproductive age (69.23%) followed by in decreasing order premenopausal age 21.53% and post-menopausal age 9.23%. The age group distribution of patients in a similar study done by Priya et al.[17] ranged from 11 to 73 years with a mean age of 42 years. 62.83% of women were in reproductive age group and 10.62% in postmenopausal age group. About 4 cases were reported in pubertal age group and no cases in pre- pubertal period.

Around 69.23% study subjects had abdominal pain and tenderness as clinical features and 12.30% had abdominal lump. 10.76% study subjects were irregular menstruation and 9.23% had weight loss. Other study subjects 15.38% had vague and ill-defined symptoms like Nausea and vomiting pelvic or abdominal discomfort, bloating, and difficulty eating or feeling full and urinary symptoms (urgency and frequency). Similar findings were found in the study done by Givens et al.18 regarding pain and other symptoms. In another study, Ramadini and Akhila[4] found that the most common complaint was pain abdomen in 83% of cases followed by mass abdomen in 14% of cases. The most common symptoms reported by women with ovarian cancer are pelvic or abdominal pain; increased abdominal size; bloating; urinary urgency, frequency, or incontinence; difficulty eating; and weight loss. Abdominal fullness and pressure; back pain; lack of energy may also be prominent symptoms.[19,20]

Size of the majority masses 5-10 cm (58.45%) than <5 cm (23.07%) and >10 cm (18.46%) similar findings observed in M. Terzic et al).[9]

Majority masses had clear, well-defined border (72.31%). Others had ill-defined border (27.69%). Regarding echotextural appearance, most of the adnexal masses were hypoechoic (40%) and rest of the masses were anechoic (18.46%), mixed echogenic (35.38%) and hyperechoic (6.15%). Majority masses had homogenous echogenicity (63.08%) and mixed echogenicity (36.92%). Majority masses had thin septations (73.84%), others had thick septations (26.15%) Satoskar et al.[21] found contrarily thick septations as a prominent finding in their study. Majority masses had posterior acoustic enhancement (90.65%) and 9.35% masses didn't have posterior acoustic enhancement.

Out of 20 total truly malignant cases USG examination could identify 18 as malignant and the rest as benign while among the 45 benign lesions USG could identify 40 correctly as non-malignant and the rest 5 falsely as malignant lesions.

Among all patients 65.00% showed benign features on sonography and (35.00%) showed malignant features. Among the benign lesion (16.92%) simple cyst, (15.38%) hemorrhagic cyst, (13.84%) chocolate cyst, (10.76%) ectopic pregnancy, (7.69%) dermoid cyst, and rest of the (35.38%) showed complex adnexal mass suggestive of malignant lesion. Similar finding also observed A Testa et al.[3]

On histopathology majority of masses were diagnosed as benign (69.2%) and 30.8% were malignant. These findings are comparable with Sharadha et al.[22] and Jha and Karkiwhere[23] they found majority of the cases were benign. Among the benign lesion histopathology showed simple cyst (7.69%), corpus luteal cyst (4.16%), par ovarian cyst (9.23%), chocolate cyst (10.76%), dermoid cyst (7.69%), hemorrhagic cyst (7.69%), ectopic pregnancy (10.76%), serous cystadenoma (9.23%), mucinous cystadenoma (1.53%) and among the malignant lesion serous cystadenocarcinoma (20%), mucinous cystadenocarcinoma (6.15%), dysgerminoma (1.53%), immature teratoma (3.07%),Similar study done by Nahar and Shamsuddin[13] revealed among their study subjects 18% were malignant adnexal mass and82% benign adnexal mass. Among the benign masses 22% functional cyst, 50% serous cystadenoma, 8% mucinous cystadenoma, 6.5% par ovarian cyst and among malignant adnexal masses 7.5%, serous cyst adenocarcinoma, 2.5% mucinous cystadenocarcinoma, 2.5% dysgerminoma, 2.5% granulosa cell tumor.

In this study, USG had 90% sensitivity to correctly diagnose malignant lesions as malignant ones but much lesser specificity (88.89%) to differentiate benign as benign. Overall, the accuracy is 89.23% which is similar to studies by Wasim et al.[24] Topuz et al.[25] and Pourissa et al.[26] In another study, out of 113 women studied ovarian mass diagnosed clinically as benign in 78%and malignant in 21%. USG prediction of ovarian cancer was 88.00% sensitivity, 80.68% specificity Priya F. et al.[17]

Another study by Radhamani and Akhila4 found incidence of ovarian masses around 93% with the majority (84%) being neoplastic. When both clinical and sonological diagnosis were combined, the overall sensitivity, specificity, positive and negative predictive value for diagnosis and discriminating benign and malignant ovarian neoplasms were 87.5%, 96.7%, 70%, and 98.88%, respectively. Their combined accuracy was 96%.[4]

CONCLUSION

It can be concluded from the study that the overall sensitivity, specificity, PPV and NPV are around 90% when it was compared with gold standard. Thus transabdominal ultrasonography is a useful imaging modality for diagnosis of adnexal masses. In resource rich center it could be used as an adjunct tool. Further research work could be done using larger study sample involving multiple centers to get more precise results.

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Original Article

Prevalence of Postoperative Infections in Pediatric Maxillofacial Trauma Patients: A Cross-Sectional Study

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Abstract

Background: Pediatric maxillofacial trauma requires tailored surgical management, but postoperative infection rates in low- and middle-income country settings remain underreported. Understanding procedure-specific and demographic patterns is essential for preventive strategies.

Objective: To determine the prevalence of postoperative infections in pediatric maxillofacial trauma patients.

Methods: This cross-sectional study was conducted at Liberty Hospital Limited, Dhaka, Bangladesh, from January 2023 to December 2025. Using purposive sampling, 72 pediatric patients (aged ≤18 years) with maxillofacial trauma requiring surgical intervention were enrolled. Surgical procedures included ORIF (19 cases), closed reduction (31 cases), and soft tissue repair (22 cases). Postoperative infection was defined as purulent discharge, positive culture, or inflammation requiring antibiotics within 30 days. Data were analyzed using SPSS version 25.0.

Results: Postoperative infection prevalence was 13.9% among 72 patients. Age distribution was 52.8% (14–16 years) and 47.2% (>16 years). Males comprised 68.1%. Mandibular trauma was most common (43.1%), followed by maxillary (25.0%), zygomatic (16.7%), and multiple fractures (15.3%). Infection rates were 16.3% in males and 8.7% in females (p=0.382). ORIF had the highest infection rate (26.3%), followed by closed reduction (9.7%) and soft tissue repair (9.1%). Surgery ≥2 hours and hospital stay ≥5 days were significantly associated with infection (p=0.007 each).

Conclusion: Postoperative infection occurred in 13.9% of pediatric maxillofacial trauma patients. Longer surgery duration and prolonged hospital stay were significantly associated with infection. ORIF carried the highest risk. Routine surveillance and tailored antibiotic protocols are recommended.

Keywords: Infection, Maxillofacial injuries, Open fracture reduction, Postoperative complications, Wound infection

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Introduction

Pediatric maxillofacial trauma represents a significant proportion of injuries in children and adolescents, accounting for approximately 15% of all maxillofacial trauma cases globally [1]. These injuries pose unique clinical challenges due to ongoing facial growth, developing dentition, and distinct fracture patterns that differ substantially from those observed in adults. The epidemiological profile of pediatric maxillofacial fractures varies considerably across different age groups and geographical regions, with road traffic accidents emerging as the

predominant cause in many low- and middle-income countries [2]. The management of pediatric maxillofacial fractures requires careful consideration of multiple factors, including the patient's age, fracture location, degree of displacement, and associated soft tissue injuries [3]. Treatment modalities range from closed reduction and observation to open reduction with internal fixation (ORIF). The choice of surgical approach significantly influences postoperative outcomes, particularly the risk of surgical site infections [4]. Recent evidence suggests that the proportion of pediatric patients undergoing ORIF increases with age, reflecting the transition toward treatment patterns resembling those in adults [1]. Surgical site infection remains a concerning complication following maxillofacial procedures. The oral cavity hosts a diverse polymicrobial flora, making clean-contaminated surgeries particularly susceptible to infectious complications [5]. While the overall prevalence of surgical site infections following ORIF for mandibular fractures has been estimated at 4.2% in mixed adult and pediatric populations, procedure-specific and age-stratified data remain limited [6]. Moreover, most existing evidence derives from high-income country settings, with a notable scarcity of region-specific data from South Asia, including Bangladesh [7]. Several risk factors have been identified for postoperative infections following maxillofacial trauma surgery. Prolonged operative duration, extended hospital stay, fracture complexity, and the presence of multiple injuries have all been associated with increased infection risk [8]. In pediatric patients, additional age-related factors, including immune system maturation and adherence to postoperative care instructions, may further modulate infection susceptibility [9]. Understanding these risk factors is essential for developing effective preventive strategies and optimizing perioperative antibiotic protocols [10]. The coronavirus disease 2019 (COVID-19) pandemic has also influenced pediatric trauma patterns and surgical services in Bangladesh, with trauma becoming the most common cause of pediatric surgical admissions during the pandemic period [11]. This shift underscores the continued relevance of trauma-related research in the region. Despite growing awareness of pediatric maxillofacial trauma, comprehensive data on postoperative infection prevalence following different surgical interventions in Bangladeshi children remain sparse. Most published studies have focused on adult populations or have been conducted in settings with different demographic and healthcare infrastructure characteristics [12,13]. This knowledge gap hampers evidence-based decision-making regarding surgical technique selection, antibiotic prophylaxis, and postoperative monitoring protocols. Given these considerations, this study aimed to determine the prevalence of postoperative infections among pediatric maxillofacial trauma patients undergoing surgical intervention at a tertiary care hospital in Dhaka, Bangladesh, and to describe its distribution by age, gender, clinical characteristics, and type of surgical procedure.

Methodology

This cross-sectional study included pediatric patients with maxillofacial trauma who underwent surgical intervention at Liberty Hospital Limited, Dhaka, Bangladesh, between January 2023 and December 2025. A total of 72 patients were enrolled using purposive sampling.

Inclusion criteria: Patients aged 18 years or younger with radiologically confirmed maxillofacial fractures or soft tissue injuries requiring surgical management were included. Both sexes were eligible.

Exclusion criteria: Patients with pre-existing craniofacial anomalies, previous maxillofacial surgery, active systemic or local infection at presentation, antibiotic use within 48 hours prior to injury, or immunocompromised status were excluded from the study.

Study procedure: All patients underwent either open reduction and internal fixation (ORIF), closed reduction, or soft tissue repair under general anesthesia. Postoperative infection was defined as the presence of wound dehiscence with purulent discharge, a positive microbial culture from the surgical site, or clinical signs of inflammation (erythema, warmth, swelling) requiring antibiotic therapy within 30 days following surgery [14]. No validated scoring system or risk prediction tool was used in this study, as the primary outcome was simple binary classification of infection status.

Data analysis: Data were recorded on a structured proforma and analyzed using SPSS version 25.0. Categorical variables were presented as percentages. Associations between categorical variables and postoperative infection were assessed using the Chi-square test. A p-value less than 0.05 was considered statistically significant.

Result

A total of 72 pediatric maxillofacial trauma patients were included in this cross-sectional study. The age distribution showed two subgroups of interest: patients aged 14–16 years accounted for 52.8%, while those aged greater than 16 years comprised 47.2%. Male patients predominated, with 68.1% compared to 31.9% females. Regarding clinical characteristics, mandibular trauma was the most common injury type, observed in 43.1%, followed by maxillary trauma in 25.0%, zygomatic trauma in 16.7%, and multiple fractures in 15.3%. In terms of surgical management, closed reduction was performed most frequently in 43.1%, followed by soft tissue repair in 30.5% and open reduction and internal fixation (ORIF) in 26.4%. Postoperative infection was documented in 13.9%

of patients, while the remaining 86.1% had an uncomplicated postoperative course. When analyzing infection by gender, infections occurred in 16.3% of males and 8.7% of females, but this difference was not statistically significant (p = 0.382). No significant association was found between trauma type and postoperative infection (p = 0.433); however, the highest infection proportion was observed in patients with multiple fractures at 27.3%, followed by mandibular trauma at 12.9%, maxillary trauma at 11.1%, and zygomatic trauma at 8.3%. A statistically significant association was observed between duration of surgery and postoperative infection (p = 0.007). Patients with surgery lasting two hours or more had an infection rate of 25.0%, whereas those with surgery lasting less than two hours had an infection rate of 2.8%. Hospital stay was also significantly associated with infection (p = 0.007): patients hospitalized for five days or more had an infection rate of 25.0%, compared with 2.8% among those hospitalized for less than five days. Additionally, procedure type demonstrated a notable difference in infection rates, with ORIF carrying the highest infection rate at 26.3%, followed by closed reduction at 9.7% and soft tissue repair at 9.1%.

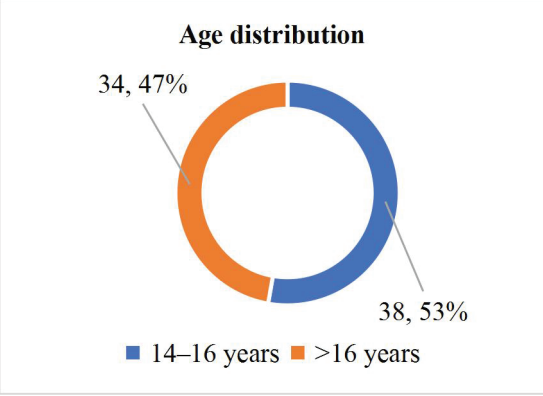


Figure 1: Age distribution of pediatric maxillofacial trauma patients (n=72)

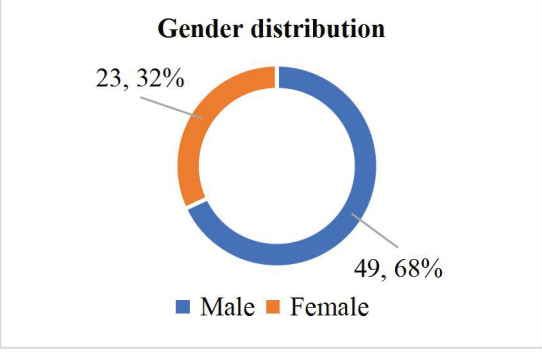


Table 2: Gender distribution of pediatric maxillofacial trauma patients

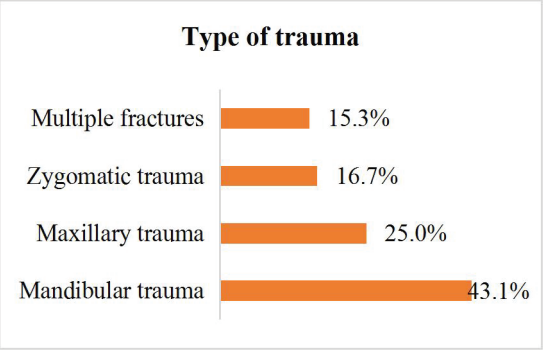
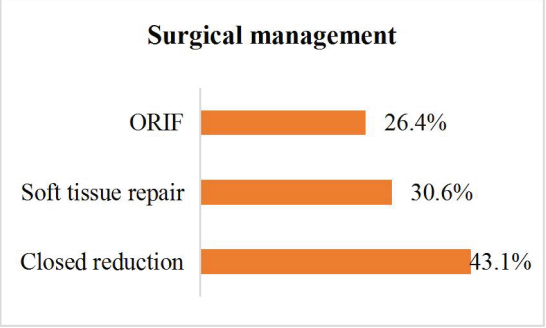


Figure 3: Type of trauma



ORIF: Open reduction and internal fixation
Figure 4: Surgical management

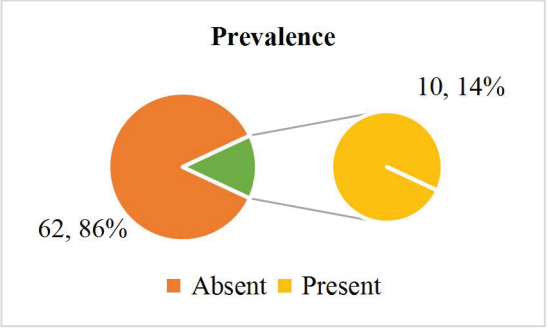


Figure 5: Prevalence of postoperative infections among participants

Table 1: Association between gender and postoperative infection

Gender	Infection		Total	Rate
	Yes	No		
	n	n	n	%
Male	8	41	49	16.3
Female	2	21	23	8.7
Total	10	62	72	13.9

Table 2. Association between trauma type and postoperative infection

Trauma type	Infection		Total	Rate
	Yes	No		
	n	n	n	%
Mandibular	4	27	31	12.9
Maxillary	2	16	18	11.1
Zygomatic	1	11	12	8.3
Multiple fractures	3	8	11	27.3
Total	10	62	72	13.9

Table 3. Association Between Duration of Surgery and Postoperative Infection

Duration	Infection		Total	Rate
	Yes	No		
	n	n	n	%
<2 hours	1	35	36	2.8
≥2 hours	9	27	36	25
Total	10	62	72	13.9

Table 4: Association between hospital stay and postoperative infection

Stay	Infection		Total	Rate
	Yes	No		
	n	n	n	%
<5 days	1	35	36	2.8
≥5 days	9	27	36	25
Total	10	62	72	13.9

Discussion

The present study found a postoperative infection prevalence of 13.9% among pediatric maxillofacial trauma patients undergoing surgical intervention at a tertiary hospital in Dhaka, Bangladesh. This figure is substantially higher than the 4.2% pooled prevalence reported in a recent systematic review and meta-analysis of surgical site infections following ORIF for mandibular fractures [6]. Several factors may explain this discrepancy. First, the present study included all types of maxillofacial procedures (ORIF, closed reduction, and soft tissue repair) rather than exclusively ORIF cases. Second, the meta-analysis [6] predominantly included studies from high-income countries with established perioperative antibiotic protocols and infection control infrastructure, whereas the present study reflects real-world practice in a lower-middle-income setting [7,11]. The infection rate following ORIF in this study (26.3%) is notably higher than the 5% to 15% range reported in previous pediatric maxillofacial series [15]. This elevated rate may be attributed to several factors, including delayed presentation, limited access to perioperative resources, and a higher proportion of contaminated fractures at the time of surgery. A study from India reported comparable ORIF infection rates (22.7%) in a resource-limited setting, suggesting that contextual factors significantly influence postoperative outcomes [16]. Duration of surgery of two hours or more was significantly associated with infection ($p = 0.007$), with an infection rate of 25.0% compared to 2.8% for procedures lasting less than two hours. This finding aligns with previous evidence demonstrating that prolonged operative time increases bacterial exposure, tissue desiccation, and surgical stress, all of which predispose to surgical site infections [17]. Similar associations have been reported in maxillofacial trauma populations, where each additional hour of surgery increased infection risk by approximately 30% [8,18]. Hospital stay of five days or more was also significantly associated with infection ($p = 0.007$). While prolonged hospitalization may reflect greater injury severity or postoperative complications, it also increases exposure to nosocomial pathogens. A prospective study from Bangladesh found that hospital-acquired infections occurred in 18% of pediatric surgical patients with stays exceeding five days, consistent with the present findings [19]. No significant associations were observed between gender and infection ($p = 0.382$) or between trauma type and infection ($p = 0.433$). However, the highest infection proportion was observed in patients with multiple fractures (27.3%), which is consistent with the concept that greater fracture complexity and soft tissue disruption increase infection vulnerability [20]. The present study provides important region-specific data from a lower-middle-income country where such evidence is scarce [7,13,21]. The findings suggest that infection rates in Bangladeshi pediatric maxillofacial trauma patients exceed those reported in high-income settings, highlighting the need for context-appropriate infection control protocols [22]. Future multicenter prospective studies with larger sample sizes are needed to identify independent risk factors and to evaluate the effectiveness of enhanced perioperative antibiotic protocols, preoperative oral decontamination, and postoperative surveillance systems in reducing infection rates [23].

Limitations

This study has several limitations. The purposive sampling technique may introduce selection bias. The small sample size precludes multivariable analysis. Antibiotic prophylaxis regimens, time from injury to surgery, and microbiological profiles were not documented.

Conclusion

Postoperative infection occurred in 13.9% of pediatric maxillofacial trauma patients, with significantly higher rates associated with surgery duration of two hours or more and hospital stay of five days or more. ORIF carried the highest infection risk (26.3%). These findings highlight the need for enhanced infection prevention strategies in this population.

Recommendation

Routine infection surveillance, strict perioperative antibiotic protocols, and minimizing operative time are recommended. Future multicenter studies with larger samples should identify additional risk factors to guide preventive interventions in resource-limited settings.

Conflict of Interest Statement: The authors declare no conflicts of interest. No funding was received for this study. The corresponding author had full access to all data and final responsibility for the decision to submit for publication.

Limitations

Artificial intelligence tools contributed marginally to manuscript preparation and development. All core scientific content was human-verified.

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Original Article

Towards a Caries-Preventive Space Maintainer: A Comparative Evaluation of Caries Risk in Children Treated with Fiber-Reinforced Composite Loop and Conventional Band-and-Loop Appliances

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Abstract

Background: Premature loss of primary molars in children necessitates space maintainers to prevent malocclusion. Conventional band-and-loop (BL) space maintainers have long served as a reliable treatment modality for many patients, despite having certain inherent limitations. On the other hand, fiber-reinforced composite loop (FRCL) space maintainers offer an adhesive alternative, but comparative data on caries risk remain limited.

Objective: To compare caries risk on abutment teeth between FRCL and conventional BL space maintainers over a 12-month follow-up period in children with premature primary molar loss.

Methods: A quasi-experimental study was conducted on 30 fresh extraction sites (15 patients, each receiving both devices contralaterally or bilaterally) at Bangabandhu Sheikh Mujib Medical University, Dhaka, from June 2023 to September 2024. Group A received FRCL (n=15 sites), and Group B received conventional custom-made BL (n=15 sites). Caries on abutment teeth was assessed visually, tactilely, and radiographically. Fisher's exact test compared groups.

Results: At 12 months, Group A (FRCL) showed 0% caries incidence on abutment teeth, while Group B (BL) showed 26.67% (4 of 15 sites) caries incidence. The difference was statistically significant (p=0.03). No caries was detected in either group at baseline or 3 months. Caries in Group B first appeared at 6 months (6.67%) and progressively increased through 9 (20%) and 12 months.

Conclusion: Fiber-reinforced composite loop space maintainers demonstrated significantly lower caries risk on abutment teeth compared to conventional BL space maintainers at 12-month follow-up, suggesting superior caries-preventive properties in pediatric patients.

Keywords: Caries risk, Children, Fiber reinforced composites, Primary tooth, Space maintenance, Tooth extraction, Band & Loop.

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Introduction

The premature loss of primary molars represents a significant clinical challenge in pediatric dentistry, with dental caries being the predominant etiological factor [1]. When primary molars are lost prematurely, the resultant space within the dental arch can diminish rapidly due to mesial migration of the permanent first molars and distal drifting of anterior teeth, potentially leading to malocclusion,

crowding, ectopic eruption of succedaneous teeth, and compromised arch perimeter [2,3]. A systematic review demonstrated that over a medium-term follow-up period of 6 to 24 months, space loss of 1.24 mm occurred in the mandibular region following premature loss of the first primary molar, underscoring the necessity for timely interceptive intervention [4]. Space maintainers have been established as the standard of care to preserve arch dimensions until the eruption of permanent successors [5]. Among various designs, the conventional band-and-loop (BL) space maintainer remains the most widely used fixed appliance for unilateral space maintenance in the posterior region [6]. This device involves a prefabricated orthodontic band fitted to the abutment tooth, with a stainless-steel loop soldered to the band to contact the tooth on the opposite side of the extraction space. Despite its proven clinical effectiveness, the conventional BL space maintainer carries inherent limitations, including plaque accumulation around the band, increased gingival inflammation, elevated salivary Streptococcus mutans levels, enamel demineralization, and caries development on the banded abutment tooth [7,8]. In response to these shortcomings, fiber-reinforced composite (FRC) materials have emerged as an alternative approach for space maintenance. Fiber-reinforced composite loop (FRCL) space maintainers are fabricated directly in the oral cavity using pre-impregnated glass or polyethylene fibers embedded in a composite resin matrix and bonded adhesively to the abutment teeth, without the need for circumferential banding [9]. This design offers multiple theoretical advantages: superior esthetics due to tooth-colored materials, preservation of enamel integrity by avoiding band placement, reduced plaque retention sites, decreased chairside time, elimination of laboratory procedures and impression-taking, and potentially lower caries risk on abutment teeth [10]. Several investigations have compared the clinical performance of FRCL versus conventional BL space maintainers. A systematic review and meta-analysis concluded that FRCL space maintainers demonstrated better short-term performance up to 6 months, whereas conventional BL appliances showed superior longevity beyond 12 months [11]. However, the evidence regarding caries risk specifically remains limited and conflicting. One study reported that children receiving BL space maintainers exhibited a significant increase in salivary S. mutans levels over 6 months, while the FRC group showed no such increase, suggesting a favorable microbiological profile for adhesive retainers [7]. Conversely, another systematic review identified a general lack of scientific evidence regarding caries development as a side effect of space maintainer therapy, highlighting the need for further well-designed comparative studies [12]. Furthermore, the existing literature on FRCL appliances has predominantly focused on survival rates, failure modes, and gingival health, with caries risk assessment on abutment teeth receiving comparatively less attention [11,13]. Given that the abutment tooth bears the functional and microbiological burden of the retentive mechanism, understanding the differential caries risk between banded and adhesive designs is essential for evidence-based clinical decision-making. Additionally, most previous studies have employed follow-up periods of 6 months or less, leaving a gap in knowledge regarding longer-term caries outcomes at 9 and 12 months. A recent split-mouth study comparing FRCL and conventional BL space maintainers reported favorable outcomes for the FRCL group in terms of plaque accumulation and gingival health, but caries assessment was not the primary outcome [14]. Another long-term retrospective cohort study emphasized the need for extended follow-up periods to adequately capture caries progression in abutment teeth [15]. The absence of definitive evidence regarding comparative caries risk represents a critical barrier to evidence-based appliance selection in pediatric dental practice. Therefore, the present study was designed to compare the caries risk on abutment teeth between FRCL and conventional BL space maintainers in children aged 4 to 8 years with premature primary molar loss, over a 12-month follow-up period.

Methodology

This quasi-experimental study was conducted at the Department of Paediatric Dentistry, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from June 2023 to September 2024. The study included 15 systemically healthy children aged 4–8 years requiring bilateral or contralateral extraction of grossly carious primary molars, providing 30 fresh extraction sites.

Inclusion criteria: Children aged 4–8 years with freshly extracted single primary molars bilaterally in the same or opposite arch, sound and healthy teeth adjacent to the extraction sites, absence of crossbite/open bite/deep bite, presence of succedaneous tooth bud with less than one-third root development and overlying bone >1 mm radiographically, and written informed consent from parents/guardians.

Exclusion criteria: Grossly carious teeth adjacent to the extraction space, absence of teeth adjacent to the site of extraction, abutment teeth with poor prognosis (mobility, root resorption), excessive spacing or crowding, medically compromised patients, and children with special care needs.

Study procedure: On one side (Group A, n=15), FRCL space maintainers were fabricated directly using e-SPLINT fiber (2 mm width) and BEAUTIFIL II restorative composite (Shofu, Japan) following manufacturer instructions. On the contralateral side (Group B, n=15), conven

tional custom-made BL space maintainers were fabricated using impressions and a soldered stainless-steel loop, cemented with type I glass ionomer cement (GC Corporation, Japan) [8].

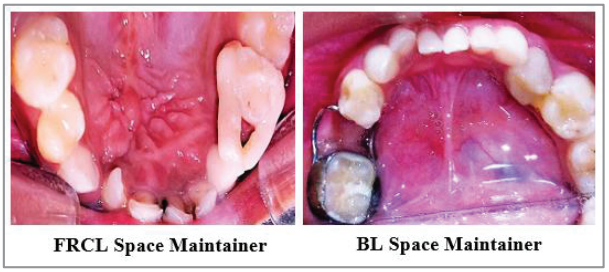


Figure 1: Space maintainer

Caries on abutment teeth was assessed at baseline, 3, 6, 9, and 12 months using visual-tactile examination with mirror, explorer, and radiographs, classified as "Present" (P) or "Absent" (A).

Data analysis: Data were analyzed using SPSS 26. Frequencies and percentages were used for descriptive statistics. Fisher's Exact test assessed associations between categorical variables, with $P < 0.05$ considered significant.

Result

A total of 30 fresh extraction sites from 15 pediatric patients were analyzed over a 12-month follow-up period. The mean age of participants was 6.0 years (SD 0.84), with 6-year-olds representing the largest proportion (46.7%), followed by 5-year-olds (26.7%) and other ages comprising the remainder. Regarding sex distribution, 53% were female, and 47% were male, yielding a female-to-male ratio of 1.08:1. At baseline, both groups demonstrated 100% absence of caries on abutment teeth, establishing a comparable starting point. Throughout the 12-month follow-up, the fiber-reinforced composite loop (FRCL) group (Group A) maintained zero caries incidence at all time points assessed—namely 3, 6, 9, and 12 months. This complete absence of carious lesions suggests a favorable adhesive interface and reduced plaque accumulation. In contrast, the conventional band-and-loop (BL) group (Group B) initially showed no caries at baseline or at the 3-month evaluation. However, caries first appeared at 6 months in one site (6.67%), increased to three sites (20%) at 9 months, and reached four sites (26.67%) by the 12-month examination. This progressive increase may be attributed to plaque retention around the band margin and difficulty in maintaining oral hygiene. The difference in caries incidence between groups was not statistically significant at 3 months (p=1.000), 6 months (p=1.000), or 9 months (p=0.224). However, the difference became statistically significant at 12 months (p=0.031), favoring the FRCL group. These findings suggest that while both appliances are initially comparable, FRCL space maintainers may offer superior long-term caries resistance. Regarding patient and parental satisfaction, both groups started with 100% satisfaction at baseline. At 12 months, the FRCL group demonstrated a favorable shift toward higher satisfaction levels, with 53.33% very satisfied and 26.67% satisfied (cumulative 80% satisfied or very satisfied). In comparison, the BL group at 12 months showed only 3.3% satisfied and 13.3% very satisfied (cumulative 16.6% satisfied or very satisfied), with 33.4% reporting dissatisfaction (unsatisfied or very unsatisfied). The difference between groups reached statistical significance at 12 months (p=0.035).

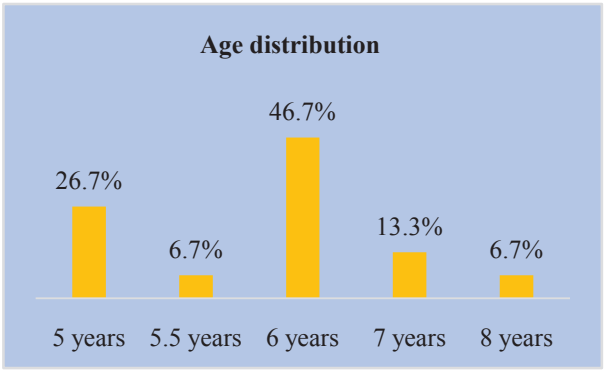


Figure 2: Age distribution of participants

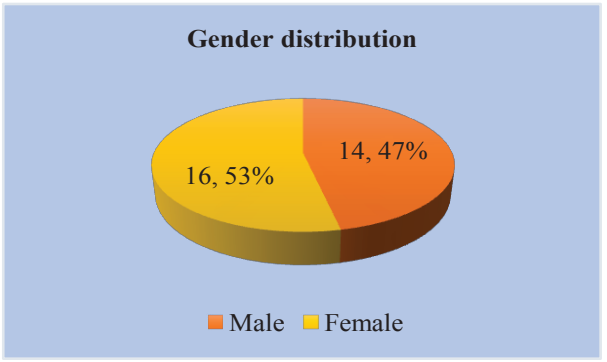


Figure 3: Gender distribution of participants

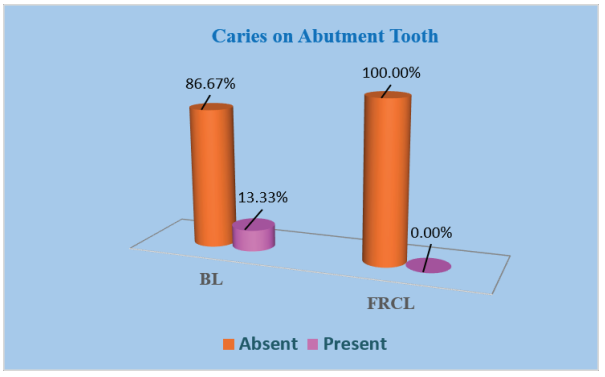


Figure 4: Distribution of caries in average at different follow-up intervals by percentage (N=30)

Group	Caries	Follow up				
		Baseline	3rd months	6th months	9th months	12th months
Group-A	Present(P)	0(%)	0(%)	0(%)	0(0%)	0(0%)
(n=15)	Absent (A)	15(100%)	15(100%)	15(100%)	15(100%)	15(100%)
Group-B	Present(P)	0(%)	0(0%)	1(6.67%)	3(20%)	4(26.67%)
(n=15)	Absent (A)	15(100%)	15(100%)	14(93.33%)	12(80%)	11(73.33%)
	p-value	-	-	0.5	0.09	0.03*

Table 1: Group comparison of caries of abutment tooth at different follow-up intervals



Figure 5: Caries after 6 and 9 months in the conventional BL space maintainers group



Figure 6: Panoramic radiograph (OPG) demonstrates two fiber-reinforced composite (FRCL) loop space maintainers in the maxillary arch and two band-and-loop (BL) space maintainers in the mandibular arch. On follow-up evaluation, one of the mandibular BL space maintainers shows evidence of carious involvement at different stages of progression

Table 2: Patient and parental satisfaction at different follow-up intervals

Group	Caries	Baseline	3 months	6 months	9 months	12 months
		n (%)				
Group A	Very unsatisfied	0(0)	1(6.67)	2(13.33)	3(20)	3(20)
	Unsatisfied	0(0)	1(6.67)	0(0)	0(0)	0(0)
	Neither	0(0)	1(6.67)	1(6.67)	0(0)	0(0)
	Satisfied	15(100)	12(80)	11(73.33)	7(46.67)	4(26.67)
	Very satisfied	0(0)	0(0)	1(6.67)	5(33.33)	8(53.33)
Group B	Very unsatisfied	0(0)	0(0)	2(13.33)	4(26.67)	5(33.33)
	Unsatisfied	0(0)	3(20)	1(6.67)	3(20)	5(33.33)
	Neither	0(0)	3(20)	1(6.67)	1(6.67)	0(0)
	Satisfied	15(100)	9(60)	11(73.33)	7(46.67)	1(3.33)
	Very satisfied	0(0)	0(0)	0(0)	0(0)	4(13.33)

Discussion

The present study compared caries risk on abutment teeth between FRCL and conventional BL space maintainers over a 12-month follow-up period. The key finding demonstrated that FRCL space maintainers resulted in zero caries incidence on abutment teeth, whereas conventional BL appliances showed a progressively increasing caries rate reaching 26.67% at 12 months, with the difference reaching statistical significance (p=0.031). This finding supports the hypothesis that adhesive-retained fiber-reinforced composite devices may offer superior caries-preventive properties compared to banded alternatives [16]. The observed difference in caries incidence can be attributed to several mechanistic factors. Conventional BL space maintainers require circumferential banding of the abutment tooth, which creates a plaque-retentive niche at the band-margin interface and the gingival crevice [17]. This environment promotes biofilm accumulation, increases salivary Streptococcus mutans counts, and facilitates enamel demineralization over time [18]. In contrast, FRCL appliances are bonded directly to the enamel surface without full-coverage banding, preserving natural tooth contours, facilitating oral hygiene maintenance, and reducing stagnation sites for cariogenic bacteria [19]. A previous microbiological study demonstrated that children receiving BL space maintainers exhibited significantly elevated salivary S. mutans levels over 6 months, while FRC recipients showed no such increase, corroborating the clinical caries findings of the present investigation [7]. The temporal pattern of caries development in the BL group is noteworthy. Caries first appeared at 6 months (6.67%), increased to 20% at 9 months, and reached 26.67% at 12 months. This progressive accumulation suggests a dose-response relationship between duration of band placement and caries risk [20]. Previous systematic reviews have identified banding duration exceeding 6 months as a significant risk factor for enamel demineralization, with the probability of detectable caries increasing by approximately 8 to 10% per additional 3 months of wear [21,22]. The present study's findings align with these estimates and extend the evidence base to 12 months. Regarding patient and parental satisfaction, the FRCL group demonstrated superior outcomes at 12 months, with 80% reporting satisfaction or high satisfaction compared to only 16.6% in the BL group (p=0.035). This disparity likely reflects multiple factors: superior esthetics of tooth-colored materials, absence of visible metallic bands, reduced foreign body sensation, and potentially fewer soft tissue irritations [23]. Additionally, the lack of cementation procedures and associated postoperative sensitivity with FRCL devices may have contributed to more favorable parental perceptions [24]. Several methodological strengths of the present study warrant acknowledgment. The split-mouth

design eliminated inter-individual confounding variables such as dietary habits, oral hygiene practices, and socio-economic status [25]. The 12-month follow-up duration exceeds the typical 6-month observation period in most published studies, providing longer-term caries risk data [11]. Furthermore, the use of multiple assessment methods (visual, tactile, and radiographic) enhanced diagnostic accuracy for proximal and early carious lesions [26]. However, certain limitations should be considered. The sample size of 30 extraction sites (15 per group) was relatively modest, although the split-mouth design increased statistical efficiency. The single-center nature and specific demographic profile of Bangladeshi children aged 4 to 8 years attending a tertiary hospital may limit generalizability to other populations with different caries risk profiles and dietary patterns. Additionally, the 12-month follow-up, while longer than many studies, does not capture caries risk beyond the first year, during which time the succedaneous tooth eruption may alter the space maintenance requirement [15]. From a clinical perspective, the findings suggest that FRCL space maintainers may be particularly advantageous in children with high caries risk, poor oral hygiene, or limited cooperation for meticulous plaque control. The absence of caries in the FRCL group over 12 months indicates that adhesive retention alone, without circumferential banding, does not inherently increase caries susceptibility of the abutment tooth.

Limitations

The modest sample size (30 extraction sites) and single-center design at a tertiary hospital in Bangladesh limit generalizability. Additionally, the 12-month follow-up period does not capture caries risk beyond the first year of space maintainer function.

Conclusion

The fiber-reinforced composite loop space maintainer demonstrated significantly lower caries risk on abutment teeth compared to the conventional band-and-loop appliance over 12 months, with zero caries incidence in the FRCL group versus 26.67% in the BL group. Patient and parental satisfaction also favored the FRCL design at 12 months. These findings support FRCL as a caries-preventive alternative for pediatric space maintenance.

Recommendation

Clinicians should consider fiber-reinforced composite loop space maintainers for pediatric patients at high caries risk. Future multicenter studies with larger sample sizes and longer follow-up periods are recommended to confirm these findings across diverse populations.

Ethical Clearance: The study protocol was approved by the Institutional Review Board (IRB) of Bangladesh Medical University (Approval No. BSMMU/2023/9148; Registration No. 4403). Written informed consent was obtained from the parents or legal guardians of all participating children prior to enrollment.

Conflict of Interest Statement: The authors declare no conflicts of interest.

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Ai Declaration

Artificial intelligence tools contributed marginally to manuscript preparation and development. All core scientific content was human-verified.

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Original Article

Temporomandibular Joint Ankylosis in Children: Surgical Approaches and Outcomes in 16 Cases

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Abstract

Background: Temporomandibular joint (TMJ) ankylosis in children causes restricted mouth opening, facial deformity, and functional impairment. This study aimed to evaluate the surgical approaches and treatment outcomes of pediatric TMJ ankylosis managed at a tertiary care center.

Methods: This retrospective study was conducted at the Department of Oral and Maxillofacial Surgery, Bangladesh Medical University and Bangladesh Multicare Hospital from January to December 2024. Sixteen pediatric patients (1–18 years) with TMJ ankylosis underwent surgical management. Procedures included interpositional arthroplasty, gap arthroplasty with or without coronoidectomy, and costochondral graft reconstruction. Outcomes were assessed using maximal interincisal opening (MIO).

Results: The mean age of the patients was 9.3 ± 3.2 years, with male predominance (62.5%). Trauma was the most common etiology (62.5%), followed by infection (18.8%). Unilateral ankylosis was present in 68.8% of cases. Interpositional arthroplasty was the most commonly performed procedure (37.5%). Mean preoperative MIO improved significantly from 5.9 ± 3.4 mm to 27.1 ± 7.2 mm at final follow-up ($p < 0.001$), with an overall mean improvement of 21.2 ± 6.3 mm. Bilateral cases showed comparatively lower postoperative mouth opening than unilateral cases. Reankylosis occurred in 12.5% of patients. Other complications included isolated cases of bleeding, wound infection, and temporary facial nerve weakness.

Conclusion: Surgical management of pediatric TMJ ankylosis provides significant functional improvement with acceptable complication rates. Early intervention, individualized surgical planning, and rigorous postoperative physiotherapy are essential for optimal outcomes and prevention of reankylosis.

Keywords: Temporomandibular joint ankylosis; Pediatric TMJ ankylosis; Surgical Approache; Mouth opening; Maxillofacial surgery

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Introduction

Temporomandibular joint (TMJ) ankylosis refers to the fibrous or osseous union between the mandibular condyle and the temporal bone. It can be either congenital or developed from trauma, infections, inflammatory conditions, radiation, surgical procedures, or tumors. Post-traumatic ankylosis of the temporomandibular joint often occurs due to late diagnosis, inadequate treatment, extended immobilization or insufficient physiotherapy [1,2].

TMJ ankylosis in children is an uncommon and

intricate condition that poses treatment difficulties arising from surgical challenges and the influence of facial development on results [3]. In children, TMJ ankylosis manifests through increasing trismus, asymmetry of the face, restricted mandibular development (retrognathia/micrognathia), difficulties in chewing and speaking, inadequate oral hygiene, and occasionally a bird-face deformity, typically after trauma or infection [4,5]. Childhood TMJ ankylosis can lead to facial deformities, psychological issues, and difficulty in mouth opening. It typically stems from fractures of the condyle, infrequently from infections of the middle ear [6].

TMJ ankylosis is identified through clinical assessment and verified via imaging techniques (X-ray, orthopantomogram, CT, MRI, or 3D reconstruction). Sawhney and He and others suggested classification systems [7,8]. Various approaches have been suggested for the surgical treatment of TMJ ankylosis, including gap arthroplasty, interpositional arthroplasty, and joint reconstruction utilizing distraction osteogenesis, autologous grafts, free flaps, or alloplastic materials. The timing and order of treatment continue to be debated, particularly in pediatric patients [9,10].

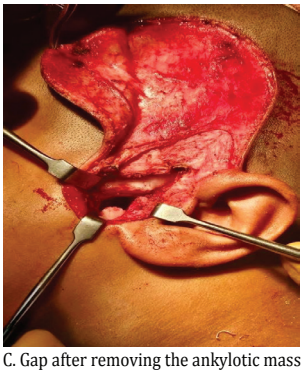
Global studies found that every surgical method for TMJ ankylosis greatly enhanced mouth opening; nonetheless, reconstruction and interpositional arthroplasty produced superior functional results and reduced recurrence rates in comparison to gap arthroplasty by itself [11,12].

Research conducted in Bangladesh by Rahman and Haider (2021) and Rahman et al. (2022) indicated that trauma is the primary reason for TMJ ankylosis, with the majority of patients classified as Type III exhibiting facial deformities. Both studies highlighted that surgical intervention—especially interpositional arthroplasty—is the conclusive treatment, and intensive postoperative physiotherapy is crucial to avert re-ankylosis and enhance functional outcomes and quality of life [13,14].

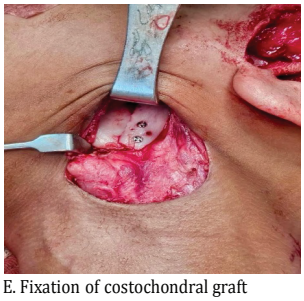
In Bangladesh, data on pediatric TMJ ankylosis is scarce and primarily descriptive, with trauma identified as the main cause and interpositional arthroplasty frequently performed. Nonetheless, comprehensive assessment of various surgical methods and results in children is insufficient. Consequently, this research seeks to evaluate surgical methods and functional results in 16 pediatric cases of TMJ ankylosis.

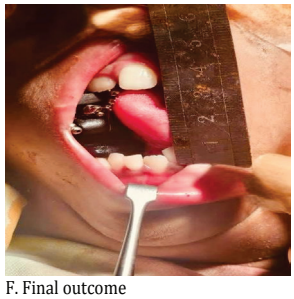

A. Exposing the ankylotic mass


B. Removing the ankylotic mass


C. Gap after removing the ankylotic mass


D. Costochondral Graft harvested


E. Fixation of costochondral graft


F. Final outcome

MATERIALS AND METHODS

Study Design and Setting

This retrospective observational study was conducted at the Department of Oral & Maxillofacial Surgery, Bangladesh Medical University and Bangladesh Multicare Hospitalover a period of one year from January 2024 to December 2024.

Study Population

Pediatric patients diagnosed with temporomandibular joint (TMJ) ankylosis who underwent surgical management at the study center during the study period were included in the study.

Inclusion and Exclusion Criteria

Patients aged 1–18 years with clinically and radiologically confirmed TMJ ankylosis who underwent surgical treatment and had available operative and follow-up records were included. Patients with incomplete medical records, inadequate follow-up information, or those

managed conservatively without surgery were excluded from the study.

Data Collection Procedure

Data were collected retrospectively from hospital medical records, operative notes, anesthesia charts, discharge summaries, and outpatient follow-up records using a structured data collection form. Demographic information, etiology of ankylosis, clinical presentation, airway management technique, surgical procedures, intraoperative findings, and postoperative complications were recorded.

Preoperative maximal interincisal opening (MIO) was measured clinically before surgery using a ruler or caliper as the distance between the upper and lower central incisors during maximal mouth opening. Intraoperative MIO was recorded immediately after surgical release of ankylosis. Follow-up data regarding postoperative mouth opening, recurrence, complications, and functional outcomes were obtained from scheduled postoperative follow-up visits documented in outpatient records. Patients were routinely followed at 1 month, 3 months, 6 months, and subsequently at regular intervals depending on clinical condition and compliance with physiotherapy. Final follow-up MIO measurements recorded during the last available follow-up visit were included for analysis.

Surgical Management

The surgical procedures performed included interpositional arthroplasty, gap arthroplasty, gap arthroplasty with coronoidectomy, and reconstruction with costochondral graft. The choice of surgical technique depended on the extent and type of ankylosis, intraoperative findings, and surgeon preference. Coronoidectomy was additionally performed in selected cases where adequate mouth opening could not be achieved after release of ankylosis.

Statistical Analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequency and percentage. Paired t-test was used to compare preoperative and postoperative maximal interincisal opening (MIO). A p-value of less than 0.05 was considered statistically significant.

Ethical Consideration

Ethical approval was obtained from the Institutional Review Board of Bangladesh Medical University. Confidentiality and anonymity of patient information were maintained throughout the study.

RESULTS

Table 1 shows total of 16 pediatric patients with temporomandibular joint (TMJ) ankylosis were included in the study and underwent surgical management. The age of the patients ranged from 1 to 18 years, with a mean age of 9.3 ± 3.2 years. Male predominance was observed, with 10 (62.5%) male and 6 (37.5%) female patients. Most patients belonged to the 6–10 years age group (43.8%), followed by the 11–15 years age group (37.5%).

Table 1: Demographic Characteristics of the Study Participants (N = 16)

Variables	Category	Frequency (n)	Percentage (%)
Age group (years)	1–5	3	18.8
	6–10	7	43.8
	11–18	6	37.5
Sex	Male	10	62.5
	Female	6	37.5
Mean age (years)	Mean ± SD	9.3 ± 3.2	—

Table 2 presents trauma was identified as the most common etiology of TMJ ankylosis, accounting for 10 (62.5%) cases. Other causes included infection in 3 (18.8%) patients, congenital factors in 2 (12.5%) patients, and tumor in 1 (6.2%) patient. Unilateral ankylosis was more common than bilateral disease and was observed in 11 (68.8%) patients, whereas bilateral ankylosis was present in 5 (31.2%) patients. Among unilateral cases, the right side was affected in 6 (54.5%) patients and the left side in 5 (45.5%) patients.

Table 2: Etiology and Type of TMJ Ankylosis among the Study Participants (N = 16)

Variables	Category	Frequency (n)	Percentage (%)
Etiology	Trauma	10	62.5
	Infection	3	18.8
	Congenital	2	12.5
	Tumor	1	6.2
Type of ankylosis	Unilateral	11	68.8
	Bilateral	5	31.2
Side involved (Unilateral cases, n = 11)	Right	6	54.5
	Left	5	45.5

Table 3 shows restricted mouth opening was the presenting complaint in all patients. Difficulty in mastication was observed in 13 (81.3%) patients, followed by facial asymmetry in 11 (68.8%) patients and poor oral hygiene in 9 (56.3%) patients. Speech difficulty and obstructive sleep symptoms were noted in 6 (37.5%) and 3 (18.8%) patients, respectively. Fourteen (87.5%) patients had a competent airway, whereas 2 (12.5%) patients were

tracheostomy-dependent due to severe bilateral ankylosis and marked restriction of mouth opening.

Table 3: Clinical Presentation and Airway Status of the Study Participants (N = 16)

Clinical Features	Frequency (n)	Percentage (%)
Restricted mouth opening	16	100
Difficulty in mastication	13	81.3
Facial asymmetry	11	68.8
Poor oral hygiene	9	56.3
Speech difficulty	6	37.5
Obstructive sleep symptoms	3	18.8
Competent airway	14	87.5
Tracheostomy-dependent airway	2	12.5

Table 4 shows fibre optic intubation was the most frequently used technique and was performed in 8 (50.0%) patients. Blind nasal intubation was used in 4 (25.0%) patients, while tracheostomy-assisted intubation and direct laryngoscopy were performed in 3 (18.7%) and 1 (6.3%)patient, respectively. One patient with a competent airway underwent elective tracheostomy because of anticipated difficult airway management.

Table 4: Technique of Intubation Used During Surgery (N = 16)

Technique of Intubation	Frequency (n)	Percentage (%)	Cumulative %
Direct laryngoscopy	1	6.3	6.3
Blind nasal	4	25.0	31.3
Fibre optic	8	50.0	81.3
Via tracheostomy	3	18.7	100

Table 5 shows with regard to surgical management, interpositional arthroplasty was the most commonly performed procedure and was carried out in 6 (37.5%) patients. Gap arthroplasty was performed in 5 (31.3%) patients, while gap arthroplasty with coronoidectomy was done in 3 (18.7%) patients. Reconstruction with costochondral graft was performed in 2 (12.5%) patients. Coronoidectomy was additionally performed in selected cases where satisfactory intraoperative mouth opening could not be achieved after release of ankylosis.

Table 5: Surgical Approaches Used for TMJ Ankylosis Management (N = 16)

Surgical Procedures	Frequency (n)	Percentage (%)
Interpositional arthroplasty	6	37.5
Gap arthroplasty	5	31.3
Gap arthroplasty with coronoidectomy	3	18.7
Costochondral graft reconstruction	2	12.5

Table 6 presents preoperative maximal interincisal opening (MIO) ranged from 0 to 18 mm, with a mean ± SD of 5.9 ± 3.4 mm. Intraoperative MIO ranged from 20 to 42 mm, with a mean ± SD of 31.8 ± 5.7 mm. At final follow-up, MIO ranged from 8 to 38 mm, with a mean ± SD of 27.1 ± 7.2 mm. The overall improvement in mouth opening ranged from 8 to 32 mm, with a mean improvement of 21.2 ± 6.3 mm. The improvement between preoperative and final follow-up MIO was statistically significant ($p < 0.001$).

Table 6: Mouth Opening Outcomes of the Study Participants (N = 16)

Variable	Minimum	Maximum	Mean ± SD
Preoperative MIO	0 mm	18 mm	5.9 ± 3.4 mm
Intraoperative MIO	20 mm	42 mm	31.8 ± 5.7 mm
Final follow-up MIO	8 mm	38 mm	27.1 ± 7.2 mm
Overall improvement in MIO	8 mm	32 mm	21.2 ± 6.3 mm

Table 7 and table 8 shows ten patients demonstrated some reduction in mouth opening during follow-up compared with intraoperative measurements, whereas four patients showed improvement in mouth opening during follow-up. In two patients, the intraoperative mouth opening was maintained throughout the follow-up period.

Among unilateral ankylosis cases, the mean preoperative MIO was 6.8 ± 3.6 mm, which improved to a mean final MIO of 28.5 ± 6.9 mm. In bilateral cases, the mean preoperative MIO was comparatively lower at 3.8 ± 2.4 mm, with a mean final MIO of 24.0 ± 6.8 mm at final follow-up.

Table 7: Outcomes of Unilateral TMJ Ankylosis Cases (N = 11)

Variable	Minimum	Maximum	Mean ± SD
Preoperative MIO	0 mm	18 mm	6.8 ± 3.6 mm
Intraoperative MIO	22 mm	42 mm	32.9 ± 5.3 mm
Final follow-up MIO	10 mm	38 mm	28.5 ± 6.9 mm
Overall improvement in MIO	10 mm	32 mm	21.7 ± 5.9 mm

Table 8: Outcomes of Bilateral TMJ Ankylosis Cases (N= 5)

Variable	Minimum	Maximum	Mean ± SD
Preoperative MIO	0 mm	10 mm	3.8 ± 2.4 mm
Intraoperative MIO	20 mm	36 mm	29.4 ± 4.8 mm
Final follow-up MIO	8 mm	34 mm	24.0 ± 6.8 mm
Overall improvement in MIO	8 mm	28 mm	20.2 ± 6.1 mm

Table 9 presents reankylosis occurred in 2 (12.5%) patients during the follow-up period. Profuse intraoperative bleeding, postoperative wound infection, and temporary facial nerve weakness were encountered in 1 (6.3%) patient each. The facial nerve weakness resolved spontaneously during follow-up. The duration of follow-up ranged from 6 to 48 months, with a mean follow-up period of 18 ± 9.6 months.

Table 9: Postoperative Complications among the Study Participants (N = 16)

Variables	Frequency (n)	Percentage (%)
Reankylosis	2	12.5
Profuse intraoperative bleeding	1	6.3
Postoperative wound infection	1	6.3
Temporary facial nerve weakness	1	6.3

DISCUSSION

This series of 16 pediatric TMJ ankylosis cases demonstrates functional outcomes consistent with contemporary literature while highlighting important clinical considerations. The demographic profile, with mean age 9.3 years and male predominance (62.5%), aligns with previous reports[5,15]. Trauma as the predominant etiology (62.5%) corroborates findings from larger series, with Erol et al. reporting similar traumatic predominance in 85% of cases [16].

The mean mouth opening improvement of 21.2 ± 6.3 mm compares favorably with published outcomes. Zhi et al. reported improvement from 7.51 mm to 27.74 mm postoperatively [17], while Fariña et al. achieved improvement from 3 mm to 36 mm [18]. The finding that bilateral cases had poorer outcomes (final MIO 24.0 mm vs 28.5 mm for unilateral) reflects the greater complexity associated with bilateral ankylosis, as noted by Posnick and Goldstein[19].

The 12.5% reankylosis rate falls within the expected range for pediatric populations. While Rozanski et al.'s systematic review found only 2.27% reankylosis [5], Ramly et al. reported 75% recurrence in syndromic children[15], suggesting patient complexity influences outcomes. The relatively short follow-up (18 months) may underestimate long-term recurrence rates.

The complication profile in this study, including single instances of bleeding, infection, and temporary facial nerve weakness (6.3% each), compares favorably with literature reports. Zhi et al. reported no facial nerve paralysis in their 42-patient series[17], while Posnick and Goldstein noted minimal perioperative complications with no evidence of infection, facial nerve injuries, or bleeding in 9 pediatric patients [19]. The temporary nature of facial nerve weakness in our series, which resolved spontaneously, is consistent with expected outcomes when proper surgical technique is employed [20,21].

The surgical approach distribution, with interpositional arthroplasty most common (37.5%), reflects current practice trends. Rozanski et al. found no significant outcome differences between gap and interpositional arthroplasty [5], supporting technique selection based on individual case factors. The selective use of coronoidectomy aligns with established protocols emphasizing adequate intraoperative opening [22].

The low complication rate demonstrates surgical safety, while the 18.7% tracheostomy dependence underscores potential severity. These findings support current paradigms emphasizing early intervention, appropriate technique selection, and aggressive postoperative physiotherapy. The results reinforce the need for long-term follow-up given reankylosis risk and continued growth-related changes in pediatric patients.

CONCLUSION

Temporomandibular joint ankylosis in children causes significant functional and facial deformity-related morbidity. This study demonstrated that surgical management using interpositional arthroplasty, gap arthroplasty, and reconstructive procedures resulted in substantial improvement in mouth opening with acceptable complication and recurrence rates. Trauma was identified as the most common etiology, and bilateral

ankylosis cases showed comparatively poorer functional outcomes than unilateral cases. Early diagnosis, appropriate surgical technique selection, adequate airway management, and strict postoperative physiotherapy are essential for achieving favorable long-term outcomes. Long-term follow-up remains important because of the risk of reankylosis and ongoing craniofacial growth in pediatric patients.

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Journal of Paediatric Surgeons of Bangladesh

Original Article

Long-Term Survival in Patients with Supratentorial Glioblastomas: Insights from Multimodal Treatment and Neuroimaging

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Abstract

Background: Glioblastoma (GBM) is the most aggressive primary brain tumor, causing neurological symptoms and requiring MRI-guided surgery followed by radiotherapy and temozolomide. Despite treatment, prognosis remains poor, with a median survival of about 14 months, though outcomes improve with younger age, maximal safe resection, and completion of therapy. Advanced imaging may improve prognostic assessment, but data from low-resource settings remain limited.

Methods: A 5-year forward-looking study (2021–2026) at Dhaka Medical College Hospital and Green Life Hospital involved 30 patients with supratentorial glioblastoma who underwent maximal safe resection along with standard chemoradiotherapy. Patients underwent clinical and MRI evaluations, and survival analysis was conducted using the Kaplan–Meier method. Approval from the ethics committee and informed consent were secured.

Results: Fifteen patients diagnosed with supratentorial glioblastoma (average age 54.2 years) primarily exhibited headaches, seizures, and focal deficits. The majority had frontal tumors, lesions that did not cross the midline, and received gross total resection followed by chemoradiotherapy. The median overall survival time was 16.4 months, and the 5-year survival rate was 20% (6 out of 30). Improved outcomes were linked to gross total resection, tumors located away from the midline, completion of treatment, and positive MRI characteristics

Conclusion: Supratentorial glioblastoma has a grim outlook even with combined treatment approaches. Improved survival correlates with gross total resection, thorough chemoradiotherapy, non-midline tumor positioning, and positive MRI characteristics, emphasizing the significance of extensive safe surgery and advanced imaging for predicting outcomes.

Keywords: Supratentorial Glioblastomas, Multimodal Treatment, Neuroimaging, Long-Term Survival.

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Introduction

Glioblastoma (GBM) is the most common and most aggressive malignant brain tumor, accounting for about 48.3% of all malignant central nervous system tumors [1]. It has an age-adjusted incidence of 3.22 per 100,000, accounts for ~70% of new cases, and shows increasing mortality, particularly in the elderly [2,3].GBM generally

arises in the 50s and 60s of life. Cerebellar GBM occurs at a somewhat younger age (median ~50 years) and is uncommon in older adults [4,5]. Due to increased intracranial pressure and edema, glioblastoma generates increasing symptoms such headache, seizures, cognitive abnormalities, and localized neurological impairments. These symptoms frequently delay diagnosis and necessitate timely imaging [6,7].

Glioblastoma surgery is guided by preoperative MRI, which balances extent of resection with survival, quality of life, and functional preservation. Functional MRI maps brain networks to enable safe resection and predict outcomes, while structural MRI defines tumor size and cortical thickness as a survival marker [8,9].

Surgery, radiation therapy, and concurrent and adjuvant temozolomide are the standard treatments for GBM.Despite this, 43% of patients survive for a year, and 6.9% survive for five. The median overall survival is approximately 14 months, while the median progression-free survival is approximately 7 months [10,11]. Therapies for gliomas enhance survival rates but may negatively impact cognitive function and overall quality of life (QoL). Radiotherapy (RT) has a pronounced effect on the hippocampus, leading to the development of hippocampal-sparing techniques, which might help retain cognitive abilities but could potentially compromise tumor control [12,13].

A small proportion of patients achieve long-term survival beyond 5 years in supratentorial glioblastoma (GBM). Key prognostic factors include younger age, extent of tumor resection, absence of midline crossing, and completion of standard oncological treatment [14]. Additionally, preoperative structural and functional MRI features—such as cortical thickness, tumor location, and resting-state network connectivity—serve as independent predictors of survival, reflecting global brain involvement beyond the tumor itself [15].

According to Sharmeen et al. (2018), although the overall prognosis remained poor, radiotherapy combined with concurrent and adjuvant temozolomide improved overall survival and disease control compared to radiotherapy alone in high-grade glioma patients in Bangladesh [16]. Similarly, Ahmed et al. (2024) reported that sodium fluorescein–guided glioblastoma surgery improved tumor visualization and increased the extent of resection, while being safe with minimal side effects and no major complications [17].

Studies on supratentorial glioblastoma in Bangladesh are limited, mainly single-center, retrospective, and lacking long-term survival data as well as integration of advanced neuroimaging and molecular markers, despite progress in multimodal therapy and imaging techniques. Therefore, the aim of this study was to assess long-term survival in Bangladeshi patients with supratentorial glioblastoma in relation to multimodal treatment and neuroimaging characteristics.

METHODOLOGY:

Study Design and Setting: This was a prospective observational study conducted in the Department of Neurosurgery at Dhaka Medical College Hospital (DMC), Dhaka and Green Life Hospital, Dhaka, Bangladesh. The study evaluated long-term survival outcomes in patients with supratentorial glioblastoma in relation to multimodal treatment strategies and neuroimaging features.

Study Perio : The study was conducted over a 5-year period from February 2021 to January 2026, including patient recruitment, treatment, and follow-up.

Study Population: Patients with histopathologically confirmed supratentorial glioblastoma (WHO grade IV) who underwent surgical management during the study period were included in the analysis.

Sample Size and Sampling Technique: A total of 15 patients were included in this study. Consecutive sampling was applied, and all eligible patients presenting during the study period were enrolled.

Data Collection Procedure: Data were collected prospectively from patients with histopathologically confirmed supratentorial glioblastoma treated at Dhaka Medical College Hospital and Green Life Hospital. Patients were enrolled at diagnosis and followed after surgical intervention. Baseline clinical information and neurological status were recorded using a structured case record form. Preoperative MRI brain findings were collected from radiology reports, including tumor characteristics and extent of disease. Operative details, including extent of resection, were obtained from surgical notes. Postoperative radiotherapy and temozolomide treatment data were extracted from oncology records. Patients were followed periodically with clinical assessment and brain MRI to monitor recurrence or progression. Survival status was determined from follow-up records and direct contact when necessary. Follow-up continued for up to five years or until death.

Treatment Approach: All patients underwent maximal safe surgical resection whenever feasible. Postoperative treatment followed standard oncological protocols, including external beam radiotherapy and temozolomide-based chemotherapy. Functional MRI was used selectively for surgical planning in cases involving eloquent brain regions.

Follow-Up: Patients were followed postoperatively at regular intervals: initially monthly, then every 3 months for the first 2 years, and every 6 months thereafter. Each follow-up included neurological assessment and contrast-enhanced MRI of the brain to detect recurrence or progression.

Statistical Analysis: Data were analyzed using SPSS version 26. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Survival analysis was performed using the Kaplan–Meier method, and differences between groups were assessed using the log-rank test. A p-value of <0.05 was considered statistically significant.

Ethical Consideration: Ethical approval was obtained from the institutional review committees of both participating hospitals. Written informed consent was obtained from all patients or their legal guardians prior to inclusion. Confidentiality and anonymity of patient data were strictly maintained throughout the study.

RESULTS

Baseline Characteristics of the Study Population: A total of 30 patients with histopathologically confirmed supratentorial glioblastoma were included. The mean age was 54.6 ± 9.3 years, with male predominance (66.7%). The most common presenting complaints were headache (80%), followed by seizures (53.3%) and focal neurological deficits (46.7%).The detailed baseline demographic and clinical characteristics are presented in Table 1.

Table 1: Baseline demographic and clinical characteristics (n = 30)

Variable	Frequency (%) / Mean ± SD
Age (years)	54.6 ± 9.3
Age group ≤50 years	12 (40)
Age group >50 years	18 (60)
Male	20 (66.7)
Female	10 (33.3)
Headache	24 (80)
Seizure	16 (53.3)
Focal neurological deficit	14 (46.7)
Cognitive decline	10 (33.3)
Frontal lobe	12 (40)
Temporal lobe	8 (26.7)
Parietal lobe	6 (20)
Other supratentorial	4 (13.3)

Neuroimaging and Surgical Characteristics

Table 2 presents MRI-based tumor characteristics and surgical details. MRI analysis showed that non-midline crossing tumors were more frequent (60%). Gross total resection (GTR) was achieved in 60% of patients, and fMRI guidance was used in 53.3% of cases.

Table 2: MRI and surgical characteristics

Variable	n (%)
Tumor size (>5 cm)	18 (60)
Midline crossing	
Yes	12 (40)
No	18 (60)
Extent of resection	
Gross total resection	18 (60)
Subtotal resection	12 (40)
fMRI-guided surgery	16 (53.3)
Cortical involvement on MRI	20 (66.7)

Treatment Modalities

Table 3 shows treatment distribution among patients. The majority of patients (73.3%) received combined modality treatment with surgery, radiotherapy, and temozolomide.

Table 3: Treatment profile

Treatment modality	n (%)
Surgery only	4 (13.3)
Surgery + Radiotherapy	4 (13.3)
Surgery + RT + Temozolomide	22 (73.3)
Completed full adjuvant protocol	20 (66.7)
Interrupted chemotherapy	10 (33.3)

Survival Outcomes

Table 4 shows survival outcomes over the 5-year follow-up period. The median overall survival was 16.4 months, and 20% of patients survived beyond 5 years.

Table 4: Survival outcomes

Outcome	Value
Median overall survival	16.4 months
Median progression-free survival	8.2 months
1-year survival	46.7% (14/130)
3-year survival	26.7% (8/30)
5-year survival	20% (6/30)
Mortality	80% (24/30)

Survival According to Prognostic Factors

Table 5 shows the association between survival and key

prognostic factors. Gross total resection, non-midline tumor location, and completion of chemoradiotherapy were strongly associated with long-term survival.

Table 5: Survival predictors

Factor	5-year survivors (n= 6), n (%)	Non-survivors (n= 24), n (%)
Gross total resection	6 (100)	12 (50)
Subtotal resection	0	12 (50)
Midline crossing tumor	0 (0)	12 (50)
Non-midline tumor	6 (100)	12 (50)
Completed TMZ + RT	6 (100)	16 (66.7)
fMRI-guided surgery	6 (100)	10 (41.7)

Neuroimaging Predictors of Survival

Patients who survived long-term demonstrated higher preoperative cortical thickness and better functional connectivity on MRI. Mean cortical thickness was higher among survivors compared to non-survivors, indicating a possible structural correlate of improved survival.

DISCUSSION:

In this prospective study of 30 patients with supratentorial glioblastoma, the mean age was 54.6 years with a male predominance (66.7%). The most common presenting symptoms were headache, seizures, and focal neurological deficits, with the frontal lobe being the most frequently involved site. These findings are consistent with the well-established clinical pattern of glioblastoma, which typically affects middle-aged to older adults and presents with symptoms related to raised intracranial pressure and focal cortical dysfunction. Similar demographic and clinical profiles have been reported in prior studies, where male predominance and peak incidence in the fifth to sixth decade of life were consistently observed, along with headache and seizures as the leading presenting features [18,19].

In this study, tumors not crossing the midline were more prevalent (60%), with gross total resection attained in 60% of patients; fMRI guidance was utilized in 53.3% and cortical involvement was observed in 66.7%. These results align with previous evidence indicating that the degree of resection is an important prognostic factor in glioblastoma, with enhanced survival following gross total resection [20]. Sanai and Berger et al.,2009 highlight that advanced imaging and mapping methods, such as fMRI, facilitate safer maximal resections, especially for tumors situated close to eloquent cortex [21].

The majority of patients underwent standard trimodality treatment (surgery, radiotherapy, and temozolomide), whereas 66.7% finished the entire adjuvant protocol and 33.3% experienced interrupted chemotherapy. This indicates regular application of standard care, yet underscores problems with finishing treatment. These results align with evidence that the combination of radiotherapy and temozolomide enhances survival in glioblastoma, and that finishing the full adjuvant therapy correlates with improved outcomes [22].

In our study, the median overall survival was 16.4 months, with a 5-year survival rate of 20%, suggesting a poor outlook despite multimodal treatment. Likewise, Chandra et al. found that survival rates for glioblastoma are restricted and are affected more by prognostic elements like the degree of resection rather than the tumor's location [23].In this study, long-term survival correlated with gross total resection, non-midline tumor positioning, completion of chemoradiotherapy, and fMRI guidance, whereas subtotal resection and tumors that cross the midline had worse outcomes [20-22].

Glioblastoma shows poor overall survival despite multimodal therapy, while better outcomes are associated with gross total resection, non–midline tumor location, completion of chemoradiotherapy, and fMRI-guided surgery.

CONCLUSION:

This study illustrates that supratentorial glioblastoma continues to be an extremely aggressive condition with a negative overall outlook, regardless of multimodal therapy. Nonetheless, enhanced survival is seen in patients who have undergone gross total resection, received comprehensive chemoradiotherapy, and possess non–midline-crossing tumors. Preoperative MRI characteristics, such as cortical integrity and functional connectivity, demonstrate potential predictive value. These results emphasize the significance of maximal safe resection, finishing treatment, and advanced neuroimaging in enhancing survival predictions and outcomes.

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Original Article

Risk Factors for Seizure Recurrence in Children with Febrile Seizures

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Abstract

Background: Febrile seizures happen in children between 6 months and 5 years with fever, impacting 2%–5%, and about one-third recur, typically within 1–2 years. They are categorized as either simple or complex. Recurrence is associated with factors like early onset age, family background, reduced fever intensity, and brief fever duration. This study seeks to pinpoint significant risk factors for recurrence to enhance management and guidance.

Methods: This observational study conducted in a hospital involved 35 children between 6 months and 5 years who were clinically diagnosed with febrile seizures inthe department of Emergency, Observation & Referral, Bangladesh Shishu Hospital & Institute. Clinical, demographic, and laboratory data were analysed using SPSS v25.0 to determine predictors of recurrence, with ethical approval and informed consent secured.

Results: Out of 35 children experiencing febrile seizures, 34.3% experienced a recurrence. Younger age (<2 years), a family history, brief fever duration (<24 hours), and multiple seizures occurring within 24 hours were significant predictors ($p<0.05$). Logistic regression indicated higher odds of recurrence for age under 2 years (OR=2.8), a family history (OR=3.5), fever lasting less than 24 hours (OR=2.9), and multiple seizures (OR=3.8), with hyponatremia demonstrating borderline significance.

Conclusion: Recurrent febrile seizures were common and associated with younger age, a family history, brief fever duration, and several seizures occurring within a 24-hour period. There was also a connection to extended seizures and low sodium levels. These elements assist in evaluating risks and providing guidance, with additional extensive studies required for validation.

Keywords: Febrile Seizures, Recurrence, Risk Factors, Children

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Introduction

A febrile seizure is a convulsion in a child between 6 months and 5 years old that happens with a fever of ≥ 100.4°F (38°C), without signs of central nervous system infection or any other clear reason [1]. They happen in

approximately 2%–5% of children, and around one-third of those affected have a relapse [2]. Recurrences are frequent and usually occur shortly after the initial episode, with the majority happening in the first one to two years [3].

Febrile seizures are categorized into simple or complex types. Simple seizures are generalized, last for less than 15 minutes, and happen once every 24 hours, while complex seizures are extended, focal, or happen again within 24 hours [4]. The incidence and recurrence of febrile seizures vary across ethnic and geographic populations, suggesting the influence of genetic and environmental factors [5,6].

Several predictors of recurrence have been identified in previous studies. Younger age at first seizure, family history of febrile seizures or epilepsy, lower peak fever, and shorter duration of fever before seizure onset have consistently been associated with increased recurrence risk [1,7–9]. In addition, prolonged seizure duration and multiple seizures during the same febrile episode have been reported as important clinical predictors [6]. Some studies have also suggested associations with male sex, recurrent febrile illnesses, electrolyte imbalance, and iron deficiency anemia [10-12].

A study from Bangladesh reported that younger age, abnormal electroencephalographic or neuroimaging findings, and positive family history were significant predictors of seizure recurrence in children [11]. Despite extensive research, the recurrence of febrile seizures remains difficult to predict because of variations in study populations and associated risk factors. Identification of recurrence predictors is important for appropriate counseling of caregivers, risk stratification, and long-term management of affected children. The aim of the study was to determine and assess the risk factors linked to the reoccurrence of febrile seizures in children.

MATERIALS AND METHODS:

Study Design and Setting:

This hospital-based observational study was conducted in the department of Emergency, Observation & Referral(EOR) at Bangladesh Shishu Hospital & Institute over a period of 12 months from July 2024 to June 2025.

Study Population:

Among children aged 0–14 years presenting with clinically diagnosed seizures during the study period, children aged 6 months to 5 years who fulfilled the diagnostic criteria for febrile seizures were included in the present analysis. Febrile seizure was defined as a seizure occurring in association with fever (body temperature ≥38°C) in the absence of central nervous system infection, metabolic abnormalities, or previous afebrile seizures.

Inclusion Criteria:

Children fulfilling the following criteria were included in the study:

- Age between 6 months and 5 years
- Clinically diagnosed febrile seizure
- Availability of relevant clinical and laboratory information
- Parents or guardians willing to provide informed consent

Exclusion Criteria

Children were excluded if they had:

- Evidence of meningitis, encephalitis, or other central nervous system infections
- History of epilepsy or afebrile seizures
- Congenital neurological disorders or developmental abnormalities
- Seizures secondary to identifiable metabolic causes
- Incomplete medical records

Sample Size and Sampling Technique

A total of 35 children with febrile seizures were included in this study using purposive sampling according to the eligibility criteria.

Data Collection Procedure

Data were collected using a predesigned semi-structured case record form. Information regarding demographic profile, clinical presentation, seizure characteristics, family history, perinatal history, and laboratory findings was obtained from caregivers and hospital records.

Variables collected included age, sex, duration of fever before seizure onset, peak body temperature, seizure type, seizure duration, recurrence within 24 hours, associated clinical symptoms, and family history of seizures. Perinatal factors such as prematurity, low birth weight, and history of neonatal seizures were also documented. Relevant laboratory findings including serum sodium level and hemoglobin concentration were recorded where available.

Participants were categorized into two groups:

- Recurrent febrile seizure group
- Non-recurrent febrile seizure group

Recurrence was defined as the occurrence of more than one febrile seizure episode either during the same febrile illness or during subsequent febrile episodes.

Statistical Analysis

Data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequency and percentage. Comparisons between recurrent and non-recurrent groups were performed using Student's t-test for continuous variables and Chi-square test or Fisher's exact test for categorical variables, as appropriate. Multivariate logistic regression analysis was performed to identify independent predictors of recurrence. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. A p-value of <0.05 was considered statistically significant.

Ethical Consideration

Ethical approval was obtained from the institutional ethical review committee of Bangladesh Shishu Hospital & Institute. Written informed consent was obtained from the parents or legal guardians of all participants prior to enrollment. Confidentiality and anonymity of the study participants were strictly maintained throughout the study period.

RESULTS:

Study Population and Frequency of Febrile Seizures

A total of 127 pediatric patients with seizure episodes were initially evaluated. Among them, 55 children (43.3%) were identified as having febrile seizures, while the remaining were excluded due to alternative etiologies such as afebrile seizures, CNS infections, and metabolic causes. Of the 55 febrile seizure cases, 35 children met the inclusion criteria and were included in the final analysis.Among these 35 children, 12 (34.3%) experienced recurrent febrile seizures, whereas 23 (65.7%) had a single episode only.

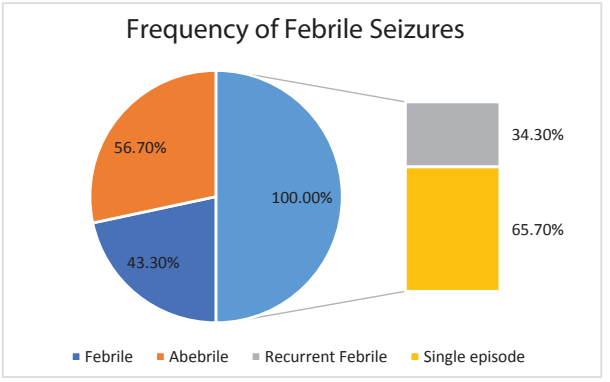


Figure I: Distribution of seizure types among the total study population (n = 127)

Figure Idemonstrates a hierarchical distribution: from the total seizure population, a significant febrile seizure subset is identified, and within this subset, recurrence is a common clinical pattern.

Demographic and Clinical Characteristics

Table 1 compares the demographic and baseline clinical characteristics between children with recurrent and non-recurrent febrile seizures. Children with recurrent febrile seizures were significantly younger than those without recurrence (2.6 ± 1.4 years vs. 3.7 ± 2.0 years, p=0.04). A significantly higher proportion of recurrent cases were aged below 2 years compared to the non-recurrent group (58.3% vs. 26.1%, p=0.05). Family history of seizures was also significantly more common among children with recurrent febrile seizures (50.0% vs. 17.4%, p=0.04). Although sibling history of seizures was more frequent in the recurrent group (25.0% vs. 4.3%), the difference did not reach statistical significance (p=0.09). No significant difference was observed regarding sex distribution between the two groups (p=0.88).

Table 1: Comparison of Demographic and Clinical Characteristics Between Recurrent and Non-Recurrent Febrile Seizures (n = 35)

Variable	Recurrent (n = 12), n (%)	Non-Recurrent (n = 23), n (%)	p-value
Age (years), mean ± SD	2.6 ± 1.4	3.7 ± 2.0	0.04*
Age <2 years	7 (58.3)	6 (26.1)	0.05*
Sex (Male)	7 (58.3)	14 (60.9)	0.88
Family history of seizure	6 (50.0)	4 (17.4)	0.04*
Sibling affected	3 (25.0)	1 (4.3)	0.09

Clinical Features Associated with Recurrence

Table 2 shows fever duration of less than 24 hours before the seizure episode was significantly more common among recurrent cases compared to non-recurrent cases (66.7% vs. 30.4%, p=0.04). Similarly, a peak body temperature below 39°C was significantly associated with recurrence (58.3% vs. 26.1%, p=0.05). Other clinical symptoms, including vomiting, lethargy, and impaired consciousness, were more frequent among recurrent cases but did not show statistically significant associations with recurrence (p>0.05).

Table 2: Clinical Features Associated with Recurrence (n = 35)

Clinical Feature	Recurrent (n = 12), n (%)	Non-Recurrent (n = 23), n (%)	p-value
Fever duration <24 hours before seizure	8 (66.7)	7 (30.4)	0.04*
Peak temperature <39°C	7 (58.3)	6 (26.1)	0.05*
Vomiting	5 (41.7)	6 (26.1)	0.34
Lethargy	4 (33.3)	5 (21.7)	0.47
Impaired consciousness	4 (33.3)	6 (26.1)	0.66

Seizure Characteristics and Recurrence

Table 3 demonstrates the relationship between seizure characteristics and recurrence. Most seizures were generalized in both recurrent and non-recurrent groups (75.0% vs. 82.6%, respectively), with no statistically significant difference in seizure type (p=0.58). However, prolonged seizure duration (≥15 minutes) was significantly associated with recurrence, occurring in 41.7% of

recurrent cases compared to 13.0% of non-recurrent cases (p=0.05). In addition, multiple seizure episodes within 24 hours were significantly more frequent among recurrent cases (50.0% vs. 17.4%, p=0.04).

Table 3: Seizure Characteristics and Recurrence (n = 35)

Variable	Recurrent (n = 12), n (%)	Non-Recurrent (n = 23), n (%)	p-value
Seizure type			0.58
Generalized	9 (75.0)	19 (82.6)	
Focal/Complex	3 (25.0)	4 (17.4)	
Duration ≥15 minutes	5 (41.7)	3 (13.0)	0.05*
Multiple seizures within 24 hrs	6 (50.0)	4 (17.4)	0.04*

Perinatal and Laboratory Factors

Table 4 presents preterm birth, low birth weight, and history of neonatal seizures were more commonly observed among recurrent cases; however, these associations did not achieve statistical significance (p>0.05). Hyponatremia was identified in 41.7% of recurrent cases compared to 13.0% of non-recurrent cases and demonstrated a borderline significant association with recurrence (p=0.05). Although anemia was more prevalent in the recurrent group (50.0% vs. 30.4%), the association was not statistically significant (p=0.26).

Table 4: Perinatal and Laboratory Factors Associated with Recurrence (n = 35)

Variable	Recurrent (n = 12), n (%)	Non-Recurrent (n = 23), n (%)	p-value
Preterm birth	3 (25.0)	1 (4.3)	0.08
Low birth weight	4 (33.3)	2 (8.7)	0.06
Neonatal seizure history	3 (25.0)	1 (4.3)	0.08
Hyponatremia	5 (41.7)	3 (13.0)	0.05*
Anemia	6 (50.0)	7 (30.4)	0.26

Multivariate Logistic Regression Analysis

Table 5 identified several independent predictors of recurrent febrile seizures. Children younger than 2 years had approximately 2.8 times higher odds of recurrence compared to older children (Adjusted OR=2.8, 95% CI: 1.1–7.5, p=0.04). A positive family history of seizures was also independently associated with recurrence (Adjusted OR=3.5, 95% CI: 1.2–9.8, p=0.03). Fever duration of less than 24 hours before seizure onset increased the likelihood of recurrence by nearly threefold (Adjusted OR=2.9, 95% CI: 1.1–8.2, p=0.04). Furthermore, children who experienced multiple seizures within 24 hours had significantly increased odds of recurrence (Adjusted OR=3.8, 95% CI: 1.3–10.5, p=0.02). Hyponatremia showed an increased odds ratio for recurrence (Adjusted OR=2.6, 95% CI: 1.0–7.1), although the association was borderline significant (p=0.06).

Table 5: Multivariate Logistic Regression Analysis of Factors Associated with Recurrence

Variable	Adjusted OR	95% CI	p-value
Age <2 years	2.8	1.1 – 7.5	0.04*
Family history of seizure	3.5	1.2 – 9.8	0.03*
Fever duration <24 hrs	2.9	1.1 – 8.2	0.04*
Multiple seizures in 24 hrs	3.8	1.3 – 10.5	0.02*
Hyponatremia	2.6	1.0 – 7.1	0.06

DISCUSSION:

This study identified younger age, early onset, and a positive family history as predictors of recurrent febrile seizures, showing no difference based on sex. Kantamalee et al. (2017) also recognized younger age, brief fever duration, and family history as significant risk factors, highlighting early-life recurrence. Both studies emphasize the influence of clinical and family factors on the risk of recurrence[13].

The current study found that a shorter fever duration and a lower peak temperature were notably linked to recurrent febrile seizures, whereas other symptoms did not show significance. Likewise, Kim et al. (2024) found that the early onset of seizures during fever is a crucial predictor of recurrence, while related clinical symptoms offer limited predictive significance. Both studies emphasize fever characteristics as crucial risk factors for recurrence[14].

The current study indicated that seizure type did not correlate with recurrence, whereas prolonged seizures and several episodes within 24 hours were important predictors. Mizorogi et al. (2015) also indicated that extended seizure duration and clustered seizures heighten the risk of recurrence. Both studies suggest that the severity of seizures, not their type, is a crucial element in forecasting recurrence[15].

The current study demonstrated no notable relationship between perinatal factors and recurrence, while hyponatremia exhibited a marginal connection and anemia proved to be insignificant. In the same vein, Castellazzi et al. (2024) indicated that electrolyte imbalances, particularly hyponatremia, are more significant for early recurrence compared to perinatal factors. Both studies emphasize the significance of metabolic factors in evaluating recurrence risk[16].In this study identified that age under 2 years, a positive family history, brief fever duration, and

several seizures in 24 hours are standalone predictors of recurrence, whereas hyponatremia displayed a marginal correlation. In general, recurrence is primarily associated with younger age, genetic factors, severity of seizures, and metabolic conditions. These results align with earlier research [13-16].In summary, recurrent febrile seizures are primarily linked to younger age, a positive family history, factors related to fever, the severity of seizures, and metabolic imbalances, highlighting the necessity of prompt recognition and suitable monitoring of children at high risk.

CONCLUSION:

Recurrent febrile seizures were observed in a considerable proportion of children with febrile seizures in this study. Younger age at onset, positive family history of seizures, shorter duration of fever before seizure onset, and multiple seizures within 24 hours were identified as significant predictors of recurrence. Prolonged seizure duration and hyponatremia also showed important associations with recurrent episodes. Early identification of these risk factors may help clinicians in risk stratification, parental counseling, and appropriate follow-up planning for children with febrile seizures. Further large-scale multicenter studies are recommended to better understand recurrence patterns and develop predictive models for clinical practice.

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Journal of Paediatric Surgeons of Bangladesh

Original Article

Negligent homicide in paediatric surgery cases found in autopsies

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Abstract

Background: Paediatricsurgicalpatientsarevulnerabletoperioperativemorbidityandmortality.Inlow-resource settings,differentiatingunavoidablesurgicalcomplicationsfrompotentiallynegligentdeathremainschallenging. Autopsy findings may provide objective evidence of medical error, yet systematic prospective data linking autopsy-proven negligence to legal definitions of homicide are scarce.

Objective: To determine the proportion and nature of negligent homicide among paediatric surgical autopsies.

Methods: This prospective cohort study was conducted at Sir Salimullah Medical College Mitford Hospital, Dhaka, Bangladesh, from January 2025 to December 2025. A total of 78 paediatric surgical deaths were included using purposive sampling. All cases underwent a complete medicolegal autopsy. Negligent homicide was defined as death directly caused by a healthcareprovider'sactionoromissiondeviatingfrom thestandardofcareestablishedbyanindependentexpert panel reviewing clinical records and autopsy findings. Data were analyzed using SPSS version 23.0. Results: Among 78 autopsied paediatric surgical deaths, 23 cases (29.5%) met criteria for negligent homicide. Common contributory factors included unrecognized intraoperative bleeding (47.8%), retained surgical instruments (26.1%), wrong-site surgery (13.0%), and anaesthesia-related errors (13.0%). Most deaths occurred within 48 hours postoperatively (78.3%). Mean age was 4.2 years, with no significant sex predominance.

Conclusion: Negligent homicide was identified in nearly one-third of paediatric surgical deaths autopsied in this cohort. Routine medicolegal autopsy combined with systematic case review can help distinguish negligence from unavoidable complications. Targeted perioperative safety protocols and training are urgently needed in similar low-resource settings.

Keywords: Anesthesiaerror,Autopsy,Homicide,Intraoperativebleeding,Paediatricsurgery

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Introduction

Paediatric surgery has witnessed substantial advances in perioperative care, anaesthesia, and surgical technique over the past two decades. Nevertheless, surgical mortality in children remains unacceptably high in low- and middle-income countries (LMICs), where infrastructure, trained personnel, and postoperative monitoring are often limited [1,2]. In Bangladesh, paediatric surgical services are concentrated in tertiary urban hospitals, yet the burden of postoperative deaths is poorly characterized due to weak medicolegal surveillance and limited autopsy utilization [3]. Medical negligence in surgical practice is defined as a deviation from the accepted standard of care that causes preventable harm to the patient [4]. When such negligence results in death, legal frameworks in many jurisdictions permit classification as negligent homicide — a criminal offence distinct from accidental death or unavoidable complication. However, proving

negligent homicide requires objective evidence that the healthcare provider's action or omission directly caused mortality. Autopsy remains the gold standard for determining the cause of death and can identify retained instruments, unrecognized visceral injuries, anaesthesia-related airway complications, or haemorrhage from iatrogenic vascular injury [5,6]. Globally, the prevalence of negligent death in paediatric surgery is unknown. Most studies rely on retrospective malpractice claims or voluntary reporting systems, both of which suffer from underreporting and selection bias [7]. A systematic review of surgical adverse events in children estimated that 2–5% of paediatric surgical admissions experience a preventable adverse event, of which 10–20% are fatal, but only a fraction undergoes medicolegal autopsy [8]. In high-income settings, routine autopsy following unexpected paediatric surgical death is standard, but even there, negligent homicide is rarely diagnosed due to medicolegal caution and lack of standardized definitions [9]. In Bangladesh, the legal framework for medical negligence is defined under the Penal Code 1860 and subsequent judicial interpretations, but negligence leading to homicide is seldom prosecuted. Reasons include fear of criminalizing doctors, inadequate forensic pathology services, and the absence of prospective data on the magnitude of the problem [10]. Sir Salimullah Medical College Mitford Hospital is one of the largest tertiary referral centers in Dhaka, handling a high volume of paediatric surgical cases from both urban and rural populations. The Department of Forensic Medicine routinely performs autopsies for all unnatural or unexpected hospital deaths, providing a unique opportunity to prospectively study negligence-related mortality. Previous autopsy-based studies from South Asia have reported retained surgical sponges, wrong-site surgery, and anaesthetic overdoses as recurring themes in surgical deaths, but none specifically applied a rigorous negligent homicide definition [11,12]. A recent retrospective chart review from a single Bangladeshi hospital identified 32% of paediatric postoperative deaths as possibly preventable, but without autopsy correlation, definitive attribution remained impossible [13]. The present study addresses this gap by prospectively evaluating all paediatric surgical deaths autopsied over one year at a major Dhaka hospital, using an independent expert panel to apply a standardized negligent homicide definition. The findings are intended to inform hospital safety protocols, medicolegal policy, and training priorities in resource-limited settings.

Methodology

The study included all paediatric surgical deaths (age <18 years) occurring at Sir Salimullah Medical College Mitford Hospital, Dhaka, Bangladesh, between January 2025 and December 2025, for which a complete medicolegal autopsy was performed. A total of 78 consecutive cases meeting sampling criteria were enrolled using purposive sampling.

Inclusion criteria: Deceased children aged 0 to 17 years who died during or after a surgical procedure (general, orthopedic, urological, or neurosurgical) performed in the hospital, with autopsy conducted within 48 hours of death and written medicolegal consent from legal guardians.

Exclusion criteria: Deaths from purely medical (non-surgical) causes, deaths before any surgical incision, cases where autopsy was refused by guardians, inadequate autopsy reports (missing organ examination), and deaths from major trauma or burns unrelated to surgical care.

Study procedure: All autopsies followed a standard medicolegal protocol. Clinical records were reviewed by a three-member independent expert panel (two paediatric surgeons, one forensic medicine specialist) blinded to each other's assessments. Negligent homicide was determined using a validated negligence assessment checklist for surgical deaths [14] (Cronbach's alpha 0.89, inter-rater reliability 0.86). The panel required unanimous agreement that deviation from the standard of care directly caused death.

Data analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 23.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics (frequencies, percentages, means, and standard deviations) were calculated. Inter-rater agreement was assessed using Fleiss' kappa.

RESULT

A total of 78 paediatric surgical deaths were autopsied during the study period. The median age was 4.2 years (interquartile range 1.5–9.0 years), with a slight male predominance (55.1%). Most deaths occurred in children under five years of age (61.5%). The majority of surgical procedures were abdominal (43.6%), followed by thoracic (19.2%) and neurosurgical (16.7%). Overall, negligent homicide was confirmed in 23 cases (29.5%). Among these, the most common direct cause of death was unrecognized intraoperative bleeding (47.8%), followed by retained surgical instruments (26.1%), wrong-site surgery (13.0%), and anaesthesia-related errors (13.0%). Deaths attributed to negligent homicide occurred predominantly within the first 48 hours postoperatively (78.3%). No significant association was found between negligent homicide and patient sex or age group. When comparing baseline characteristics between negligent homicide and non-negligent homicide groups, no statistically significant differences were observed for age, sex, or emergency versus elective surgery status. However, the proportion of deaths occurring within 48 hours was significantly higher in the negligent homicide group (78.3% vs. 34.5%, $p = 0.001$). The most frequent anatomical sites of iatrogenic

injury among negligent homicide cases were the liver (34.8%), major abdominal vessels (21.7%), and bowel (17.4%). Retained surgical instruments included laparotomy sponges (4 cases), surgical needles (1 case), and a fractured instrument tip (1 case). In wrong-site surgery cases, all involved the incorrect side for inguinal hernia repair (2 cases) and the incorrect vertebral level for laminectomy (1 case). Anaesthesia errors comprised unrecognized oesophageal intubation (2 cases) and massive opioid overdose (1 case). Inter-rater agreement among the three expert panel members for negligent homicide classification was excellent (Fleiss' kappa = 0.86).

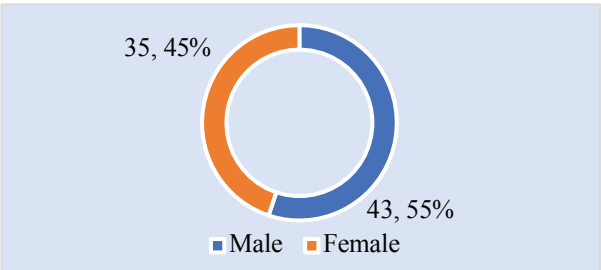


Figure 1: Gender distribution of participants

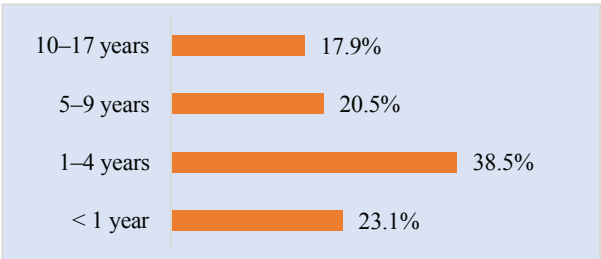


Figure 2: Age distribution of participants

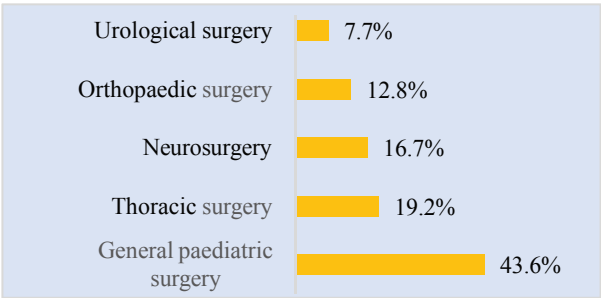


Figure 3: Surgical specialty

Table 1: Negligent homicide classification and causes (n= 23)

Cause of negligent homicide	n	%
Unrecognized intraoperative bleeding	11	47.8
Retained surgical instrument	6	26.1
Wrong-site surgery	3	13
Anaesthesia-related error	3	13

Table 2: Comparison of characteristics between negligent homicide and non-negligent homicide groups

Variable	Homicide		p-value
	Negligent	Non-negligent	
	(n = 23)	(n = 55)	
	n (%)		
Age < 5 years	15 (65.2)	33 (60.0)	0.789
Male sex	13 (56.5)	30 (54.5)	0.873
Emergency surgery	16 (69.6)	33 (60.0)	0.421
Death within 48 hours post-op	18 (78.3)	19 (34.5)	0.001

Statistical test used: Chi-square test for all comparisons.

Table 3: Anatomical sites of iatrogenic injury in negligent homicide cases (n = 23)

Anatomical site	n	%
Liver	8	34.8
Major abdominal vessels	5	21.7
Bowel	4	17.4
Spleen	3	13.0
Great vessels (thoracic)	2	8.7
Trachea/bronchus	1	4.3

Table 4: Details of retained surgical instruments (n=6 cases)

Type of retained instrument	n	%
Laparotomy sponge	4	66.7
Surgical needle	1	16.7
Fractured instrument tip	1	16.7

Table 5: Postoperative survival time distribution

Time of death*	Homicide	
	Negligent	Non-negligent
	n (%)	
< 24 hours	12 (52.2)	10 (18.2)
24–48 hours	6 (26.1)	9 (16.4)
49–72 hours	3 (13.0)	14 (25.5)
> 72 hours	2 (8.7)	22 (40.0)

Discussion

The present prospective autopsy-based cohort study found that negligent homicide was identified in nearly one-third (29.5%) of paediatric surgical deaths at a major

tertiary hospital in Dhaka, Bangladesh. This is, to our knowledge, one of the first studies to apply a standardized, validated negligence assessment tool specifically to autopsy-confirmed paediatric surgical deaths in a low-resource setting [15,16]. The proportion of negligent homicide observed (29.5%) is substantially higher than estimates from high-income countries, where preventable surgical deaths in children are reported in 2–8% of cases [1,8]. Several factors may explain this disparity. First, underreporting and limited autopsy utilization in high-income settings likely underestimate true negligence rates [7,9]. Second, resource constraints in Bangladesh—including inadequate intraoperative monitoring, shortage of trained paediatric anesthetists, and high surgical volumes—increase the risk of iatrogenic injury [3,10]. Third, the present study's prospective design and independent expert panel may have captured negligence more systematically than retrospective malpractice reviews [17]. Unrecognized intraoperative bleeding was the leading cause of negligent homicide (47.8%), consistent with previous autopsy reports from South Asia identifying haemorrhage as a common preventable factor in surgical deaths [11,12]. In children, blood volume is small, and delayed recognition of even modest bleeding can be fatal [18]. The predominance of hepatic and major vascular injuries in the present series suggests that technical errors during abdominal exploration—potentially compounded by inadequate intraoperative monitoring of vital signs and haemoglobin—were critical [19]. Retained surgical instruments (26.1%) remain an emblematic but entirely preventable form of negligence. Sponge retention rates in low-income countries have been reported up to ten times higher than in high-income settings [20]. The absence of routine instrument and sponge counts, lack of intraoperative imaging, and heavy workload of operating room staff are probable contributing factors [21]. Notably, deaths within 48 hours postoperatively were significantly more common in the negligent homicide group (78.3% vs. 34.5%, $p = 0.001$). This temporal pattern suggests that many negligence-related deaths occur before physiological compensation fails or before rescue interventions can be effectively mounted [22]. Early postoperative death should therefore trigger automatic medicolegal autopsy review rather than being dismissed as an unavoidable complication. Anesthesia-related errors (13.0%) in this series—unrecognized esophageal intubation and opioid overdose—reflect systemic deficits in paediatric airway management and drug dosing. A multicenter study from South Asia reported that anaesthesia-related paediatric mortality is 10–100 times higher than in high-income countries, largely due to inadequate training and monitoring [23]. Pulse oximetry, capnography, and weight-based dosing protocols are not universally available in Bangladeshi operating rooms [3]. The present findings have important medicolegal and policy implications. First, routine autopsy for all unexpected paediatric surgical deaths should be mandated and adequately funded [5,9]. Second, hospital accreditation systems should incorporate negligent homicide rates as a quality indicator [24]. Third, targeted interventions—including surgical safety checklists, mandatory sponge counts, video-based anaesthesia training, and rapid response teams—could reduce preventable deaths [25]. Limitations include single-center design, purposive sampling, potential expert panel bias despite blinding, and inability to generalize to hospitals without autopsy services. Causality between identified negligence and death, though rigorously assessed, remains a judgment rather than a biological measurement. Additionally, cultural and legal definitions of negligence vary; the present findings may not be directly transferable to other jurisdictions. Despite these limitations, the study provides critical evidence that negligent homicide is neither rare nor unavoidable in paediatric surgical care in Bangladesh. Systematic investment in patient safety infrastructure, training, and transparent medicolegal review is urgently needed.

Limitations

Single-center design, purposive sampling, and potential expert panel bias limit generalizability. Causality determination remains judgment-based. Findings may not apply to hospitals without routine autopsy services or different medicolegal frameworks.

Conclusion

Negligent homicide was identified in nearly one-third of autopsied paediatric surgical deaths in this Bangladeshi cohort, predominantly from unrecognized bleeding, retained instruments, and anaesthesia errors. Routine medicolegal autopsy combined with standardized negligence assessment can distinguish preventable deaths from unavoidable complications. Urgent investment in perioperative safety protocols, training, and transparent mortality review is essential to reduce preventable paediatric surgical deaths in low-resource settings.

Recommendation

Hospitals should mandate medicolegal autopsy for all unexpected paediatric surgical deaths, implement surgical safety checklists, ensure routine sponge and instrument counts, provide anaesthesia training, and establish independent mortality review panels to identify and prevent negligent homicide.

Ai Declaration

Artificial intelligence tools contributed marginally to manuscript preparation and development. All core scientific content was human-verified.

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Journal of Paediatric Surgeons of Bangladesh

Original Article

Evaluation of Acute Kidney Injury (AKI) due to Urosepsis in a Tertiary Care Hospital

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Abstract

Background: Urosepsis is associated with significant morbidity and mortality and remains one of the leading causes of acute kidney injury (AKI) in nephrology, urology, and intensive care unit (ICU) settings.

Aim of Study: To evaluate the clinical characteristics, microbiological profile, and severity of acute kidney injury, antimicrobial sensitivity, resistance patterns, and treatment outcomes among patients with urosepsis-associated AKI.

Methods: This prospective observational study was conducted over a three-year period from January 2023 to December 2025. Patients aged 15–80 years of both sexes attending the inpatient and outpatient departments of Nephrology were enrolled.

Result: Patients with AKI secondary to urosepsis were identified according to the kidney disease: Improving Global Outcomes (KDIGO) criteria and included in the study. A total of 200 patients were enrolled. Urosepsis was defined as the presence of acute pyelonephritis or pyonephrosis with bacterial growth in blood cultures consistent with the organism isolated from urine cultures. Among a patient with Urosepsis; Upper UTI was observed in 78% cases and lower UTI was in 22% patients. The major types of cUTI were acute pyelonephritis (56%) then acute complicated cystitis (25%), acute emphysematous pyelonephritis (3%), pyonephrosis (5%) were detected. Among the patients, 60% were mild AKI, 15% moderate AKI, 10% was severe AKI, 10% AKI on CKD, and 5% were dialysis-dependent, while the remaining patients had other grades of renal impairment. The most frequent anatomical abnormalities were posterior urethral valve (PUV), urethral stricture, vesicoureteral reflux (VUR), Autosomal Dominant Polycystic Kidney Disease (ADPKD), and pelvic kidney. Diabetes mellitus was the most common comorbidity among patients with complicated urinary tract infection (cUTI). Escherichia coli (E. coli) was the predominant pathogen, isolated in 44% of cases. Among the Gram-positive organisms, Staphylococcus aureus was the most frequently isolated, accounting for 8% of cases. The antibiogram showed that E. coli was most sensitive to colistin, meropenem, and tigecycline (88.5%). Staphylococcus aureus showed the highest sensitivity to linezolid (90%), followed by vancomycin (80%). Pseudomonas was most sensitive to imipenem (90%) and amikacin (70%). Klebsiella showed the highest sensitivity to piperacillin–tazobactam (95%), followed by meropenem (85%). Enterococcus was most sensitive to amoxicillin–clavulanic acid (80%) and levofloxacin (76%). Proteus showed 75% sensitivity to meropenem. Staphylococcus saprophyticus was most sensitive to linezolid (80%), followed by vancomycin (75%). Group B Streptococci showed the highest sensitivity to meropenem (85%) and amoxicillin–clavulanic acid (70%). Treatment response was not uniform, the study found that a 14-days antibiotic course provided better clinical outcomes compared to a 10-days treatment.Conclusion: Urosepsis-induced Acute Kidney Injury (AKI) is a severe, life-threatening complication that significantly increases short-term mortality and long-term risk of chronic kidney disease (CKD). It requires immediate source control, antibiotic therapy, and hemodynamic stabilization to prevent irreversible end-organ damage.

Keywords: Acute Kidney injury, Urosepsis, Acute Pyelonehritis, Positive Urine Culture.

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Introduction

Urosepsis is a severe and potentially life-threatening systemic infection that originates from the urinary tract

and represents one of the most common causes of sepsis worldwide. It accounts for approximately 20–30%[1] of all septic episodes and is associated with substantial morbidity, mortality, prolonged hospitalization, and increased healthcare expenditure. Studies from Germany and other European countries have reported that urosepsis accounts for approximately 9–31% of all sepsis cases, with the variation largely attributable to geographical differences and patient characteristics[2].Urosepsis commonly develops as a complication of urinary tract infections involving the kidneys, ureters, bladder, or prostate and is particularly prevalent among elderly individuals, patients with diabetes mellitus, urinary tract obstruction, nephrolithiasis, indwelling urinary catheters, and other structural abnormalities of the urinary tract[3].

The mortality rate of urosepsis is approximately 30–40%. The severity of the disease appears to be increasing and is commonly associated with acute respiratory distress syndrome (ARDS), acute kidney injury (AKI), and disseminated intravascular coagulation (DIC).Similar findings have been documented in studies from Germany, Romania, and other European countries, where urosepsis was identified as a significant contributor to sepsis-related mortality and multiorgan failure[4,5].

Gram-negative bacteria, particularly Escherichia coli and Klebsiella pneumoniae, are the predominant causative organisms, although other pathogens such as Proteus, Pseudomonas, and Enterococcus species may also be involved[6]. Early diagnosis, prompt source control, and timely administration of appropriate antimicrobial therapy are crucial for improving patient outcomes.

Despite advances in antimicrobial therapy and critical care management, urosepsis remains a major clinical challenge because of its rapid progression to septic shock and multiple organ dysfunction syndrome. Acute Kidney Injury (AKI) is one of the most frequent and serious complications of urosepsis. Urosepsis-associated AKI has been shown to significantly increase the risk of intensive care unit admission, need for renal replacement therapy, prolonged hospital stays, and mortality[7]. The development of AKI is multifactorial and results from a complex interaction of systemic inflammation, renal hypoperfusion, microvascular dysfunction, endothelial injury, and direct tubular cell damage. The reported incidence of AKI among patients with urosepsis ranges from 20% to 60%, depending on patient characteristics, severity of infection, and underlying comorbidities. Several factors, including advanced age, diabetes mellitus, hypertension, chronic kidney disease, urinary tract obstruction, delayed initiation of antibiotic therapy, and septic shock, have been identified as important predictors of AKI and adverse clinical outcomes.Although urosepsis is a common cause of sepsis-related AKI, information regarding its clinical characteristics, microbiological spectrum, and severity of renal involvement, treatment requirements, and outcomes remains limited in many tertiary care hospitals, particularly in developing countries. A better understanding of these factors may facilitate early identification of high-risk patients and improve clinical management strategies.

Operational Definitions:

SIRS (Systemic inflammatory response syndrome): is defined by the presence of any 2 of the following criteria: Body temperature >100.4 °F (38 °C) or <96.8 °F (36 °C) Heart rate >90 bpm. Respiratory rate >20 breaths/minute or PaCO2 <32 mm Hg (4.3 kPa).

Acute Kidney Injury (AKI): According to the KDIGO Guidelines, is defined as an abrupt decline in kidney function, identified by any of the following criteria:

1. Increase in Serum Creatinine: An increase in serum creatinine of ≥ 0.3 mg/dL (≥ 26.5 µmol/L) within 48 hours.

2. Percentage Increase in Serum Creatinine: An increase in serum creatinine to ≥ 1.5 times the baseline value, known or presumed to have occurred within the prior 7 days.

3. Reduced Urine Output: Urine output < 0.5 mL/kg/hour for 6 hours.

Urosepsis: Urosepsis is one of the most common causes of sepsis, accounting for up to 30% of all septic episodes originating from the urinary tract. It is a severe, life-threatening complication of urinary tract infection and constitutes a medical emergency. If left untreated, urosepsis can lead to multi organ failure, acute kidney injury (AKI), disseminated intravascular coagulation (DIC), and death.

Urosepsis-Induced AKI: Patients with documented urinary tract infection (positive urine culture and/or radiological evidence of urinary tract infection) fulfilling Sepsis-3 criteria and subsequently developing AKI according to KDIGO criteria.

Septic Shock: Requirement of vasopressor therapy to maintain mean arterial pressure ≥65 mmHg and serum lactate >2 mmol/L despite adequate fluid resuscitation.

METHODOLOGY

This prospective observational study was conducted in the Department of Nephrology, Bangladesh Medical University (BMU), Dhaka, Bangladesh, from January 2023 to December 2025. A total of 200 consecutive patients aged 15 years and above who were admitted with Urosepsis and developed Acute Kidney Injury (AKI) were enrolled during the study period. The study was undertaken to evaluate the clinical characteristics, microbiological profile, associated risk factors, and severity of

AKI, management strategies, and outcomes of patients with Urosepsis-associated AKI. Patients were selected by purposive sampling technique after obtaining informed written consent.

Urosepsis was diagnosed in patients with culture-positive urinary tract infection and evidence of systemic infection fulfilling Sepsis-3 criteria. AKI was defined and staged according to the kidney disease: Improving Global Outcomes (KDIGO) guidelines. Adult patients of both sexes, including those with structural or functional abnormalities of the urinary tract, chronic kidney disease (CKD), renal allograft recipients, and patients on maintenance hemodialysis, were eligible for inclusion. Patients who had received antibiotic therapy before admission, had culture-negative urinary tract infection, or refused to participate were excluded from the study.

Data regarding demographic characteristics, including age and sex, were recorded. Clinical variables assessed included pre-existing renal disease, diabetes mellitus, hypertension, urinary tract instrumentation, urinary catheterization, ureteric stenting, obstructive uropathy, nephrolithiasis, hydronephrosis, hydroureteronephrosis, intensive care unit admission, requirement of renal replacement therapy, duration of hospital stay, and in-hospital mortality. Detailed clinical examination was performed, including measurement of body temperature, pulse rate, blood pressure, and assessment for suprapubic and loin tenderness.A detailed clinical history was obtained, and all relevant physical parameters were recorded. Drug history and potential complicating factors were carefully evaluated. Physical parameters, including pulse rate, blood pressure, body temperature, urine output, level of consciousness, and oxygen saturation (SpO_2), were assessed and documented.

All patients underwent laboratory investigations including complete blood count (CBC), erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), serum procalcitonin, D-dimer, serum creatinine, blood urea, serum electrolytes, estimated glomerular filtration rate (eGFR), urine routine and microscopic examination, urine culture and sensitivity testing (aerobic and anaerobic), fungal staining, and blood cultures whenever indicated. Serial serum creatinine measurements were performed to determine the severity and progression of AKI.Radiological evaluation included ultrasonography of the kidney, ureter, and bladder (KUB) region with assessment of the prostate, urinary bladder, and post-void residual urine volume. Additional imaging studies, including plain X-ray KUB, intravenous urography (IVU), retrograde urethrography (RGU), micturating cystourethrography (MCU), non-contrast computed tomography (CT) of KUB, and CT urography, were performed when clinically indicated to identify underlying structural abnormalities and urinary tract obstruction.

Microbiological isolates and their antimicrobial susceptibility patterns were analyzed. Patients were managed according to institutional protocols, including appropriate antimicrobial therapy, source control procedures, supportive care, and renal replacement therapy when required. Clinical outcomes including renal recovery, dialysis requirement, duration of hospitalization, and in-hospital mortality were recorded and analyzed.

Results

On evaluation of 200 patients with urosepsis-associated acute kidney injury (AKI), the following findings were observed based on manual assessment.

Table1: Clinical Presentations of Patients with Urosepsis (N = 200)

Clinical presentations	Number (n)	Percentage (%)
Nausea/Vomiting	50	25%
Hesitancy	20	10%
Flankpain/Suprapubicpain	60	30%
Dysuria	70	35%
Hematuria	40	20%
Fever	30	15%
Altered level of consciousness	10	5%
Urinaryincontinence	12	6%
Urinaryretention	04	2%

Among patients with urosepsis, nausea, vomiting, and flank pain, dysuria & Hematuria were the predominant clinical presentations, each occurring in approximately 30% of cases.

Table2: Biochemical and Microbiological Parameters of Patients with Urosepsis (n = 200).

Parameters	Frequency (n)	Percentage %
RaisedCRP	160	80%
Neutrophilicleucocytosis	144	72%
Raisedserumpro-calcitonin	22	11%
Mildtomoderateproteinuria(1+to2+)	20	10%
Thrombocytopenia	06	3%
Positivebloodculture	06	3%
Massiveproteinuria(+++)	12	6%
RaisedD-dimer	06	3%
Increase FDP	08	4%
Electrolytes imbalance	110	55%
Urineformucusthread	20	10%
Bacterialcolonycount 10^2 –		
10^3cfu/ml	14	7%
10^3-10^4cfu/ml	22	11%
>10^5cfu/ml	164	82%
Urineforpuscell 05-		
10 /HPF	84	42%
10-30 /HPF	78	39%
Plenty/HPF	30	15%

Biochemical and microbiological parameters was observed; Raised CRP (80%) and neutrophilic leucocytosis (72%) were the predominant laboratory findings among patients with urosepsis. Significant bacteriuria (>10^5 CFU/mL) was detected in 82% of cases, while electrolyte imbalance was present in 55%. Pyuria was common on urine microscopy, and positive blood cultures were identified in 3% of patients.

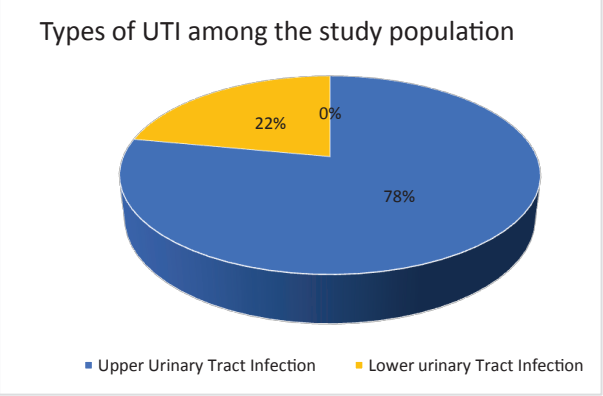


Figure-I: Types of UTIs among the study population (n=200)

Upper urinary tract infection was the predominant type of UTI among the study population, accounting for 156 (78%) cases, whereas lower urinary tract infection was observed in 44 (22%) patients.

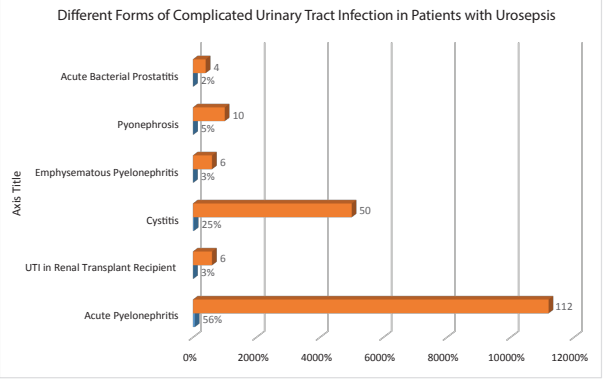


Figure-II. Distribution of different forms of urinary tract infection among patients with Urosepsis-associated acute kidney injury (AKI).

Acute pyelonephritis was the most common form of urinary tract infection, accounting for 56% of all cases, followed by cystitis (25%). Less common presentations included pyonephrosis (5%), urinary tract infection in renal transplant recipients (3%), emphysematous pyelonephritis (3%), and acute bacterial prostatitis (2%). The remaining cases comprised other less frequent forms of urinary tract infection.

Table3: Distribution of urinary tract obstructive Abnormalities among patients with Urosepsis (n = 200)

Abnormalities	Frequency (n)	Percentage (%)
Pelvi-uretericjunction(PUJ)obstruction	06	3%
ADPKD	06	3%
Strictureurethra	02	1%
Vasicouretericjunction(VUJ)obstruction	03	1.5%
Posteriorurethralvalves	03	1.5%
Bladderdiverticulum	02	1%
Renalstone	05	2.5%
Bladderneckhypertrophy	02	1%
Refluxnephropathy(unilateralorbilateral)	03	1.5%
Prolapseuterus	02	1%
Neurogenicbladder	02	1%
D-J Stent	03	1.5%

Regarding obstructive and structural abnormalities associated with urosepsis, ADPKD (3%)& PUJ obstruction (3%) was the most common abnormality. Other abnormalities included stricture urethra (3%), renal stone (2.5%), reflux nephropathy (2.5%), neurogenic bladder (2%), and VUJ obstruction (2%). Less frequent abnormalities were, posterior urethral valves, bladder diverticulum, bladder neck hypertrophy, prolapsed uterus, and D-J Stent.

Table 4: Comorbidities among patients with Urosepsis

Co-morbidities	Frequency (n=200)	Percentage(%)
Diabetesmellitus	42	21%
Pregnancy	02	1%
GN	26	13%
Immunosuppressive medication	12	6%
Steroidtherapy	08	4%
Renaltransplantrecipient	04	2%

Regarding co-morbidities, diabetes mellitus (11%) was the most common associated condition, followed by glomerulonephritis (13%), and immunosuppressive medication use (6%). Other co-morbidities were less frequent.

Table 5: OrganismsresponsibleforUrosepsis

Organisms	Frequency (%)
Grampositive bacteria	
Staphylococcussaprophyticus	4%
Staphylococcusaureus	8%
Enterococci	3%
Group-BStreptococcus	1%
Gramnegative bacteria	
E.coli	44 %
Klebsiella	5%
Proteus	12%
Actinobacteria	1.83%
Pseudomonas	14%
Other	
Candida	3.5%

Regarding the causative organisms, Gram-negative

bacteria were the predominant pathogens, with Escherichia coli (44%) being the most frequently isolated organism, followed by Pseudomonas (14%), Proteus (12%), and Klebsiella (5%). Among Gram-positive bacteria, Staphylococcus aureus (8%) was the most common isolate. Candida accounted for 3.53% of cases.

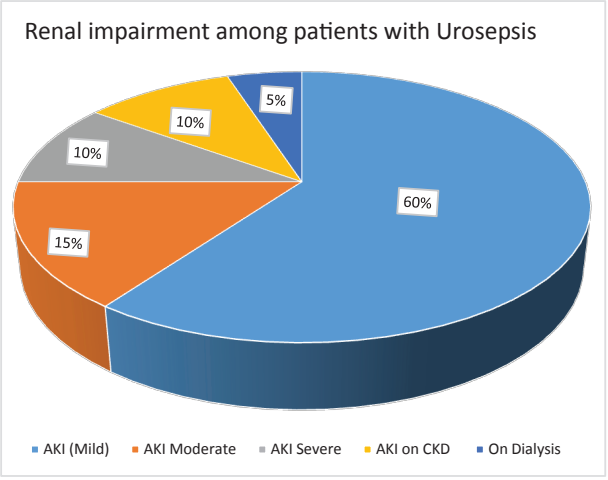


Figure-III: Patterns of renal impairment among patients with Urosepsis (n=200)

Renal impairment was common among patients with urosepsis. Mild AKI (n=120) was the most frequent presentation (60%), followed by moderate AKI (n=30) 15%, severe AKI (10% n=20, AKI on CKD (10% n=20) and dialysis-dependent kidney failure (5% n=10).

Table6:Antimicrobialagentsshowinghighbacterialsensitivity (n=200)

Bacteria	Antibiotics	Sensitive %	Resistance %
Klebsiella	Tazobactum+Piperi cillinMeropenem Tigecycline	95% 85% 80%	5% 15% 20%
Staphylococcusa ureus	Linezolid Vancomycin Tigecycline	90% 80% 75%	10% 20% 25%
E.Coli	Colistin Meropenem Tigecycline	88.5% 70% 68%	11.5% 30% 32%
Enterococci	Amoxicillin+Clavulenic Acid levofloxacin	80% 76%	20% 24%
Pseudomonas	Imipenem Amikacin Tigecycline	90% 70% 80%	10% 30% 20%
Proteus	Meropenem Amikacin levofloxacin	75% 60% 50%	25% 40% 50%
Group- BStreptococci	Meropenem Amoxicillin+Clavulenic acid	85% 70%	15% 30%
Staphylococcus Saprophyticus	Linezolid Vancomycin	80% 75%	20% 25%

Regarding antimicrobial sensitivity, most uropathogens showed high susceptibility to broad-spectrum antibiotics, particularly Meropenem, Tigecycline, Linezolid, Vancomycin, Imipenem, and Piperacillin–Tazobactam. Klebsiella demonstrated the highest sensitivity to Piperacillin–Tazobactam (95%), while E. coli was most sensitive to Colistin (88.5%). Pseudomonas showed high sensitivity to Imipenem (90%), and Staphylococcus aureus was highly sensitive to Linezolid (90%).

Table 7: Treatment responses 10 days versus 14 days

Categoryof infection	Numberof patients (n)	Numberofpatientsshowing response within 10 days	Numberofpatientsshowing response within 14 days
AcutePyelonephritis	140	60	80
EmphysematousPyelonephritis	10	04	06
Pyonephrosis	16	06	10
Cystitis	20	06	14
RecurrentAcutePyelonephritis	06	02	04
Acutebacterialprostaties	04	01	03
UTIinrenaltransplantrecipient	06	02	04

Regarding treatment response showed in patient with different UTI 14 day's treatment is superior to 10 days treatment.

DISCUSSION

Urosepsis is one of the leading causes of acute kidney injury (AKI) worldwide and represents a major complication of complicated urinary tract infections (cUTIs). Diabetes mellitus is a significant risk factor for the development of urosepsis[8], particularly among middle-aged and elderly patients. However, in children and adolescents, structural and functional abnormalities of the urinary tract are among the leading causes of urosepsis.

Among the study population, upper urinary tract infections were the most common presentation, accounting for 78% of cases, while lower urinary tract infections comprised 22%. This distribution differs from the conventional understanding that complicated UTIs primarily occur in patients with specific risk factors such as urinary tract abnormalities, immunocompromised states, or long-term catheterization9. In our cohort, acute pyelonephritis accounted for 56% of cUTI cases, followed by cystitis (25%), emphysematous pyelonephritis (3%), pyonephrosis (5%). These findings demonstrate that upper urinary tract involvement, particularly acute pyelonephritis, was the predominant clinical pattern among patients with complicated UTIs.

In the present study among the patients, 60% were mild AKI, 15% moderate AKI, 10% was severe AKI, 10% had

AKI on CKD, and 5% were dialysis-dependent, these findings indicate that most patients presented with early-stage renal dysfunction, emphasizing the importance of timely diagnosis and intervention. A multicenter study conducted in Australia and New Zealand found that 54% of patients with sepsis-associated AKI had Stage 1 AKI at diagnosis, indicating that early-stage kidney injury predominates in most cases[10]. Likewise, a large retrospective study from the United States reported that 53% of patients with sepsis-associated AKI had KDIGO Stage 1 disease, whereas Stage 2 and Stage 3 AKI accounted for 9% and 37% of cases, respectively[11]. Studies from China and Taiwan have also demonstrated that sepsis-associated AKI is frequently recognized at an early stage, although the proportion of severe AKI varies depending on patient characteristics and healthcare settings[12,13]. The predominance of mild AKI in the present study is therefore consistent with international observations and highlights the importance of early recognition and prompt management to prevent progression to severe kidney injury.

The study population exhibited a wide range of anatomical and obstructive abnormalities of the urinary tract. Autosomal Dominant Polycystic Kidney Disease (ADPKD) were among the most frequently observed structural abnormalities[14]. Other notable findings included pelvi-ureteric junction (PUJ) obstruction (3%) and posterior urethral valves (1.5%), and bladder neck hypertrophy (1%). These findings reflect the diverse congenital, structural, and acquired obstructive uropathies that predispose patients to complicated UTIs.

Diabetes mellitus (21%) was the most common comorbidity identified in the study population, followed by glomerulonephritis 13%. Significant proportions of patients were receiving immunosuppressive therapy (6%), were on long-term steroid treatment (4%). Less common but clinically important conditions included renal transplantation (2%) and pregnancy (1%) These findings highlight the important role of both systemic diseases and structural urinary tract abnormalities in predisposing patients to complicated UTIs.

Emphysematous urinary tract infections (especially emphysematous pyelonephritis) and pyonephrosis are uncommon but severe infections that occur predominantly in patients with diabetes mellitus, urinary tract obstruction, and immunocompromised states[15]. Analysis of causative organisms revealed that Gram-negative bacteria were the predominant pathogens. Escherichia coli was the most frequently isolated organism (44%), followed by Pseudomonas species (14%), Proteus species (12%), and Klebsiella species (5%). Among Gram-positive organisms, Staphylococcus aureus (8%) and Enterococcus species (3%) were the most common isolates. These findings suggest that E. coli and other Gram-negative bacteria remain the principal pathogens responsible for complicated UTIs, with occasional involvement of Gram-positive and fungal organisms. Similar findings have been reported in previous studies.

In the present study, Staphylococcus aureus demonstrated high sensitivity to Linezolid (90%) and Vancomycin (80%), findings comparable to reports from Eastern India where all S. aureus isolates were susceptible to Linezolid and approximately 88% were susceptible to Vancomycin[16]. Klebsiella species exhibited high sensitivity to Piperacillin–Tazobactam (95%), Tigecycline (80%), and Meropenem (84%). Staphylococcus saprophyticus showed 80% sensitivity to Linezolid and 75% sensitivity to Vancomycin, whereas Enterococcus species demonstrated high sensitivity to Amoxicillin–Clavulanic acid (80%) and Levofloxacin (76%).

E. coli isolates in our study remained largely susceptible to carbapenems, including Meropenem and Imipenem, as well as Amikacin, although resistance to commonly used first-line antibiotics was widespread. Most Staphylococcal isolates demonstrated good susceptibility to Linezolid, Vancomycin, and Piperacillin–Tazobactam. Linezolid and Vancomycin were highly effective against Gram-positive organisms, demonstrating sensitivity rates of 92% and 84%, respectively. Among Gram-negative bacteria, Colistin, Meropenem, and Piperacillin–Tazobactam remained effective treatment options.

Furthermore, our study demonstrated that a 14-day course of antibiotic therapy produced better clinical outcomes than a 10-day treatment regimen. This finding is supported by several clinical guidelines, which recommend prolonged treatment durations for complicated UTIs, particularly in patients with renal involvement or other complicating factors.

Limitation of study:

1. This was a single-center study, which may limit the generalizability of the findings.
2. The sample size was relatively small for subgroup analysis.
3. Long-term renal outcomes after discharge were not assessed.
4. Molecular characterization of antimicrobial resistance mechanisms was not performed.
5. Some patients had pre-existing CKD and structural urinary tract abnormalities, which may have influenced renal outcomes independently of urosepsis.

CONCLUSION

Urosepsis-induced Acute Kidney Injury (AKI) is a severe, life-threatening complication that significantly increases short-term mortality and long-term risk of chronic kidney disease (CKD). It requires immediate source control,

antibiotic therapy, and hemodynamic stabilization to prevent irreversible end-organ damage.

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Original Article

Association of COVID-19 Infection with Musculoskeletal Function and Physical Performance among Adult Patients

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Abstract

Background: Coronavirus disease 2019 (COVID-19) is associated with a wide range of long-term health consequences, including musculoskeletal symptoms and impaired physical performance. Persistent muscle weakness, fatigue, and reduced functional capacity may adversely affect recovery and quality of life among affected individuals. This study aimed to assess the association of COVID-19 infection with musculoskeletal function and physical performance among adult patients.

Methods: This hospital-based cross-sectional analytical study was conducted in the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, from July 2021 to June 2022. A total of 155 adults with a history of confirmed COVID-19 infection were enrolled using purposive sampling. Data were collected through a structured questionnaire and clinical assessments. Muscle strength was evaluated using a handgrip dynamometer, physical performance by the Six-Minute Walk Test (6MWT), and fatigue by the Fatigue Severity Scale (FSS). Associations between COVID-19 severity and musculoskeletal outcomes were analyzed using the Chi-square test.

Results: Among the participants, 39.4% had mild, 37.4% moderate, and 23.2% severe COVID-19 infection. Overall, 72.3% reported at least one musculoskeletal symptom after infection. Muscle weakness (61.9%), joint pain (54.8%), and back pain (47.1%) were the most common complaints. Mean handgrip strength was 28.4±6.2 kg in males and 19.6±4.8 kg in females. The mean 6MWT distance was 412±68 meters, while the mean FSS score was 4.3±1.2. Reduced muscle strength, reduced walking capacity, and moderate-to-severe fatigue were observed in 63.2%, 58.1%, and 70.3% of participants, respectively. The prevalence of muscle weakness, reduced physical performance, and severe fatigue increased significantly with increasing COVID-19 severity ($p<0.001$).

Conclusion: COVID-19 infection is associated with significant musculoskeletal impairment, reduced physical performance, and fatigue, particularly among patients with severe disease. Early rehabilitation interventions may improve functional recovery and long-term outcomes.

Keywords: COVID-19; Musculoskeletal Function; Physical Performance; Muscle Strength; Functional impairment.

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Introduction

Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has affected millions of people worldwide and remains a major public health concern. Beyond its acute respiratory manifestations, COVID-19 has been associated with persistent health problems involving multiple organ systems, including the musculoskeletal system, resulting in prolonged symptoms and functional impairment among affected individuals [1].

Musculoskeletal disorders are among the leading causes of disability worldwide and are associated with pain, reduced mobility, and impaired physical function[2,3]. In Bangladesh, musculoskeletal conditions constitute a significant public health burden, affecting a considerable proportion of the adult population and contributing to disability and reduced quality of life[4]. The COVID-19 pandemic has further exacerbated these concerns through direct disease-related effects as well as indirect consequences such as reduced physical activity, prolonged inactivity, and lifestyle modifications [5-7].

Physical activity plays a crucial role in maintaining musculoskeletal health, muscle strength, and functional capacity through complex interactions between the musculoskeletal and physiological systems [8]. However, restrictions imposed during the pandemic, together with the effects of COVID-19 infection itself, have been associated with decreased physical activity levels, reduced exercise tolerance, muscle weakness, fatigue, and impaired physical performance [5,6]. These impairments may limit an individual's ability to perform daily activities and negatively affect overall quality of life.

Recent studies have reported a high prevalence of musculoskeletal manifestations among individuals following COVID-19 infection, including muscle weakness, joint pain, myalgia, fatigue, and reduced physical function [3,9]. Furthermore, the severity of COVID-19 infection appears to be associated with the extent of subsequent musculoskeletal and functional impairments [10]. Despite growing international evidence, data regarding the impact of COVID-19 infection on musculoskeletal function and physical performance among adult patients in Bangladesh remain limited.

Therefore, this study was undertaken to assess the association of COVID-19 infection with musculoskeletal function and physical performance among adult patients attending the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka. The findings of this study may contribute to a better understanding of post-COVID musculoskeletal sequelae and provide evidence for the development of appropriate rehabilitation strategies for affected individuals.

METHODOLOGY

This hospital-based cross-sectional analytical study was conducted in the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh. The study period extended from July 2021 to June 2022. The aim was to evaluate the impact of COVID-19 infection on musculoskeletal function and physical performance among adult patients.

The study population included adult patients aged 18 years and above with a history of confirmed COVID-19 infection who attended the Department of Physical Medicine and Rehabilitation during the study period. Patients were selected using a purposive sampling technique. A total of 155 participants were enrolled in the study based on predefined inclusion and exclusion criteria.

Patients with confirmed COVID-19 infection documented by RT-PCR or clinical diagnosis and who were at least four weeks post-acute infection were included in the study. Individuals with pre-existing musculoskeletal disorders such as rheumatoid arthritis, advanced osteoarthritis with functional limitation, neuromuscular diseases, history of stroke or other neurological conditions affecting mobility, severe psychiatric illness, pregnant women, and those who declined to participate were excluded from the study.

The severity of COVID-19 infection was classified according to World Health Organization (WHO) clinical criteria. Mild cases were defined as symptomatic patients without evidence of pneumonia or hypoxia. Moderate cases included patients with clinical or radiological evidence of pneumonia with oxygen saturation (SpO_2) ≥94% on room air. Severe cases were defined as patients with SpO_2 <94%, signs of respiratory distress, or those requiring hospitalization, oxygen therapy, or intensive care support. Data were collected using a structured interviewer-administered questionnaire along with clinical and functional assessments. Musculoskeletal function was evaluated based on patient-reported symptoms including muscle pain, joint pain, stiffness, and functional limitations, supported by clinical examination. Muscle strength was assessed using a handgrip dynamometer, and the best of three measurements for each hand was recorded in kilograms. Physical performance was assessed using the Six-Minute Walk Test (6MWT) following standardized American Thoracic Society guidelines, and the total walking distance in meters was recorded. Fatigue was evaluated using the Fatigue Severity Scale (FSS), where a mean score of ≥4 indicated significant fatigue.

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics were expressed as frequency, percentage, mean, and standard deviation. The Chi-square (χ^2) test was used to assess the association between COVID-19 severity and musculoskeletal outcomes. A p-value of less than 0.05 was considered statistically significant.

Ethical approval for the study was obtained from the Institutional Review Board (IRB) of BSMMU. Written informed consent was obtained from all participants prior to data collection.

RESULTS

A total of 155 adult patients with history of COVID-19 infection attending BSMMU were included in the study. The results are presented below in structured tables with corresponding descriptions.

Socio-demographic characteristics of study participants

Table 1 shows that the highest proportion of participants belonged to the 40–59 years age group (48.4%). Males were slightly higher than females (56.8% vs 43.2%). Regarding BMI, 42.6% were overweight, while 29.0% were obese.

Table 1: Socio-demographic characteristics of study participants (N=155)

Characteristics	Frequency (n)	Percentage (%)
Age group (years)		
20–39	51	32.9
40–59	75	48.4
≥60	29	18.7
Gender		
Male	101	65.2
Female	54	34.8
BMI category		
Normal	44	28.4
Overweight	66	42.6
Obese	45	29.0

Clinical characteristics of COVID-19 infection

Table 2 shows that the majority of participants had mild COVID-19 infection (39.4%), followed by moderate (37.4%) and severe cases (23.2%). Among clinical symptoms, fever (82.6%) and fatigue (74.2%) were the most common, followed by cough (68.4%), myalgia (55.5%), and dyspnea (41.9%).

Table 2: Clinical characteristics of COVID-19 infection (N=155)

Variables	Frequency (n)	Percentage (%)
Severity of COVID-19		
Mild	61	39.4
Moderate	58	37.4
Severe	36	23.2
Common symptoms during infection		
Fever	128	82.6
Fatigue	115	74.2
Cough	106	68.4
Myalgia	86	55.5
Dyspnea	65	41.9

Musculoskeletal symptomsafter COVID-19 infection

Table 3 shows that 72.3% of participants reported at least one musculoskeletal symptom after COVID-19 infection. The most common complaint was muscle weakness (61.9%), followed by joint pain (54.8%) and back pain (47.1%). Shoulder stiffness (38.7%), knee pain (35.5%), and hand grip weakness (33.5%) were also reported among a considerable proportion of participants.

Table 3: Musculoskeletal symptoms after COVID-19 infection (N=155)

Musculoskeletal symptoms	Frequency (n)	Percentage (%)
Muscle weakness	96	61.9
Joint pain	85	54.8
Back pain	73	47.1
Shoulder stiffness	60	38.7
Knee pain	55	35.5
Hand grip weakness	52	33.5
Any musculoskeletal symptom	112	72.3

Muscle strength and physical performance

Table 4 demonstrates reduced physical performance among participants. Mean handgrip strength was lower in females (19.6 ± 4.8 kg) compared to males (28.4 ± 6.2 kg). The mean 6-minute walk distance was 412 ± 68 meters, indicating reduced exercise capacity compared to normal expected values. The mean Fatigue Severity Scale score was 4.3 ± 1.2, suggesting moderate fatigue among the participants.

Table 4: Muscle strength and physical performance among participants

Variables	Mean ± SD
Handgrip strength (kg) – Male	28.4 ± 6.2
Handgrip strength (kg) – Female	19.6 ± 4.8
6-minute walk distance (meters)	412 ± 68
Fatigue Severity Scale (FSS) score	4.3 ± 1.2

Functional impairment

Table 5 shows a high prevalence of functional impairment among participants. Reduced muscle strength was observed in 63.2% of participants, while 58.1% had reduced walking capacity (<80% of predicted). Marked functional limitation (<60% of predicted) was found in 21.3% of participants. Overall, moderate to severe fatigue was reported in 70.3% of the study population.

Table 5: Functional impairment among study participants

Outcome	Frequency (n)	Percentage (%)
Reduced muscle strength	98	63.2
Reduced walking capacity (<80% predicted)	90	58.1
Marked functional limitation (<60% predicted)	33	21.3
Moderate to severe fatigue	109	70.3

COVID-19 severity and musculoskeletal outcomes

Table 6 demonstrates a statistically significant association between COVID-19 severity and musculoskeletal outcomes. The prevalence of muscle weakness, reduced 6-minute walk test (6MWT) performance, and severe fatigue increased progressively with increasing severity of COVID-19 infection. Patients with severe COVID-19 showed the highest proportion of muscle weakness (80.6%), reduced 6MWT performance (80.6%), and severe fatigue (86.1%), compared to those with mild and moderate disease. The differences across severity groups were statistically significant for all outcomes ($p < 0.001$).

Table 6: Association between COVID-19 severity and musculoskeletal outcomes

Severity	Muscle weakness n (%)	Reduced 6MWT n (%)	Severe fatigue n (%)	p-value
Mild	28 (45.9)	24 (39.3)	33 (54.1)	<0.001
Moderate	39 (67.2)	37 (63.8)	45 (77.6)	<0.001
Severe	29 (80.6)	29 (80.6)	31 (86.1)	<0.001

DISCUSSION

The present study demonstrated that musculoskeletal symptoms, reduced muscle strength, impaired physical performance, and fatigue were common among adults recovering from COVID-19 infection. More than two-thirds of the participants reported at least one musculoskeletal symptom, with muscle weakness and joint pain being the most frequent complaints. These findings are consistent with previous studies that reported a high prevalence of persistent musculoskeletal manifestations following COVID-19 infection, even among patients with mild to moderate disease [11,12].

Physical performance was notably affected in the study population. The mean six-minute walk distance was reduced, and more than half of the participants exhibited decreased walking capacity. Similar reductions in exercise tolerance and functional performance among post-COVID patients have been reported in earlier studies, indicating persistent limitations in physical functioning after recovery from acute infection[13,14]. Furthermore, reduced muscle strength was observed in a substantial proportion of participants, supporting evidence that COVID-19 may lead to prolonged muscle deconditioning and impaired functional capacity [15,16].

Fatigue was another prominent finding, with the majority of participants experiencing moderate to severe fatigue. Persistent fatigue has been consistently identified as one of the most common long-term sequelae of COVID-19 and has been associated with reduced quality of life and limitations in daily activities [14, 17].

A significant association was observed between COVID-19 severity and adverse musculoskeletal outcomes. The prevalence of muscle weakness, reduced walking performance, and severe fatigue increased progressively from mild to severe disease categories. Similar findings have been reported in previous studies, where patients with more severe COVID-19 experienced greater functional impairment and poorer physical performance during recovery [13,14].

The observed impairments may be attributed to systemic inflammation, prolonged inactivity, hospitalization, muscle deconditioning, and reduced physical activity during and after illness. Pandemic-related restrictions and sedentary lifestyles may have further contributed to worsening musculoskeletal health and physical performance [18-20].

Overall, the findings suggest that COVID-19 infection has a substantial impact on musculoskeletal function and physical performance, particularly among patients with severe disease.

CONCLUSION

This study demonstrated a high prevalence of musculoskeletal symptoms and functional impairment among adult patients with a history of COVID-19 infection. Muscle weakness, joint pain, back pain, reduced muscle strength, impaired walking capacity, and moderate to severe fatigue were common findings. Physical performance, as assessed by handgrip strength and the 6-minute walk test, was notably reduced among the participants. Furthermore, the severity of COVID-19 infection was significantly associated with adverse musculoskeletal outcomes, with patients experiencing severe disease showing the greatest degree of muscle weakness, reduced exercise capacity, and fatigue. These findings highlight the substantial impact of COVID-19 on musculoskeletal function and physical performance and emphasize the importance of early assessment, rehabilitation, and long-term follow-up of affected patients to improve functional recovery and quality of life.

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Original Article

Prevalence and Pattern of Pediatric Musculoskeletal Deformities in a Tertiary Care Hospital

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Abstract

Background: Pediatric musculoskeletal deformities are an important cause of childhood disability, leading to impaired mobility, functional limitation, and reduced quality of life. Data on the pattern of these deformities in Bangladesh are limited. This study aimed to determine the prevalence and pattern of pediatric musculoskeletal deformities in a tertiary care hospital.

Methods: This cross-sectional study was conducted in the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from July 2023 to June 2024. A total of 320 children aged 0–18 years with clinically diagnosed musculoskeletal deformities were enrolled using consecutive sampling. Data on socio-demographic characteristics, deformity pattern, anatomical distribution, severity, associated clinical conditions, and rehabilitation interventions were collected through clinical assessment and medical record review. Descriptive statistics and the Chi-square test were used for data analysis.

Results: The mean age of the participants was 8.6±4.1 years, and 59.4% were male. Cerebral palsy-related deformities (25.9%) were the most common condition, followed by clubfoot (21.3%), genu valgum (13.1%), and scoliosis (10.0%). Lower limb involvement was observed in 61.9% of children, while 52.5% had bilateral deformities. Moderate deformities accounted for 45.0% of cases. Developmental delay was the most common associated condition (20.0%). Physiotherapy (90.6%) and home exercise programmes (76.9%) were the most frequently recommended interventions. A significant association was found between deformity severity and developmental delay (χ^2=27.35, p<0.001).

Conclusion: Cerebral palsy-related deformities and clubfoot were the predominant pediatric musculoskeletal deformities in this tertiary rehabilitation center, with lower limb involvement being the most common presentation. Early diagnosis, multidisciplinary rehabilitation, and timely intervention are essential to improve functional outcomes in affected children.

Keywords: Pediatric musculoskeletal deformities; Prevalence, Cerebral palsy; Clubfoot; Developmental delay.

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Introduction

Pediatric musculoskeletal deformities comprise a wide range of congenital and acquired disorders affecting bones, joints, muscles, and connective tissues, and are

important causes of childhood disability worldwide[1]. These conditions can impair physical growth, mobility, and functional independence, thereby reducing the quality of life of affected children if left untreated[2].

Congenital musculoskeletal deformities, including clubfoot, limb reduction defects, polydactyly, syndactyly, and developmental dysplasia of the hip, represent a significant proportion of congenital anomalies encountered in pediatric orthopedic practice [3-5].Their occurrence is influenced by genetic, environmental, and maternal factors, while acquired deformities may result from trauma, infections, neuromuscular disorders, and metabolic bone diseases[2,3]. Early recognition and appropriate management are essential, as untreated musculoskeletal deformities may lead to permanent disability, chronic pain, psychological distress, and considerable socioeconomic burden for affected children and their families[2,6,7].

The prevalence and pattern of pediatric musculoskeletal deformities vary across regions due to differences in population characteristics, healthcare access, and referral practices [1,3]. Previous studies have reported that congenital musculoskeletal anomalies constitute a substantial proportion of pediatric orthopedic conditions, with lower limb deformities, particularly clubfoot, being the most common presentations[3-5,8].

In Bangladesh, information on pediatric musculoskeletal deformities is limited, as most published studies have focused on congenital birth defects in general rather than the specific spectrum of musculoskeletal disorders [9]. Consequently, evidence regarding the prevalence and clinical pattern of pediatric musculoskeletal deformities in tertiary care hospitals remains inadequate.

Understanding the prevalence and pattern of these deformities is essential for planning early diagnosis, timely intervention, and appropriate orthopedic services. Therefore, the present study aimed to determine the prevalence and pattern of pediatric musculoskeletal deformities in a tertiary care hospital, providing evidence to support clinical practice and healthcare planning in Bangladesh.

METHODOLOGY

This cross-sectional study was conducted in the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from July 2023 to June 2024. The study included pediatric patients aged 0–18 years who attended the department with clinically diagnosed musculoskeletal deformities during the study period. A total of 320 participants were enrolled using a consecutive sampling technique. Children with congenital or acquired musculoskeletal deformities were included, while those with acute traumatic injuries without deformity, incomplete clinical records, or whose parents/guardians declined participation were excluded from the study.

Data were collected using a structured data collection form through clinical assessment and review of medical records. Information regarding socio-demographic characteristics, type and anatomical distribution of deformities, laterality, severity, associated clinical conditions, and recommended rehabilitation interventions was recorded. Deformities were categorized according to clinical diagnosis, and severity was classified as mild, moderate, or severe based on clinical assessment and functional limitations documented by the treating physicians. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0. Descriptive statistics were used to summarize the findings, with continuous variables expressed as mean ± standard deviation and categorical variables presented as frequencies and percentages. The association between severity of deformity and developmental delay was assessed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant. Ethical approval was obtained from the Institutional Review Board of BSMMU, and written informed consent was obtained from the parents or legal guardians of all participants.

RESULTS

A total of 320 pediatric patients with musculoskeletal deformities attending the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, during the study period were included in the study.

Socio-demographic Characteristics

Table 1 presents the socio-demographic characteristics of the study participants. The mean age of the children was 8.6±4.1 years. The highest proportion of participants belonged to the 5–9 years age group (35.3%), followed by the 10–14 years age group (30.6%). Children aged below 5 years constituted 21.9% of the study population, while 12.2% were aged 15–18 years. Male participants predominated, accounting for 59.4% of the sample, whereas females comprised 40.6%. More than half of the participants (56.9%) were from urban areas, while 43.1% resided in rural areas (Table 1).

Table 1. Socio-demographic characteristics of the study participants (n=320)

Variable	Frequency	Percentage (%)
Age group (years)		
<5	70	21.9
5–9	113	35.3
10–14	98	30.6
15–18	39	12.2
Mean age ± SD	8.6 ± 4.1 years	
Sex		
Male	190	59.4
Female	130	40.6
Residence		
Urban	182	56.9
Rural	138	43.1

Pattern of Pediatric Musculoskeletal Deformities

The distribution of musculoskeletal deformities among the study participants is shown in Table 2. Cerebral palsy-related deformities were the most common condition, affecting 25.9% of the children. Clubfoot (CTEV) was the second most prevalent deformity, accounting for 21.3% of cases. Other common deformities included genu valgum (13.1%), scoliosis (10.0%), and genu varum (8.8%). Developmental dysplasia of the hip (5.6%), limb length discrepancy (5.0%), pes planus (4.4%), and congenital upper limb deformities (2.8%) were less frequently observed. Miscellaneous deformities accounted for 3.1% of cases (Table 2).

Table 2. Distribution of musculoskeletal deformities among study participants (n=320)

Type of deformity	Frequency	Percentage (%)
Cerebral palsy-related deformity	83	25.9
Clubfoot (CTEV)	68	21.3
Genu valgum	42	13.1
Scoliosis	32	10.0
Genu varum	28	8.8
Developmental dysplasia of hip (DDH)	18	5.6
Limb length discrepancy	16	5.0
Pes planus	14	4.4
Congenital upper limb deformity	9	2.8
Others	10	3.1

Anatomical Distribution of Deformities

Table 3 illustrates the anatomical distribution of musculoskeletal deformities. The lower limb was the most commonly affected region, involving 61.9% of participants. Spinal deformities were observed in 15.0% of children, while upper limb deformities accounted for 11.3% of cases. Hip and pelvic involvement was present in 7.5% of participants, and 4.3% had deformities affecting multiple anatomical sites (Table 3).

Table 3. Anatomical distribution of deformities (n=320)

Anatomical site	Frequency	Percentage (%)
Lower limb	198	61.9
Spine	48	15.0
Upper limb	36	11.3
Hip/Pelvis	24	7.5
Multiple sites	14	4.3

Laterality of Deformities

The laterality of musculoskeletal deformities is presented in Table 4. More than half of the deformities were bilateral (52.5%). Right-sided deformities were identified in 25.6% of participants, whereas left-sided deformities accounted for 21.9% of cases (Table 4).

Table 4. Laterality of deformities (n=320)

Laterality	Frequency	Percentage (%)
Bilateral	168	52.5
Right-sided	82	25.6
Left-sided	70	21.9

Severity of Deformities

As shown in Table 5, moderate deformities constituted the largest proportion of cases (45.0%). Mild deformities were observed in 31.3% of participants, while severe deformities accounted for 23.7% of the study population (Table 5).

Table 5. Severity of deformities (n=320)

Severity	Frequency	Percentage (%)
Mild	100	31.3
Moderate	144	45.0
Severe	76	23.7

Associated Clinical Conditions

Table 6 shows the associated clinical conditions among the study participants. Developmental delay was the most common associated condition, affecting 20.0% of children. Epilepsy and intellectual disability were present in 11.3% and 10.0% of participants, respectively. Visual impairment was identified in 5.6% of cases, while hearing impairment was reported in 3.1%. Half of the participants (50.0%) had no documented associated clinical condition (Table 6).

Table 6. Associated clinical conditions among study participants (n=320)

Associated condition	Frequency	Percentage (%)
Developmental delay	64	20.0
Epilepsy	36	11.3
Intellectual disability	32	10.0
Visual impairment	18	5.6
Hearing impairment	10	3.1
No associated condition	160	50.0

Rehabilitation and Management Requirements

The rehabilitation and management interventions recommended for the participants are summarized in Table 7. Physiotherapy was the most frequently prescribed

intervention, recommended for 90.6% of children. Home exercise programmes were advised for 76.9% of participants, while regular rehabilitation follow-up was recommended for 74.4%. More than half of the children (55.0%) required orthotic or brace prescription. Corrective surgery referral was indicated for 23.1% of cases, and serial casting was recommended for 13.1% of participants (Table 7).

Table 7. Recommended rehabilitation and management interventions (n=320)

Intervention	Frequency	Percentage (%)
Physiotherapy	290	90.6
Home exercise programme	246	76.9
Orthotic/Brace prescription	176	55.0
Regular rehabilitation follow-up	238	74.4
Corrective surgery referral	74	23.1
Serial casting	42	13.1

Association between severity of deformity and developmental delay

Table 8 shows a statistically significant association between the severity of musculoskeletal deformity and the presence of developmental delay (χ^2=27.35, p<0.001). The proportion of developmental delay increased progressively with increasing severity of deformity, from 10.0% among children with mild deformities to 39.5% among those with severe deformities. Children with severe deformities were more likely to have developmental delay compared with those having mild or moderate deformities (Table 8).

Table 8. Association between severity of deformity and developmental delay among study participants (n=320)

Severity of deformity	**Developmental delay Present n (%)**	**Developmental delay Absent n (%)**	χ^2	**p-value**
Mild (n=100)	10 (10.0)	90 (90.0)	27.35	<0.001
Moderate (n=144)	24 (16.7)	120 (83.3)		
Severe (n=76)	30 (39.5)	46 (60.5)		

Chi-square test was applied.A p-value <0.05 was considered statistically significant

DISCUSSION

The present study found that cerebral palsy-related deformities (25.9%) were the most common pediatric musculoskeletal deformities, followed by clubfoot (21.3%), genu valgum (13.1%), and scoliosis (10.0%). These findings differ from previous hospital-based studies, in which congenital musculoskeletal anomalies, particularly clubfoot and limb deformities, were the predominant conditions[10,11]. The higher proportion of cerebral palsy-related deformities in the present study may be explained by the study setting, as it was conducted in a tertiary rehabilitation center that receives a large number of referrals for children with neurological disabilities. This observation is supported by previous evidence showing that neurological disorders constitute a major component of pediatric musculoskeletal admissions in tertiary hospitals[12].Clubfoot was the second most common deformity in the present study, which is comparable to previous studies where clubfoot was reported as one of the most frequent congenital musculoskeletal anomalies[12,13]. Early diagnosis and conservative treatment of clubfoot have been shown to improve functional outcomes and reduce long-term disability, emphasizing the importance of timely referral and intervention[13].

The lower limb was the most frequently affected anatomical site (61.9%), followed by the spine and upper limb. Similar findings have been reported in previous studies, where lower limb deformities represented the largest proportion of pediatric musculoskeletal abnormalities[10,11]. The predominance of lower limb involvement may be attributed to the high frequency of clubfoot, genu valgum, genu varum, and cerebral palsy-related lower limb deformities, all of which substantially affect gait and mobility[14].

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Regarding management, physiotherapy was the most frequently recommended intervention, followed by home exercise programmes and orthotic prescription. These findings are consistent with current rehabilitation recommendations, which emphasize physiotherapy and structured home exercise programmes as the cornerstone of pediatric musculoskeletal management[18]. Nearly one-quarter of the participants required referral for corrective surgery, indicating that multidisciplinary management combining rehabilitation and orthopedic intervention remains essential for children with severe deformities[19].

CONCLUSION

Pediatric musculoskeletal deformities are common among children attending tertiary rehabilitation services, with cerebral palsy-related deformities and clubfoot being the predominant conditions. Lower limb involvement was the most frequent presentation, and developmental delay was the most common associated clinical condition. The

significant association between developmental delay and deformity severity highlights the importance of early diagnosis, comprehensive assessment, and multidisciplinary rehabilitation to improve functional outcomes in affected children.

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Original Article

Impact of a Multidisciplinary Rehabilitation Program on Quality of Life in Oral Cancer Survivors: A Randomised Controlled Trial

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Abstract

Background: Oral cancer survivors often experience long-term functional impairments, including dysphagia, speech difficulties, trismus, pain, nutritional problems, and psychosocial distress, which significantly reduce HRQoL. Evidence on the effectiveness of structured rehabilitation in low- and middle-income countries is limited. This study assessed the impact of a multidisciplinary rehabilitation programme on HRQoL among Bangladeshi survivors.

Methods: A randomized controlled trial at Bangabandhu Sheikh Mujib Medical University from July 2023 to July 2024 involved 80 oral squamous cell carcinoma survivors, randomly assigned to intervention (n=40) or control (n=40) groups. The intervention included a 12-week multidisciplinary rehab program with therapy, exercises, nutrition, oral hygiene, and psychosocial support, while controls received routine care. HRQoL was measured with EORTC QLQ-C30 and QLQ-H&N35. Secondary outcomes were mouth opening, weight, nutrition, adherence, satisfaction, and adverse events.

Results: Baseline demographic, clinicopathological, and HRQoL characteristics were comparable between the groups (all p> 0.05). Following rehabilitation, the intervention group demonstrated significantly greater improvement in global HRQoL than the control group (+13.8 ± 6.2 vs. +3.7 ± 5.5; mean difference, 10.1; 95% CI, 7.5–12.7; p< 0.001). Significant improvements were also observed in swallowing (p< 0.001), speech (p = 0.002), pain (p = 0.004), mouth opening (p = 0.006), body weight (p = 0.031), nutritional status (p< 0.001), rehabilitation adherence (p< 0.001), and patient satisfaction (p< 0.001). No significant differences in adverse events were identified between the groups.

Conclusions: A structured multidisciplinary rehabilitation program significantly improved HRQoL and multiple functional outcomes in oral cancer survivors while demonstrating excellent adherence and a favorable safety profile. These findings support the integration of multidisciplinary rehabilitation into routine survivorship care, particularly in resource-limited settings.

Keywords: Oral cancer; multidisciplinary rehabilitation; quality of life; survivorship; dysphagia; randomized controlled trial.

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Introduction

Oral cancer is a major public health concern and remains one of the most prevalent malignancies in South Asia.

Bangladesh bears a substantial disease burden owing to the widespread use of smokeless tobacco and betel quid, both of which are well-established risk factors for oral carcinogenesis [1,2]. Recent epidemiological evidence indicates that South and South-East Asia account for more than half of global oral cancer mortality, with Bangladesh continuing to experience a high incidence and mortality rate [3].

Advances in surgical techniques and multimodal oncological treatment have significantly improved survival among patients with oral cancer. However, oral cancer survivors frequently experience persistent treatment-related complications, including dysphagia, speech impairment, trismus, xerostomia, nutritional deterioration, and psychosocial distress, which substantially impair health-related quality of life (HRQoL) [4,5]. These long-term functional deficits adversely affect eating, communication, social participation, and emotional well-being, making HRQoL an important outcome in oral cancer survivorship and highlighting the need for comprehensive rehabilitation.

Multidisciplinary rehabilitation is increasingly recognized as an essential component of survivorship care for patients with head and neck cancer. Rehabilitation programs integrating speech and swallowing therapy, nutritional counseling, physical therapy, and psychosocial support have demonstrated improvements in functional recovery and several quality-of-life domains [6,7]. Nevertheless, the overall effectiveness of these programs remains uncertain. Recent evidence indicates that although multidisciplinary rehabilitation improves functional outcomes, its impact on overall HRQoL varies considerably because of differences in rehabilitation protocols, intervention intensity, outcome measures, and follow-up duration [8].

Despite improvements in cancer survival, rehabilitation remains an underutilized component of oral cancer survivorship care in Bangladesh. Rehabilitation services are fragmented and are rarely delivered through a coordinated multidisciplinary approach. Consequently, many survivors continue to experience preventable long-term functional disability, nutritional compromise, and poor quality of life despite successful oncological treatment. Furthermore, most rehabilitation studies have been conducted in high-income countries with well-established rehabilitation infrastructure, limiting the applicability of their findings to resource-constrained healthcare systems such as Bangladesh [9,10]. Differences in healthcare infrastructure, availability of rehabilitation specialists, socioeconomic conditions, and access to supportive care may substantially influence both the feasibility and effectiveness of multidisciplinary rehabilitation in this setting.

Therefore, an important evidence gap exists regarding the effectiveness of structured multidisciplinary rehabilitation programs for improving HRQoL among oral cancer survivors in low- and middle-income countries. To date, no published randomized controlled trial has comprehensively evaluated a structured multidisciplinary rehabilitation program for oral cancer survivors in Bangladesh. Consequently, robust evidence to support the routine integration of multidisciplinary rehabilitation into oral cancer survivorship care in Bangladesh remains lacking.

Accordingly, the present randomized controlled trial aimed to evaluate the effectiveness of a structured multidisciplinary rehabilitation program comprising speech and swallowing therapy, nutritional counseling, physical therapy, and psychosocial support on health-related quality of life among oral cancer survivors in Bangladesh. The findings of this study are expected to provide context-specific evidence to guide clinical practice, strengthen multidisciplinary survivorship care, and inform rehabilitation policy in resource-limited healthcare settings.

Materials and Methods

Study design and setting

This prospective, parallel-group, randomized controlled trial was conducted at Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from July 2023 to July 2024. The study was designed and reported in accordance with the Consolidated Standards of Reporting Trials (CONSORT) 2010 statement (Schulz et al., 2010).

Study participants

A total of 80 oral cancer survivors were enrolled and randomly assigned in a 1:1 ratio to either the intervention group (n = 40) or the control group (n = 40). Eligible participants were aged 18 years or older, had histopathologically confirmed oral squamous cell carcinoma, had completed primary treatment (surgery with or without radiotherapy and/or chemotherapy) within the preceding 6–12 months, were disease-free at enrollment, were able to understand and complete the study questionnaires, and provided written informed consent. Patients were excluded if they had recurrent or metastatic disease, severe neurological or psychiatric disorders that could interfere with participation, another active malignancy, medical conditions precluding rehabilitation, or were unwilling or unable to complete follow-up.

Sample size calculation

The sample size was calculated using G Power version 3.1 [11]. Based on the primary outcome of health-related quality of life (HRQoL), a moderate standardized effect size (d = 0.65), a two-sided significance level (α) of 0.05, and 80% statistical power were assumed. The minimum required sample size was 72 participants. To compensate for an anticipated 10% attrition rate, the sample size was increased to 80 participants, with 40 participants allocated to each study group.

Randomization and blinding

Participants were randomly allocated to the intervention or control group using a computer-generated block randomization sequence with a block size of four. Allocation concealment was maintained using sequentially numbered, opaque, sealed envelopes prepared by an independent investigator who was not involved in participant recruitment or outcome assessment. Owing to the nature of the intervention, blinding of participants and therapists was not feasible. However, outcome assessors and the statistician were blinded to treatment allocation.

Intervention

Participants allocated to the intervention group received a 12-week comprehensive multidisciplinary rehabilitation program in addition to routine postoperative care. The rehabilitation program was delivered by a multidisciplinary team comprising an oral and maxillofacial surgeon, speech and language therapist, physiotherapist, dietitian, and clinical psychologist.

The program consisted of supervised 60-minute sessions conducted once weekly, together with daily home-based exercises. Rehabilitation components included speech and swallowing therapy, jaw-opening and mandibular mobility exercises, nutritional assessment with individualized dietary counseling, physical therapy focusing on neck and shoulder mobility, oral hygiene education, and psychosocial counseling. Home exercise compliance was monitored during each follow-up visit.

Control group

Participants assigned to the control group received routine postoperative follow-up care, including regular clinical assessment, standard medical advice, nutritional recommendations, and symptom-based management, but did not participate in the structured multidisciplinary rehabilitation program.

Outcome measures

The primary outcome was the change in health-related quality of life (HRQoL) following completion of the rehabilitation program.

HRQoL was assessed using the validated European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (EORTC QLQ-C30) and the EORTC Head and Neck Cancer Module (QLQ-H&N35) [12,13]. Questionnaire scoring was performed according to the EORTC Scoring Manual. The instruments evaluated global health status, physical, role, emotional, cognitive, and social functioning, together with head and neck cancer-specific symptoms, including pain, swallowing difficulties, speech problems, xerostomia, and taste impairment.

Secondary outcome measures included mouth opening (maximum inter-incisal distance, mm), body weight (kg), nutritional status, rehabilitation adherence, patient satisfaction, and adverse events. All assessments were performed at baseline and immediately after completion of the 12-week rehabilitation program.

Data collection

Baseline demographic and clinicopathological characteristics, including age, sex, body mass index (BMI), smoking history, alcohol consumption, primary tumor site, AJCC stage, treatment modality, and time since completion of treatment, were recorded using a standardized case record form. Clinical and questionnaire assessments were performed by trained investigators who were independent of the rehabilitation team.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Data normality was assessed using the Shapiro–Wilk test. Continuous variables were expressed as mean ± standard deviation (SD), whereas categorical variables were presented as frequencies and percentages.

Baseline characteristics between groups were compared using the independent-samplest-test for continuous variables and the chi-square test or Fisher's exact test for categorical variables. Within-group changes from baseline to post-intervention were analyzed using the paired-samples t-test. Between-group differences in outcome changes were assessed using the independent-samples t-test, and mean differences with 95% confidence intervals (CI) were calculated where appropriate. All statistical tests were two-sided, and a p-value <0.05 was considered statistically significant.

Ethical considerations

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board of Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh. Written informed consent was obtained from all participants before enrollment. Participant confidentiality and anonymity were maintained throughout the study.

Results

Table 1 summarizes the baseline demographic and clinicopathological characteristics of the study participants. The intervention and control groups were comparable with respect to age, sex, body mass index, smoking status, alcohol consumption, primary tumor site, AJCC stage, treatment modality, and time since completion of treatment, with no statistically significant differences observed between the groups (all $p> 0.05$). These findings indicate that the two groups were well balanced at baseline.

Table 1: Baseline demographic and clinicopathological characteristics of participants in the intervention and control groups

Characteristic	Intervention (n = 40)	Control (n = 40)	p-value
Age (years), mean ± SD	54.1 ± 9.6	53.4 ± 10.2	0.748
Sex, n (%)			0.816
Male	29 (72.5)	28 (70.0)	
Female	11 (27.5)	12 (30.0)	
BMI (kg/m^2), mean ± SD	23.6 ± 3.2	23.3 ± 3.5	0.682
Smoking history, n (%)			0.821
Current/Former smoker	26 (65.0)	25 (62.5)	
Never smoker	14 (35.0)	15 (37.5)	
Alcohol consumption, n (%)			0.641
Yes	13 (32.5)	11 (27.5)	
No	27 (67.5)	29 (72.5)	
Primary tumor site, n (%)			0.934
Buccal mucosa	18 (45.0)	17 (42.5)	
Tongue	12 (30.0)	13 (32.5)	
Floor of mouth	6 (15.0)	6 (15.0)	
Gingiva/Alveolus	4 (10.0)	4 (10.0)	
AJCC stage, n (%)			0.884
Stage II	9 (22.5)	10 (25.0)	
Stage III	18 (45.0)	17 (42.5)	
Stage IV	13 (32.5)	13 (32.5)	
Treatment modality, n (%)			0.917
Surgery only	8 (20.0)	7 (17.5)	
Surgery + Radiotherapy	20 (50.0)	21 (52.5)	
Surgery + Chemoradiotherapy	12 (30.0)	12 (30.0)	
Time since completion of treatment (months), mean ± SD	8.9 ± 2.7	9.2 ± 2.9	0.635

Values are presented as mean ± standard deviation (SD) or number (%). Continuous variables were compared using the independent-samples t-test, and categorical variables using the chi-square test or Fisher's exact test, as appropriate. P< 0.05 was considered statistically significant.

BMI, body mass index; AJCC, American Joint Committee on Cancer; SD, standard deviation.

Table 2 presents the baseline quality-of-life (QoL) scores of participants assessed using the EORTC QLQ-C30 and EORTC QLQ-H&N35 questionnaires. Baseline global health status and all functional domains, including physical, role, emotional, cognitive, and social functioning, were comparable between the intervention and control groups (all p > 0.05). Similarly, no significant differences were observed in symptom domains, including pain, swallowing, speech, dry mouth, and taste problems, indicating that both groups had similar quality-of-life status before initiation of the multidisciplinary rehabilitation program.

Table 2: Baseline quality-of-life scores of participants measured using the EORTC QLQ-C30 and EORTC

QoL Domain	Intervention (n = 40) Mean ± SD	Control (n = 40) Mean ± SD	p-value
Global health status	61.8 ± 11.2	60.5 ± 10.8	0.602
Physical functioning	73.4 ± 12.5	72.1 ± 11.9	0.638
Role functioning	69.2 ± 13.6	68.0 ± 14.2	0.701
Emotional functioning	66.5 ± 11.8	65.2 ± 12.1	0.627
Cognitive functioning	79.3 ± 10.5	78.5 ± 11.0	0.741
Social functioning	71.0 ± 12.7	69.8 ± 13.2	0.680
Pain*	38.5 ± 16.3	39.7 ± 15.9	0.736
Swallowing*	42.8 ± 18.1	44.1 ± 17.6	0.744
Speech*	35.4 ± 15.2	36.6 ± 14.9	0.718
Dry mouth*	46.9 ± 19.4	48.1 ± 18.8	0.776
Taste problems*	40.7 ± 17.8	42.3 ± 18.5	

Values are presented as mean ± SD. Higher EORTC QLQ-C30 functional scores indicate better functioning, whereas higher EORTC QLQ-H&N35 symptom scores indicate greater symptom burden. P< 0.05 was considered statistically significant.

QoL, quality of life; SD, standard deviation; EORTC, European Organisation for Research and Treatment of Cancer; QLQ-C30, Quality of Life Questionnaire-Core 30; QLQ-H&N35, Head and Neck Cancer Module.

Table 3 compares quality-of-life and functional outcomes before and after the multidisciplinary rehabilitation programme. The intervention group showed significantly greater improvement in global QoL than the control group (61.8 ± 11.2 to 75.6 ± 10.4 vs. 60.5 ± 10.8 to 64.2 ± 11.1; $p < 0.001$). Significant reductions were also observed in swallowing (42.8 ± 18.1 to 24.6 ± 15.3 vs. 44.1 ± 17.6 to 38.7 ± 16.9; $p < 0.001$), speech (35.4 ± 15.2 to 21.8 ± 13.7 vs. 36.6 ± 14.9 to 32.5 ± 14.3; $p = 0.002$), and pain scores (38.5 ± 16.3 to 23.9 ± 14.1 vs. 39.7 ± 15.9 to 34.8 ± 15.2; $p = 0.004$). In addition, the intervention group showed greater improvement in mouth opening (28.6 ± 6.4 to 35.2 ± 6.1 mm vs. 28.9 ± 6.7 to 30.4 ± 6.5 mm; $p = 0.006$) and body weight (55.8 ± 8.9 to 58.4 ± 8.6 kg vs. 56.2 ± 9.1 to 56.8 ± 8.8 kg; $p = 0.031$) than the control group.

Table 3: Comparison of quality-of-life and functional outcomes before and after the multidisciplinary rehabilitation program

Outcome	Intervention Baseline	Intervention Post	Control Baseline	Control Post	p-value
Global QoL score	61.8 ± 11.2	75.6 ± 10.4	60.5 ± 10.8	64.2 ± 11.1	<0.001
Swallowing score *	42.8 ± 18.1	24.6 ± 15.3	44.1 ± 17.6	38.7 ± 16.9	<0.001
Speech score *	35.4 ± 15.2	21.8 ± 13.7	36.6 ± 14.9	32.5 ± 14.3	0.002
Pain score*	38.5 ± 16.3	23.9 ± 14.1	39.7 ± 15.9	34.8 ± 15.2	0.004
Mouth opening (mm)	28.6 ± 6.4	35.2 ± 6.1	28.9 ± 6.7	30.4 ± 6.5	0.006
Weight (kg)	55.8 ± 8.9	58.4 ± 8.6	56.2 ± 9.1	56.8 ± 8.8	0.031

Values are presented as mean ± SD. Lower scores for swallowing, speech, and pain indicate improvement, whereas higher QoL, mouth opening, and weight indicate better outcomes. QoL, quality of life; SD, standard deviation.

Table 4 shows the mean changes in functional and psychological outcomes following the multidisciplinary rehabilitation program. Compared with the control group, the intervention group demonstrated significantly greater improvements in Global QoL (+13.8 ± 6.2 vs. +3.7 ± 5.5; mean difference [MD]: 10.1, 95% CI: 7.5–12.7; $p < 0.001$), physical function (MD: 8.7, 95% CI: 5.8–11.6; $p < 0.001$), and emotional function (MD: 7.7, 95% CI: 4.9–10.5; $p < 0.001$). Significant reductions in swallowing (MD: −12.8, 95% CI: −16.3 to −9.3; $p < 0.001$) and speech impairment (MD: −9.5, 95% CI: −12.5 to −6.5; $p < 0.001$) were also observed, along with greater improvement in nutritional status (MD: 2.0, 95% CI: 1.4–2.6; $p < 0.001$).

Table 4: Mean changes in functional and psychological outcomes following the multidisciplinary rehabilitation program

Variable	Intervention Mean Change (Mean ± SD)	Control Mean Change (Mean ± SD)	Mean Difference (95% CI)	p-value
Global QoL	+13.8 ± 6.2	+3.7 ± 5.5	10.1 (7.5 to 12.7)	<0.001
Physical function	+11.5 ± 7.0	+2.8 ± 6.1	8.7 (5.8 to 11.6)	<0.001
Emotional function	+10.2 ± 6.8	+2.5 ± 5.9	7.7 (4.9 to 10.5)	<0.001
Swallowing*	−18.2 ± 8.4	−5.4 ± 7.6	−12.8 (−16.3 to −9.3)	<0.001
Speech *	−13.6 ± 7.2	−4.1 ± 6.4	−9.5 (−12.5 to −6.5)	<0.001
Nutritional status†	+2.8 ± 1.5	+0.8 ± 1.2	2.0 (1.4 to 2.6)	<0.001

Values are presented as mean change ± SD. MD, mean difference; CI, confidence interval; QoL, quality of life; SD, standard deviation. Negative values indicate symptom improvement.

Table 5 summarizes compliance, safety, and patient satisfaction following the rehabilitation program. The intervention group demonstrated significantly higher rehabilitation adherence (91.4 ± 6.8% vs. 74.8 ± 10.9%; $p < 0.001$) and patient satisfaction (9.2 ± 0.7 vs. 7.4 ± 1.1; $p < 0.001$), with fewer missed sessions (1.8 ± 1.2 vs. 4.6 ± 2.1; $p < 0.001$) than the control group. Study completion rates (92.5% vs. 90.0%; $p = 0.692$) and the incidence of adverse events (7.5% vs. 12.5%; $p = 0.456$) and serious adverse events (0% vs. 2.5%; $p = 0.314$) were comparable between the groups, indicating good compliance and a favorable safety profile of the multidisciplinary rehabilitation program.

Table 5: Compliance, safety, and patient satisfaction following the rehabilitation program

Variable	Intervention (n = 40)	Control (n = 40)	p-value
Completed study, n (%)	37 (92.5%)	36 (90.0%)	0.692
Rehabilitation adherence (%), mean ± SD	91.4 ± 6.8	74.8 ± 10.9*	<0.001
Missed sessions, mean ± SD	1.8 ± 1.2	4.6 ± 2.1*	<0.001
Patient satisfaction score (0 – 10), mean ± SD	9.2 ± 0.7	7.4 ± 1.1	<0.001
Any adverse events, n (%)	3 (7.5%)	5 (12.5%)	0.456
Serious adverse events, n (%)	0 (0%)	1 (2.5%)	0.314

Values are presented as mean ± SD or n (%). SD, standard deviation. Higher adherence and satisfaction scores indicate better outcomes. P < 0.05 was considered statistically significant.

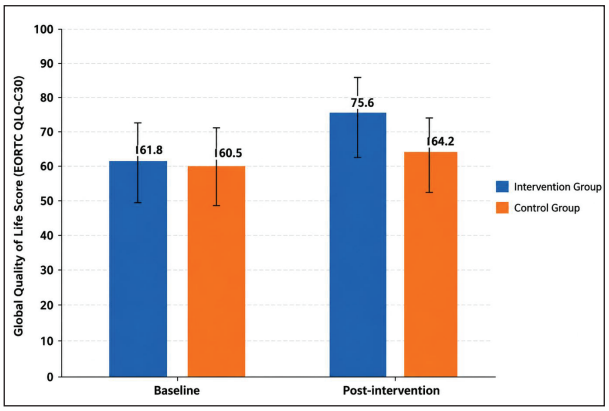


Figure 1: Changes in global quality-of-life scores before and after the multidisciplinary rehabilitation program in the intervention and control groups.

Figure 1 illustrates the changes in Global Quality of Life (QoL) scores before and after the multidisciplinary rehabilitation program. Both groups showed improvement following the intervention; however, the intervention group demonstrated a markedly greater increase in Global QoL than the control group (61.8 to 75.6 vs. 60.5 to 64.2). This finding indicates that the multidisciplinary rehabilitation program significantly improved overall quality of life compared with standard care ($p < 0.001$).

Discussion

The present randomized controlled trial demonstrated that a structured multidisciplinary rehabilitation program significantly improved health-related quality of life (HRQoL) and functional outcomes among oral cancer survivors compared with routine postoperative care. Participants in the intervention group showed significantly greater improvement in global QoL than controls (+13.8 ± 6.2 vs. +3.7 ± 5.5; MD: 10.1, 95% CI: 7.5–12.7; p< 0.001), together with better swallowing, speech, pain control, mouth opening, nutritional status, body weight, rehabilitation adherence, and patient satisfaction. These findings support the role of coordinated multidisciplinary rehabilitation as an essential component of oral cancer survivorship care [14,15].

Baseline demographic, clinicopathological, treatment-related, and HRQoL characteristics were comparable between the two groups, indicating successful randomization. Therefore, the post-intervention differences are likely attributable to the rehabilitation program rather than baseline imbalance. This methodological strength is particularly important because previous rehabilitation studies have often been limited by heterogeneous study populations and non-randomized designs [16,17].

The most important finding was the clinically meaningful improvement in global QoL. The intervention group improved from 61.8 ± 11.2 to 75.6 ± 10.4, whereas the control group improved only modestly from 60.5 ± 10.8 to 64.2 ± 11.1 (p< 0.001). The 13.8-point improvement in global QoL exceeds the threshold generally considered clinically meaningful for EORTC quality-of-life instruments [18-19]. Similar improvements in functional recovery and quality-of-life domains have been reported following multidisciplinary rehabilitation among head and neck cancer survivors [20].

Swallowing function also improved substantially after rehabilitation. Swallowing scores decreased from 42.8 ± 18.1 to 24.6 ± 15.3 in the intervention group compared with 44.1 ± 17.6 to 38.7 ± 16.9 in controls (MD: −12.8, 95% CI: −16.3 to −9.3; p< 0.001). This finding is consistent with randomized trials showing that structured swallowing exercises improve swallowing function in patients treated for head and neck cancer [21-22]. Logemann et al. also demonstrated that early postoperative swallowing exercises improve long-term swallowing outcomes following head and neck cancer surgery [23]. The improvement observed in the present study may be

explained by the combined effect of supervised swallowing therapy, home-based exercises, nutritional counseling, and pain reduction.

Speech function improved significantly in the rehabilitation group. Speech scores decreased from 35.4 ± 15.2 to 21.8 ± 13.7 compared with 36.6 ± 14.9 to 32.5 ± 14.3 in the control group (MD: −9.5, 95% CI: −12.5 to −6.5; p< 0.001). This finding agrees with previous studies demonstrating that structured speech rehabilitation improves communication and swallowing outcomes after oral cancer surgery [24,25]. Improved speech likely contributed to enhanced emotional well-being and social participation, which are important determinants of overall HRQoL.

Pain and mouth opening also improved significantly. Pain scores decreased from 38.5 ± 16.3 to 23.9 ± 14.1 in the intervention group, compared with 39.7 ± 15.9 to 34.8 ± 15.2 in controls (p = 0.004). Mouth opening increased from 28.6 ± 6.4 mm to 35.2 ± 6.1 mm in the intervention group, compared with 28.9 ± 6.7 mm to 30.4 ± 6.5 mm in the control group (p = 0.006). These findings are consistent with previous studies demonstrating that jaw-opening exercises and physiotherapy improve trismus and oral function after head and neck cancer treatment [26,27]. Exercise-based rehabilitation has also been shown to reduce pain and improve functional recovery in this patient population [28].

Nutritional recovery was another important benefit. Nutritional status improved more in the intervention group than in controls (+2.8 ± 1.5 vs. +0.8 ± 1.2; MD: 2.0, 95% CI: 1.4–2.6; p< 0.001). Body weight also increased significantly in the intervention group, from 55.8 ± 8.9 kg to 58.4 ± 8.6 kg, compared with 56.2 ± 9.1 kg to 56.8 ± 8.8 kg in the control group (p = 0.031). These findings are biologically plausible because improved swallowing, reduced pain, and individualized dietary counseling can enhance oral intake and nutritional recovery. Similar observations have been reported in the NUTRI-HAB randomized controlled trial [20]. Furthermore, oral functional impairment and dysphagia have been shown to be major contributors to malnutrition following oral cancer treatment [29,30].

The intervention was also feasible and safe. Rehabilitation adherence was significantly higher in the intervention group than in the control group (91.4 ± 6.8% vs. 74.8 ± 10.9%; p< 0.001), missed sessions were fewer (1.8 ± 1.2 vs. 4.6 ± 2.1; p< 0.001), and patient satisfaction was higher (9.2 ± 0.7 vs. 7.4 ± 1.1; p< 0.001). Importantly, adverse events and serious adverse events did not differ significantly between groups, indicating that the structured rehabilitation program was well tolerated. These findings are consistent with recommendations emphasizing multidisciplinary management as the safest and most effective approach to managing treatment-related complications in head and neck cancer survivors [31, 14].

These findings have important implications for Bangladesh and other low- and middle-income countries, where oral cancer burden is high but structured rehabilitation services remain limited. Survivorship care often focuses on oncological follow-up, while functional rehabilitation receives less attention. The present study suggests that a coordinated rehabilitation model addressing swallowing, speech, nutrition, pain, physical function, and psychosocial support can improve recovery and quality of life in this population. Given the increasing incidence of oral cancer in South Asia and other resource-limited regions, integrating multidisciplinary rehabilitation into routine survivorship care may substantially reduce long-term disability and improve patient outcomes [32-34].

Strengths and Limitations: This study has several strengths, including its randomized controlled design, balanced baseline characteristics, use of validated EORTC QoL instruments, and assessment of multiple clinically relevant outcomes. However, some limitations should be noted. This was a single-center study with a modest sample size, which may limit generalizability. The follow-up period was limited to 12 weeks; therefore, the long-term durability of the observed benefits remains uncertain. Blinding of participants and therapists was not feasible because of the nature of the intervention. In addition, objective instrumental assessments of swallowing and speech were not performed.

Future multicenter randomized trials with larger sample sizes and longer follow-up are needed to confirm these findings. Further studies should also evaluate cost-effectiveness, optimal rehabilitation intensity, timing of intervention, and the feasibility of tele-rehabilitation models in resource-limited settings.

Conclusion

This randomized controlled trial demonstrated that a structured multidisciplinary rehabilitation program significantly improved HRQoL, swallowing, speech, pain, mouth opening, nutritional status, body weight, adherence, and patient satisfaction among oral cancer survivors compared with routine postoperative care. The intervention was safe, feasible, and clinically beneficial. These findings support the integration of multidisciplinary rehabilitation into standard oral cancer survivorship care, particularly in resource-limited settings such as Bangladesh.

Authors' Contributions

All authors contributed to the conception and design of the study. Data collection, analysis, and interpretation were performed by the authors. The manuscript was drafted, critically revised, and approved by all authors. All authors agree to be accountable for all aspects of the work.

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Disclosure
The authors declare that they have no competing interests or conflicts of interest related to this study.

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Journal of Paediatric Surgeons of Bangladesh

Case Report

Case Report: Urethral Duplication in a 7 Years Old boy

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Abstract

Urethral duplication is a rare congenital anomaly, predominantly seen in males, with very few cases reported in females. This anomaly can be partial or complete and manifests with a variety of clinical symptoms including deformed penis, double urinary streams, urinary tract infections (UTIs), incontinence, urethral discharge, and outflow obstruction. This case report discusses the diagnosis, surgical management, and follow-up of a 7 years old boy with Type II A2 urethral duplication.

Keywords: urethra, dorsal, congenital, double, duplication

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Introduction

Urethral duplication is a rare congenital abnormality affecting more in males.[1], It consists of the junction of two or more channels having a smooth muscular wall and lined by excretourinary mucosa.[3] It can be complete or incomplete.[4] It occurs mainly in the sagittal plane but also in the frontal plane.[3] Several anatomical variants have been reported where an accessory urethra opens in either a normal or abnormal position. Clinical manifestation depends on the variation of anatomic patterns.[5] The therapeutic approach can be complex, depending on the anatomical type.[1] Radiological investigations are of great interest in all cases.[3] This case report discusses the diagnosis, surgical management, and follow-up of a 7-year-old boy with urethral duplication, classified as Type II A2.

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Clinical Presentation: A 7-year-old boy was admitted to the Paediatric Surgery Department of SOMCH with complaints of a double urethral opening and dribbling of urine through the dorsal urethral opening. The patient had a history of recurrent UTIs and previous hospitalizations. The patient is apparently healthy.

Genital Examination:

Penis: Uncircumcised with two urethral openings (figure 1)

□ Primary urethral opening: Normal in size, located at

the tip of the glans.

- Accessory urethral opening: Smaller in size, located dorsally about 0.5 cm proximal to the primary urethral meatus.

Scrotum: Normal. Both testis are palpable and normal.

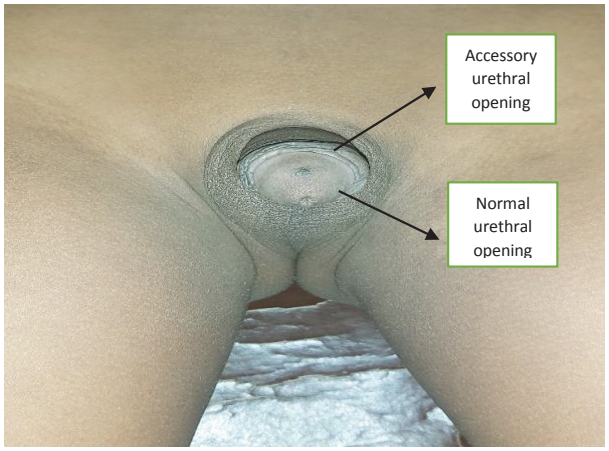


Figure 1

Investigations:

1. **Ultrasonography (USG):** Revealed a malrotated right kidney with complete bladder emptying.
2. **Retrograde Urethrogram (RGU):** Demonstrated a parallel linear smooth tubular structure along the anterior urethra connected to the membranous urethra.(figure 3)
3. **Voiding Cystourethrogram (VCUG)/MCU:** Showed short segmental narrowing in the membranous urethra causing upstream mild dilatation and contrast leakage through a suprapenile tract. (figure 2)
4. **Fistulogram:** A linear tubular structure above and parallel to the anterior urethra, connecting to the membranous urethra. (figure 3)



Figure 2

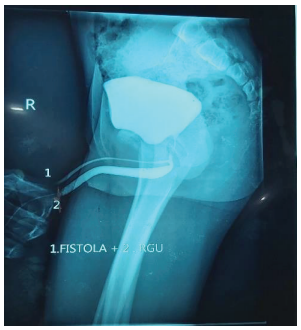


Figure 3

Surgical Management:

1. Cystourethroscopy:

- Normal urethra with intact external sphincter and urinary bladder mucosa.
- Accessory urethra was cannulated with a 0.035 mm guide wire, confirming continuity with the bladder. (figure 4)

2. Surgical procedure:

- An 8 Fr Foley catheter was inserted into the normal urethra.(figure 4)
- A longitudinal incision was made on the dorsal penile surface along the guide wire.
- The accessory urethra was excised down to the membranous urethra.(figure 5)
- The wound was closed using delayed absorbable sutures (Vicryl).(figure 6)
- Foley catheter kept in situ for 8 days.



Figure 4

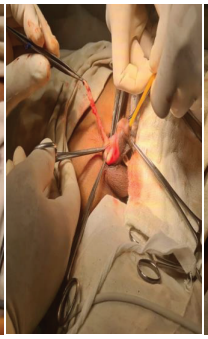


Figure 5

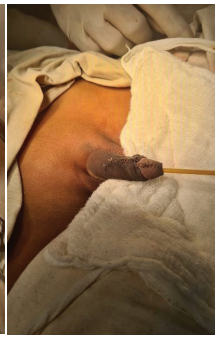


Figure 6

3. Postoperative Course:

- The patient was discharged on the 10th postoperative day.
- Follow-up over six months revealed a single urinary stream with no incontinence.

Discussion:

Urethral duplication, first described by Aristotle, is a rare congenital anomaly with approximately 300 cases documented in the literature[2]. Urethral duplication can be caused either by the growth arrest of the urogenital sinus 6 or abnormal Müllerian duct termination or misalignment of the termination of the cloacal membrane with genital tubercle.[7]

Clinical Features and Diagnosis:

- Symptomatic patients often present with recurrent UTIs, double urinary streams, dysuria, or incontinence.[8] Diagnosis typically occurs before 12 months of age, though late presentations, as in this case, are possible.

- Imaging studies such as RGU & VCUG and magnetic resonance imaging (MRI) are essential[7]. Occasionally cystoscopy is necessary to visualize the verumontanum and other urethral characteristics.[7] In our case, RGU and VCUG were diagnostic.
- Urethral duplications are classified per Effman's system into Types I, II, and III.9 (figure 7)

Type I: Blind-ending accessory urethra (incomplete duplication).

Type II: Complete duplication, further sub classified:
- Type II A1: Two non-communicating urethras arise from the bladder.
- Type II A2: Y-shaped configuration, as observed in this case.
- Type II B: Two urethras unite into a common distal channel.

Type III: Accessory urethra arises from a duplicate or septate bladder.

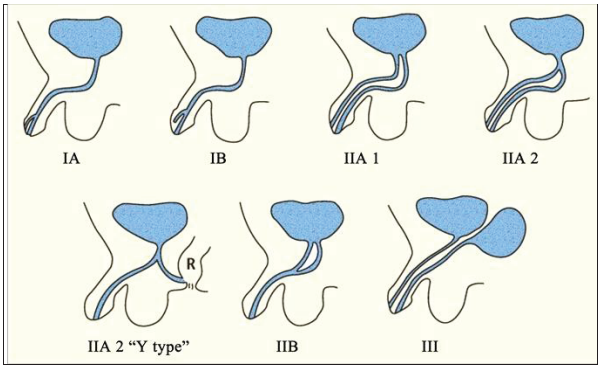


Figure 7

Management: Treatment depends on anomaly's type and severity. Complex cases may require multiple surgeries, while milder forms may not require intervention. In this case, complete excision of the accessory urethra resolved the symptoms.

Conclusion: A comprehensive diagnostic approach using imaging and Cystourethroscopy is essential for identifying urethral duplication. Individualized surgical planning based on the type and severity ensures optimal outcomes. Our patient, diagnosed with Type II A2 urethral duplication, underwent successful surgical excision of the accessory urethra with an uneventful postoperative recovery and resolution of symptoms.

Acknowledgement

We are very thankful for all the support provided by the Paediatric surgery department of Sylhet MAG Osmani Medical College Hospital. Conflict of interest statement The authors declare no conflict of interest. Ethics statement This case did not involve experiments on humans and animals. Consent Informed written consent was taken from the patient's parents prior to his inclusion in this study.

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Case Report

Duodenal Web at Bizarre Location: A report of two cases

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Abstract

In newborn child, one of the most common sites for intestinal obstruction is duodenum. Duodenal atresia and web are the primary cause of intrinsic duodenal obstruction. Duodenal webs are rare, ranging from 1 in 10,000 to 1 in 40,000 live births as per reported incidence. Duodenal web or diaphragm obstruct the lumen in complete or incomplete manner and the age of diagnosis may also vary for this. Location of webs other than the second part of duodenum is rare with only a few cases reported in literature. We are reporting two cases of different age where we found duodenal web at duodenojejunal junction. 'Case 01' is a 14months male child presented with frequent bilious and non-bilious vomiting in irregular pattern. 'Case 02' is a 5days preterm low birth weight female neonate with bilious vomiting and failure to pass meconium. Both cases were diagnosed as intestinal obstruction and the diagnosis was confirmed after laparotomy and operated accordingly.

Key words: Duodenal web, Duodenal Diaphragm, Duodenojejunal junction, unusual location

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Introduction

Intestinal obstruction in newborn child most commonly occur at duodenum. Intrinsic duodenal obstruction (DO) may be caused by atresia, stenosis, diaphragm or web, a perforated diaphragm or a 'wind sock' web [1]. Obstruction due to duodenal web is rare occurring 1 in 10,000 to 1 in 40,000 live births [2]. Duodenal web is commonly found in second part of duodenum and other locations are infrequent [3]. Diagnosis mostly done in neonatal period and perforated web may indulge in diagnostic dilemma beyond infancy [4]. We have found two patients of different age with duodenal web at duodenojejunal (DJ) junction beyond the site of "embryological traffic jam".

Case 1: A 14 months boy presented to us with bilious vomiting for the last few days. He had episodes of non-bilious vomiting minutes after breast feeding since birth. Initially the vomitus contained curd like materials but later became offensive in smell,

contained food materials and bile stained. The episodes lasted for 3 to 4 days and were relived with medicines and oral fluids, only to recur in 1 to 2 weeks as same pattern in last 14 months. He was admitted at one and half month of age with vomiting, cough and cold at hospital and was treated accordingly. The child was solely breastfed up to 6 months. Then khichuri and noodles were added to his diet but poorly tolerated by the child. The child was delivered at full term by normal vaginal delivery at home. On admission the child weighted 7.8kg which was below 5th percentile according to weight for age. On examination the child was stable with mild dehydration and epigastric distention. All the vitals were within normal limit and no other abnormality was found. Investigations showed hemoglobin 10.9gm/dl, Total leucocyte count (TLC) 7660/mm³. Abdominal X-ray showed dilated stomach and Ultrasonography suggested distended fluid filled stomach. An upper gastrointestinal contrast study demonstrated distended stomach and markedly dilated duodenum up to duodenojejunal (DJ) junction with normal distal bowel pattern suggestive of incomplete intestinal obstruction. Obstruction due to Congenital malrotation or web was suspected with high index of suspicion for windsock anomaly. The child received replacement of fluid and electrolytes. The abdomen was explored 2 weeks after admission by upper abdominal transverse incision. The stomach and duodenum were found distended in continuity up to DJ junction. An enterotomy was performed by longitudinal incision on antimesenteric border at DJ junction which revealed a mucosal web with a central hole. Circumferential excision of the web was performed and enterotomy was closed transversely. Oral liquid feeding started on 6th post-operative day (POD) and discharged on 12th POD. Patient was healthy without any symptom of obstruction at 1 month follow up.

Case 2: A 5days aged preterm female neonate weighting 1.6kg, 1st in birth order was born by vaginal delivery at home. At first, she was treated as a case of physiological jaundice with early onset of neonatal sepsis and after 4 more days presented to us with bilious vomiting and failure to pass meconium with fever. On examination the child was severely dehydrated, non-icteric and mildly anemic. Abdominal examination revealed mild epigastric distention, soft on palpation and absent bowel sound. Nasogastric aspirate was bilious and no meconium came out even after rectal wash. Laboratory investigations showed hemoglobin 15.4gm/dl, TLC 25300/mm3. Abdominal X-ray showed gasless abdomen except two radiolucent shadows. Ultrasonography was not conclusive except distended stomach. After fluid and electrolyte replacement laparotomy was planned keeping intestinal atresia with congenital malrotation as preoperative diagnosis. Laparotomy revealed dilated stomach and duodenum till DJ junction and fibrotic ring at DJ junction. Enterotomy done by longitudinal incision at DJ junction and complete mucosal web found. Then circumferential excision of web done and enterotomy closed transversely. Unfortunately, the patient died on 5th POD from septicemia.

Discussion

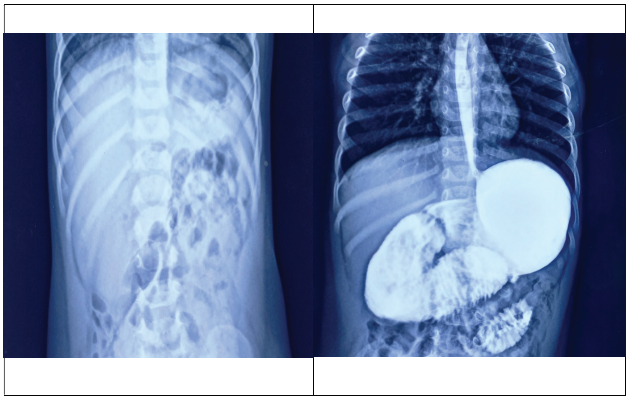
Main presenting symptom is the bilious vomiting and plain radiograph (showing double bubble appearance) is the most valuable diagnostic tool in all cases of duodenal atresia (DA) except those with partial or incomplete obstruction and also in patients with web at unusual location (additional bubble/gas shadow is seen) as seen in both of our cases [2,5,6,7,8]. Incomplete obstruction may mimic gastroesophageal reflux disease (GERD) on presentation, making the diagnosis difficult and delayed for months as seen in case 1[8,9]. So, suspicion for incomplete obstruction should keep in mind in a child presenting with repeated episodes of vomiting since birth. Screening with ultrasonography is of great importance. An upper gastro-intestinal (UGI) contrast study is indicated to demonstrate the site and nature of the obstruction in case of incomplete obstruction, which also help in surgical planning.Commonly, all types of DA are limited to the second (post-ampullary) followed by first part of the duodenum. The second part of the duodenum is also the most common site of web (85%); involvement other than second part of duodenum is rare. Incomplete obstruction may be caused by a web with a central or eccentric opening as seen in case 1. Ganguly et al (1995), reported a case of duodenal web at DJ junction as both of our cases.Kaddah et al (2006) reported patients with type-I DA; the mucosal diaphragmatic web was present at the second part of the duodenum, except three patients with webs at unusual location. Our both cases are of web at unusual location.Gupta et al (2016), reported 3 cases of more distal duodenal web of which in 2 cases at DJ junction as both of our cases.Gupta et al (2016) proposed that, failure of recanalization shifted from the site of “embryological traffic jam” to unusual locations (third part of the duodenum and DJ junction) which also corresponds to our cases. [10]

Conclusion

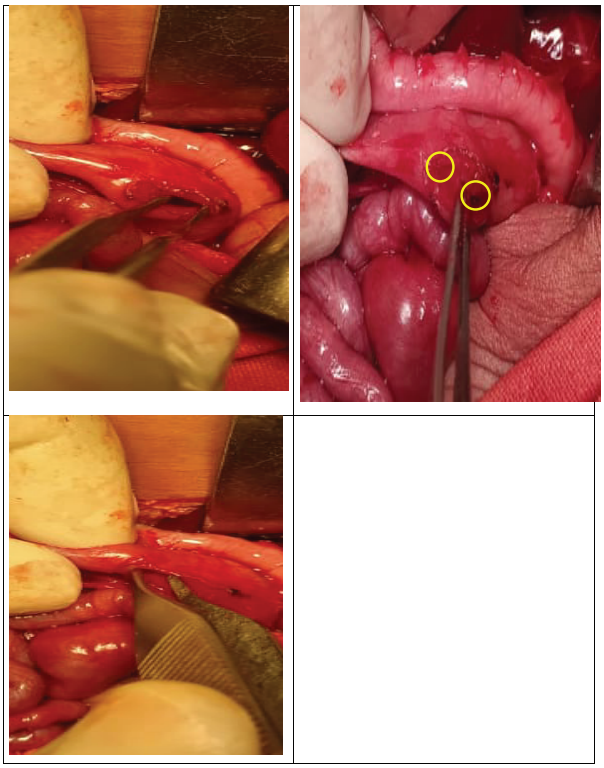
Duodenal web may present at location other than second part of duodenum, as seen in both of our patients with web at DJ junction. Clinicians should have high index of suspicion for webs in a child presenting with vomiting since birth.

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Journal of Paediatric Surgeons of Bangladesh

Case Report

Caecal Duplication Cyst Presenting as Complicated Appendicitis

Islam ADMS[1], Mahmud MR[2], Tonny JN[3], Islam MS[4]

Abstract

Background: Caecal duplication cyst is an exceptionally rare congenital anomaly of the gastrointestinal tract and accounts for a very small proportion of alimentary tract duplications.[1] Clinical presentation is variable and may include abdominal pain, palpable mass, intussusception, gastrointestinal bleeding, or intestinal obstruction.[1,2]

Case Presentation: A 7-year-old girl presented with right-sided lower abdominal pain and non-bilious vomiting. She had an abdominal lump in the right lumbar region.Initially, she was diagnosed as appendicular lump. On CECT abdomen, she was diagnosed with cystic duplication of the ascending colon. On exploratory laparotomy, it was identified asa caecal duplication. Ileocaecal resection with primary ileocolic anastomosis was performed. Histopathological examination confirmed a duplication cyst.

Conclusion: Although rare, caecal duplication cyst should be considered in the differential diagnosis of complicated appendicitis. Complete surgical excision remains the treatment of choice and is associated with excellent outcomes.[1,2]

Key words: Caecal, Duplication cyst, Complicated appendicitis.

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Introduction

Enteric duplication cysts are rare congenital malformations characterized by a well-developed smooth muscle coat and a mucosal lining resembling any part of the gastrointestinal tract.[1] The ileum is the most common site, while colonic duplications account for approximately 13% of all gastrointestinal duplications.[2] Caecal duplication cysts are among the rarest forms reported in the literature.[1,3] Most patients present before two years of age, although diagnosis may occur later in childhood or adulthood.[2]

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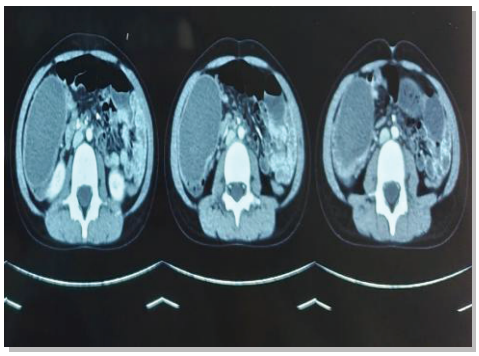
Case Presentation

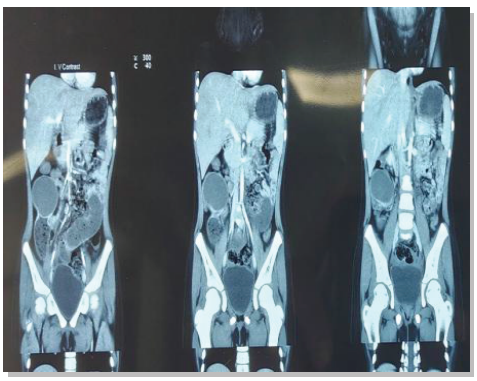
A 7-year-old girl wasadmitted with complaints ofright-sided lower abdominal pain for 6 days. Pain was associated with vomiting for 5days, which was initially non bilious but became bilious with time. She was lethargic and dehydrated but afebrile. There was a tender intra-abdominal lump measuring about 6x5 cm in the right lumbar region, which had a smooth surface. The margin, consistency, and mobility couldn't be evaluated due to tenderness. Digital rectal examination and other systemic examination were normal.

Her complete blood picture shows neutrophilic leukocytosis. Plain abdominal radiography demonstrated multiple air-fluid levels suggestive of distal intestinal obstruction. Ultrasonography revealed a cystic lesion

in the right lumbar region with solid debris in it. Similar imaging findings have been described in previously reported cases of caecal duplication cyst.[1,2]

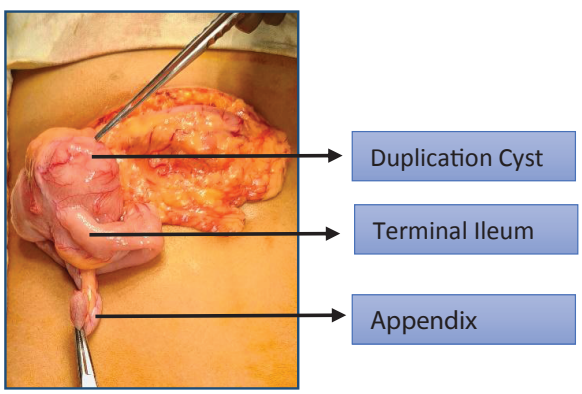
On contrast-enhanced CT scan, it was diagnosed as duplication cyst which was arising from ascending colon.

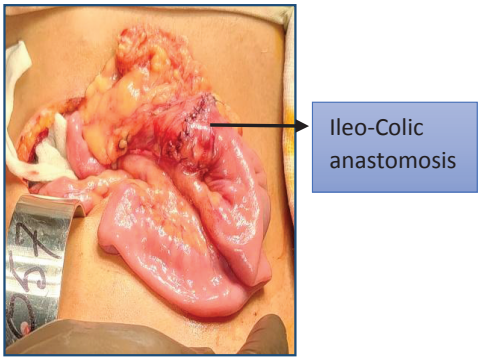


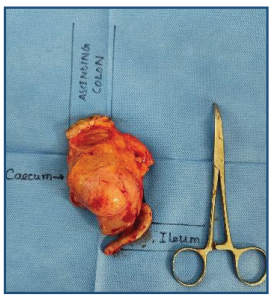


Surgical Management

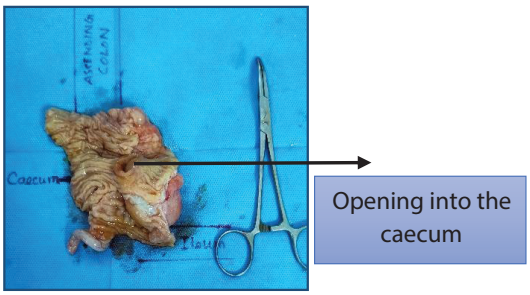
Exploratory laparotomy revealed a cystic mass arising from the mesenteric border of the caecum. The lesion compressed the adjacent bowel lumen, causing intestinal obstruction. Segmental ileocaecal resection followed by primary ileocolic anastomosis was performed, which remains the recommended treatment in most reported cases.[1,2,4] We cut the specimen along the ante-mesenteric border of the caecum and found an opening of the duplication cyst in the caecum.







Specimen



Cut open Specimen

Histopathological Findings

Histopathological examination demonstrated gut wall showing focal thinning along with duplication of mucosa in between muscularis propia. Histopathological diagnosis was Enteric Duplication Cyst. No ectopic gastric mucosa or malignant changes were identified.

Discussion

The embryogenesis of enteric duplication cysts remains uncertain. Proposed mechanisms include aberrant recanalization of the primitive gut, split notochord syndrome, and persistence of embryonic diverticula.[2]

Clinical presentation varies according to size, location, and associated complications. Patients may

present with abdominal pain, intestinal obstruction, intussusception, perforation, gastrointestinal bleeding, or an acute abdomen.[1–5]

Preoperative diagnosis is often difficult. Ultrasonography is considered the initial imaging modality of choice because it may demonstrate the characteristic double-wall sign.[2] Computed tomography and magnetic resonance imaging can further delineate anatomical relationships.[2]

Complete surgical excision is recommended because untreated lesions may lead to recurrent obstruction, infection, perforation, or, rarely, malignant transformation.[2,4] Surgical outcomes are generally excellent following complete resection.[1,2]

Conclusion

Caecal duplication cyst is a rare condition. Due to its nonspecific clinical and radiological features, diagnosis is often made intraoperatively. Complete surgical excision remains the definitive treatment and is associated with excellent prognosis.[1,2]

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INFORMATION FOR AUTHOR'S

Aims and editorial process:

Journal of Paediatric Surgeons of Bangladesh (JPSB) is the official journal of Association of Paediatric Surgeons of Bangladesh (APSB) which is recognized by Bangladesh Medical and Dental Council (BMDC) and has International Standard Serial Number (ISSN) 2077-7469 (print), 2309-1320 (online). The journal publishes articles of authors from any part of the globe, but with special interest in articles from authors from Bangladesh. The content includes, but is not limited to, the field of Paediatric Surgery, Paediatric Urology, Paediatric Onco-surgery, Neonatal Surgery, Minimal Invasive Surgery. It publishes editorial, original articles, special articles, review articles, meta-analyses, systematic reviews, case reports and case series through rigorous peer review. A key goal is to promote postgraduate training and further education in all spectrum of Paediatric Surgery.

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Original article	4000	30	6
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Special article	2500	20	4
Case report	2000	15	4

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It is an invited article based on current affairs in the field of all disciplines of paediatric surgery.

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Original articles should follow the basic structure of Abstract, Introduction (includes aims and objective), Methods (divided into study setting, procedures, data analysis and Ethics statement), Results, Discussion, Conclusion, Acknowledgement, Disclosure, and References.

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This section should introduce the subject and answer why the research originated. It provides the knowledge that is already known and states the problem that encouraged the study. The purpose of the study should be stated at the end.

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