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Editorial

Birth defects: a challenge of Neonatal surgery

All developmental anomalies can be called as birth defect and congenital abnormalities which are interchangeable. A birth defect is a broad category of prenatal defect that can be caused by a single gene defect, chromosomal abnormalities micronutrient deficiencies multifunctional inheritance or environmental.[1] It can be presented as isolated or part of a syndrome, considered to be a major causes of neonatal and infantile morbidity and mortality.[2]

More than 8.14 million children are born with serious birth defect each year caused by genetic or environmental factors in South East Asia the prevalence of birth defects range from 54.1 to 64.3 per 1000 live birth and in Bangladesh it is 58.6 per 1000.[3] So Birth defects are emerging as a significant perinatal problem with serious consequences for the mothers and families.[4] Congenital anomalies account for approximately 7% in al under 5 death Worldwide.[5] In developing country due to birth defect death account 30-35% where is only 5-7% death in developed country.[3]

The maximum cause of these defect is still unknown but about 25% of congenital anomalies are thought to be multifactional implying a complex interaction between genetic and environmental factor.[6]

Many study has been carried out to determine the relationship between risk factors and occurrence of birth defectas for example.

- Folic acid supplementation for neural tube defects correction.[7]
- Thaldomidal, phenyton, alcohol, cigarette smoking, certain environment and chemical and high radiation has been found to be related with pregnancy[8-10].
- Advanced paternal and paternal age.[11]
- Parental consanguinity
- Increasing birth order
- Low birth weight Most common congenital anomalies have been reported to involve the CNS, CVS and musculoskeletal system.[2]

In Bangladesh there is no data to reflect the whole countries situation. But study had done in few hospital like BMU where show reports 3.68% on 1630 newborn where neural tube defect.[14] In another studies total defect was 3.7% and CVS were 21%.[15] Among all defect approximately 3% of neonate need surgical intervention at birth or few days after birth[1,2]. Most infants with otherwise fetal multifunction can be rescued by an operation in the neonatal period however morbidity is high in some of them with the necessity of repeated operation.[2]

Mortality is still high in newborn with certain malformation such as long diaphragmatic hernia, trachea oesophagus atresia, gastoschicis, ruptured myelomeningocele int. atresia of various cause.

Incidence of surgical congenital anomalies are increasing day by day which is real threat to reduce the neonatal and infant mortality programme. The figure of defect probably not reflecting the actual incidence of congenital anomalies worldwide. Though in western world due to improved maternal and child care and ICU has better chance for survival.

On the other hand this statistical shifts indicate that knowledge about congenital malformation and birth defect is laking behind the progress of clinical research that has been made. So now time has come to take

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efforts are needed to close the gap and learn more about baby killer identification of teratogen.

Conclusion:

Paediatric neonatal surgery is still thriving in our country. Proper antenatal checkup, immunization, proper delivery care and surgical NICU is the demand of the times. To achieve SDG goal and reduce the neonatal mortality comprehensive management of congenital correctable anomaly in most advanced way is needed. All the medical college hospital must have the facilities to deal with such morbid congenital anomalies patient. We are hopeful for better future for congenital surgical patient with improvement of neonatal surgical facilities in Bangladesh.

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Original Article

Comparative Outcomes of the Bishop Koop Procedure and Primary Anastomosis in Jejunoileal atresia

Sayeed F[1], Huq M A[2], Islam M T[3], Das B B[4], Hasan S[5]

Abstract

Background: Jejunoileal atresia is a common congenital anomaly of the small intestine. The most widely practiced surgical approach is resection of the dilated and hypertrophied proximal bowel followed by primary anastomosis. However, to mitigate the complications associated with primary anastomosis, the Bishop Koop procedure remains a valuable alternative—particularly in developing countries, where access to advanced NICU care and total parenteral nutrition is often limited.

Methods: A quasi-experimental study conducted at Dhaka Medical College Hospital between July 2017 and June 2019 including 50 pediatric patients with jejunoileal atresia. Participants were randomly selected to receive either Bishop Koop ileostomy (Group A) or primary anastomosis (Group B). Primary outcomes were-operation time, bowel movement time, time to establish oral feeding, duration of hospital stay, and complication rates.

Results: Group A showed significantly shorter less hospital stay duration (8.40 vs 11 days, p=0.004), and fewer complications compared to Group B. The mortality rate in Group A was lower (12% vs. 40%, p=0.024). Anastomotic leakage occurred in 8% of Group A compared to 40% in Group B (p=0.008). In the adjusted bivariate regression analysis model, the likelihood of hospitalization>8 days was determined to be 10 times (95% CI 2.356-46.578) longer in group B than in group A.

Conclusion: Bishop Koop ileostomy is associated with improved outcomes, in respect of less hospital stay duration, less complication and lower mortality. These outcomes making it a preferred approach for high-risk neonates with jejunoileal atresia.

Key words: Bishop Koop procedure, Primary anastomosis, Jejunoilealatesia

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Introduction:

Jejunoileal atresia represents one of the most common causes of neonatal intestinal obstruction.[1] While survival rates for this condition are high (89-90%) in developed countries, still they remain significantly lower in developing countries ranging between 58.3% to 71.5%.[2] This disparity is largely attributed to delayed presentation and diagnosis, which can worsen the patient's condition, as well as limited access to neonatal intensive care units and insufficient parenteral nutritional support. If left untreated, jejunoileal atresia may lead to severe complications such as sepsis and intestinal perforation, necessitating immediate surgical intervention.

Primary anastomosis, a commonly used surgical method, directly connects the dilated proximal and distal segments of the intestine, reestablishing continu

ity in a single operation.[3] However, this approach has a significant risk of complications, particularly including anastomotic leakage and obstruction.[4,5] In contrast, the Bishop Koop ileostomy is an approach that establishes a transient ileostomy to redirect bowel contents away from the anastomosis, thereby reducing pressure at the site and providing the distal intestine with the opportunity to heal and recover. This intervention is associated with fewer complications, quicker recoveries, and often reduced hospital stays in high-risk patients, according to studies.[6-8]

However, there are limited data comparing the outcome and complications of Bishop Koop Ileostomy and Primary Anastomosis. A few previous studies have produced inconsistent outcomes, with some studies advocating for the safety and efficacy of primary anastomosis in specific circumstances, while others underscore the advantages of Bishop Koop ileostomy in reducing postoperative complications.[9,10]

Although Bishop Koop procedure was not performed for JIA primarily, it has been considered as a treatment of choice for different types of atresia for the last few decades. Most of the studies based on the outcome of BK procedure were conducted in developing countries and almost all were on the basis of retrospective data. This two years study aims to address this empirical gap by adopting a quasi-experimental study design comparing the outcomes of Bishop Koop ileostomy and primary anastomosis in neonates with jejunoileal atresia types II and IIIa. Specifically, key postoperative outcomes, including operative time, time to first bowel movement, time to establish oral feeding, hospital stay duration, and complication rates have been thoroughly evaluated.

Materials and Methods

Study Design, setting and sample: The study, designed as quasi-experimental was carried out over 24 months, from July 2017 to June 2019, at the Department of Pediatric Surgery, Dhaka Medical College Hospital. The target population included all pediatric patients diagnosed with jejunoileal atresia. The aim of this study was to evaluate the comparative the outcome of two surgical procedures- Bishop Koop ileostomy and Primary Anastomosis.

Diagnosis and Definition of Patients: This study specifically focused the patients diagnosed with jejunoileal atresia types II and IIIa. A combination of clinical evaluation and radiological imaging were used to confirm the presence and type of intestinal obstruction in the diagnosis of jejunoileal atresia among the sample patients in this study. Patients were admitted with symptoms that are frequently associated with atresia, including abdominal distension, bilious regurgitation, and meconium passage. To confirm the diagnosis, the attending pediatric surgeon requested a number of diagnostic imaging tests after the initial clinical evaluation. The abdominal X-ray, which is typically taken in an erect posture, was a critical diagnostic tool.

The study focused exclusively on patients diagnosed with jejunoileal atresia types II and IIIa, confirmed during surgery. Type II atresia is characterized by a fibrous cord connecting a dilated, blind-ending proximal segment to a collapsed distal segment, with an intact mesentery. Type IIIa atresia involves a complete interruption of the bowel without a connecting cord, leaving a V-shaped mesenteric defect between the two ends of the intestine. Patients with other forms of atresia (types I, IIIb, and IV) were excluded from the sample to maintain uniformity in comparing surgical outcomes. Patients were randomly selected and allocated to the intervention groups through an initial lottery system, followed by alternate assignment until each group reached the target sample size of 25 patients. Due to low prevalence of this condition, a total of 50 patients were selected and were allocated into two groups:

Group A: Diagnosed case of jejunoileal atresia and planned for Bishop Koop ileostomy and

Group B: Diagnosed case of jejunoileal atresia and planned for Primary Anastomosis.

Preoperative Evaluation and Treatment

All patients were subjected to an initial physical examination by the attending physician upon admission followed by a secondary evaluation by a resident surgeon or consultant. Baseline diagnostic procedures included complete blood counts, blood grouping and Rh typing, serum creatinine, serum electrolytes, random plasma glucose, C-reactive protein (CRP) testing and abdominal X-rays. Preoperative preparations comprised keeping the patient on nothing per oral, nasogastric decompression, and intravenous fluid. A Standard preoperative antibiotic protocol was maintained along with Vitamin K.

Operative Procedure

Following sufficient resuscitation, patients underwent laparotomy under general anesthesia. The surgery

begins with a supra-umbilical transverse incision, allowing access to the abdominal cavity, where the surgeon locates and assesses the atretic segments. The procedure type for each patient (either Bishop Koop ileostomy or Primary Anastomosis) was pre-decided. In both groups, the procedure completion time was measured using a stopwatch. During surgery, blood transfusion was administered as necessary. Approximately 10-15 cm of the hypertrophied, obstructed bowel is resected to relieve pressure on the proximal segment, and the distal portion is then manually decompressed. Following the resection of the atretic segment in each patient, the surgical procedure went as follows:

A. Bishop Koop Ileostomy:
An anastomosis was done between the end of the proximal bowel and the side of the distal bowel using fine absorbable sutures, typically 5-0 Polyglactin 910, approximately 4-5 cm from the end. The distal ileum is then exteriorized through a small incision in the right iliac fossa to create a stoma, providing a controlled outlet for intestinal contents. This diversion protects the anastomosis from direct pressure, thus minimizing the risk of leakage, a common complication in neonatal bowel surgeries.

B. Primary Anastomosis:
A Cheatle slit is created on the distal length to minimize any size disparity between the two segments. An end-to-end anastomosis was done between proximal and distal gut with fine, absorbable sutures like 5-0 Polyglactin 910, to establish a continuous, tension-free intestinal conduit.

Postoperative Management and Follow-Up
Postoperative care included ongoing nasogastric decompression, intravenous fluid administration, potassium supplementation starting from the second postoperative day, and the continuation of antibiotics and analgesics. Bowel function was monitored, and oral feeding started gradually after confirmation of bowel movement. Six hourly post operative follow up of these patients included vital signs such as temperature, heart rate, respiratory rate, abdominal distension, wound condition, stoma functionality and bowel movement. Patients were discharged upon the establishment of normal oral feeding and bowel movement, and the absence of any symptoms of sepsis. They were advised to attend follow up visits on 2nd and 6th week of discharge. Patients with complications such as anastomotic leakage or obstruction underwent re-laparotomy for enterostomy and peritoneal lavage.

Outcome measured:
The primary outcome measures in this study were designed to evaluate the effectiveness and safety of these two surgical approaches by postoperative recovery and complications. The outcome measures encompassed operation time, time to initial bowel movement, time to commence oral feeding, and total hospital stay, Furthermore, postoperative complications including anastomotic leakage, blockage, and death were meticulously observed due to their influence on patient outcomes and the safety profile of each surgical technique.

Data Collection and Statistical Analysis
Data were collected through a structured questionnaire and check list. Data analysis for this study was conducted using SPSS version 24.0 to ensure a robust statistical evaluation of the collected data. Descriptive statistics, including means and standard deviations, were calculated for continuous variables such as operative time, time to bowel movement, time to establish oral feeding, and hospital stay duration. To compare these continuous variables between the two surgical groups an independent samples t-test was used. Categorical variables, including postoperative complications, gender, and mortality rates, were analyzed using chi-square tests to assess associations between the type of surgery and incidence of these complications. Additionally, univariate and bivariate logistic regression analysis were performed to identify any predictive relationships between surgical method and specific outcomes, adjusting for potential confounding factors. Statistical significance was set at 95% confidence interval with $p < 0.05$ for all tests.

Ethical Considerations
This study was approved by the Ethical Review Committee of Dhaka Medical College Hospital. Informed consent was obtained from all parents or legal guardians of the participants, with the study's objectives and methods clearly explained to guarantee understanding and voluntary participation. All the methods in the present study were carried out following the ethical guidelines of the 1975 Declaration of Helsinki and its later amendment.

Results:

The average age of patients was 4.92 (±2.87) and 6.04(±3.86)daysIn Group A and Group B respectively. Group A patients showed a slightly elevated average weight of 2.63 (±0.53) kg in contrast to 2.44 (±0.44) kg in Group B. Ileal atresia was found in 56.0% patients of

Group A and Type IIIa was more prevalent in Group B (64.0%)(Table I).

Table I: Distribution of the patients' characteristics by two operative groups (N=50)

Attributes	Group A (n=25)	Group B (n=25)
Age (days)		
1 – 5	19 (76.0%)	12 (48.0%)
6 – 10	5 (20.0%)	10 (40.0%)
11 – 15	1 (4.0%)	3 (12.0%)
Mean ± SD	4.92 ± 2.87 (2-4)	6.04 ± 3.86 (1-15)
Gender		
Male:Female	1:0.92	1:0.66
Male	13 (52.0%)	15 (60.0%)
Female	12 (48.0%)	10 (40.0%)
Weight (kg)		
Mean ± SD	2.63 ± 0.53	2.44 ± 0.44
Site of atresia		
Ileum	14 (56.0%)	13 (52.0%)
Jejunum	11 (44.0%)	12 (48.0%)
Type of atresia		
Type II	12 (48.0%)	9 (36.0%)
Type IIIa	13 (52.0%)	16 (64.0%)

One way anova test states that operation time in minutes and hospital stay in days in between two group were found significant (0<0.01). Group A needed more operation time (minutes) but less hospital stay (days) (Table II)

Table II: Compare means between operation time, bowel movement, oral feeding establishment (in POD) and hospital stay (days) in two groups (N=50)

Attributes	Group G-A (n=25) G-B (n=25)	mean±SD	95% CI	P-value
Operative Time in Minutes	G-A	38.88±6.412 (26-54)	36.23-41.53	**<001**
	G-B	30.68±7.793 (18-47)	27.46-33.90	
	Total	34.78±8.187 (18-54)	32.45-37.11	
Bowel Movement in POD	G-A	4.52±1.531 (3-9)	3.89-5.15	0.432
	G-B	3.92±3.463 (0-9)	2.49-5.35	
	Total	4.22±2.667 (0-9)	3.46-4.98	
Establishment of Oral feeding in POD	G-A	6.84±2.173 (0-11)	5.94-7.74	0.257
	G-B	5.60±4.95 (0-15)	3.56-7.64	
	Total	6.22±3.83 (0-15)	5.13-7.31	
Hospital Stay (days)	G-A	8.40±1.871 (6-13)	7.63-9.17	**0.004**
	G-B	11±3.884 (5-21)	9.40-12.60	
	Total	9.7±3.290 (5-21)	8.76-10.60	

one way anova test was conducted, p<0.5 was considered significant

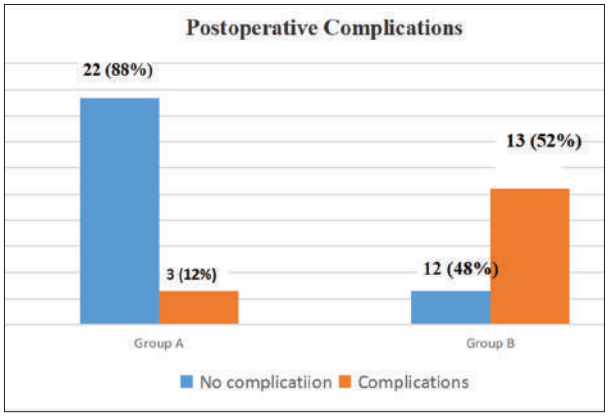


Figure 1: Comparison of post-operative complications between two groups (N=50)

The complication rates highlighted the benefits of the Bishop Koop ileostomy in Group A, where only 12% encountered postoperative problems, in contrast to 52% in Group B (p=0.002)(Figure 1).

Group B had a markedly elevated incidence of anastomotic leakage (40% compared to 8% in Group A, p=0.008) and a prolonged hospital stay, with 80% of Group B patients remaining hospitalized for over eight days (in contrast to 32% in Group A, p=0.001). Mortality rates in Group B were significantly higher at 40% compared to Group A's 12% (p=0.024) (Table III).

Table III: Post-operative complication pattern between two groups (N=50)

Post-operative Complications	Group A (n=25)	Group B (n=25)	p-value
Anastomotic leakage			
Yes	2 (8.0%)	10 (40.0%)	0.008[b]
No	23 (92.0%)	15 (60.0%)	
Obstruction			
Yes	1(4.0%)	3 (12.0%)	0.197[b]
No	24 (96.0%)	22 (88.0%)	
Hospital stay (days)			
5-8 days	17 (68%)	5 (20%)	0.001[b]
>8 days	8 (32%)	20 (80%)	
Mortality			
Yes	3 (12.0%)	10 (40.0%)	0.024[b]
No	22 (88.0%)	15 (60.0%)	

unpaired t testa was done to measure the level of significance, chi-square testb was done to measure the level of significance

In the unadjusted model, group B exhibited 7.667 (95% CI 1.470-39.987), 8.500 (95% CI 2.338-30.908), and 4.889 (95% CI 1.150-20.790) times greater likelihoods of experiencing postoperative complications such as anastomotic leakage, prolonged hospital stay, and mortality; respectively. In the adjusted bivariate regression analysis model, the likelihood of hospitalization was determined to be 10 times (95% CI 2.356-46.578) greater in group B than in group A (Table IV).

Table IV: Univariate and Bivariate logistic regression analysis assessing post-operative complication in two group (N=50)

Attributes	Unadjusted Odds Ratio (UOR) 95%CI	p-value	Adjusted Odds Ratio (AOR) 95% CI	p-value
Anastomotic Leakage				
No	1		1	
Yes	7.667 (1.470-39.987)	0.016	5.030 (0.495-51.140)	0.172
Hospital Stay				
5-8 days	1		1	
>8 days	8.500 (2.338-30.908)	0.001	10.476 (2.356-46.578)	0.002
Mortality				
No	1		1	
Yes	4.889 (1.150-20.790)	0.032	2.557 (0.302-21.643)	0.389

In summary, this study suggests that Bishop Koop ileostomy (Group A) provides better outcomes than Primary Anastomosis (Group B) in terms of shorter recovery times, fewer complications, and reduced mortality, making it a potentially preferable approach for treating Jejunoileal Atresia in pediatric patients.

Discussion:

The outcomes of the current study were operative time, bowel movement, establishment of oral feeding and complications in prospective measures. Type II and type IIIajejunoileal atresia were included because only excision of web followed by repair can be done in type I.[11] and multiple anastomosis might be required in type IV. Also, there is significant loss of length of intestine in type IIIb and type IV.[12]

In this study, ileal atresia (56.0%vs 52%) is more than jejunal atresia (44.0% vs 48%) in Group A and B respectively which differed from the result of a study conducted in Egypt in 2009.[13] This study found that the operative time was significantly longer for Bishop Koop ileostomy (Group A) than for Primary Anastomosis (Group B). The mean operation time of group A and group B was 38.88 ± 6.412 minutes and 30.68±7.793 minutes respectively. A study conducted by Zhang et al. 2016 showed 3 (1.2-4.5) hours as median operative time for this type of operation.[14] In the current study, only the time for completion of the mentioned procedures was considered, not the whole operative procedure. Most importantly the process was measured by stopwatch. This type of time frame was not mentioned in any other studies. The result showed significant statistical difference in operation time between two groups as the p=0.001. As the Bishop Koop procedure required a stoma in addition to anastomosis, about 5-10 minutes more was required compared to primary anastomosis.

In the present study, it was found that the mean time of bowel movement of group A and group B was 4.52±1.531 days and 3.92±3.463 days after surgery respectively. For BK procedure, functioning of stoma was considered as bowel movement and on the basis of that (along with other clinical parameters) trial feeding was introduced. Comparison between passage of bowel content though stoma and anus might be questionable. But BK procedure was given benefit of doubt for two reasons: a) funneling of anastomotic line can be avoided by wide end to side anastomosis, b) distal exteriorized stoma effectively decompress the raised intraluminal pressure.[15] There was no significant statistical difference in time of bowel movement between two groups (p=0.432).

In this study, Bishop Koop procedure gave the benefit of starting of test feeding early, earliest on 4th POD. On the other hand, test feeding started from 6th Pod onwards in case of Primary anastomosis in contrast to other study result of group A and group B (6.84±2.173 vs 5.60±4.95) didn't match with the result (4±0.67 vs 9.33 ± 2.16) of a study by Eltayeb (2009).[13]

In the current study, postoperative complications which included anastomotic leakage and intestinal obstruction were compared. In group A, In group A, only 2 (8.0%) respondent had anastomotic leakage. On the other hand, in group B, 10 respondents (40.0%) had anastomotic leakage. Findings of other studies showed 16.6% leakage in primary anastomosis was 22.22% and leakage in Bishop Koop procedure in Rahman et al (2012).[13,15] The result of current study demonstrates significant statistical difference in developing anastomotic leakage but not in developing obstruction between two groups. Moreover, there was significant difference is seen in relation to complications in two groups. Re-Laparotomy followed by enterostomy was done in eight patients of Group A and two patients in Group B among those who developed leakage or obstruction.

Reducing duration of postoperative hospital stay was another target. There was significant difference in length of hospital stays among Group A (mean, 8.40±1.871 days) which was shorter than Group B (mean, 11.00 ± 3.88 days). Imran et al (5.78 days) showed much lower duration of hospital stay in Bishop koop group in comparison to present study.[16] This difference was probably due to hospital discharge policy, strict practice of enhanced recovery protocol and the easy access to hospital for further follow-up visits if necessary.

In this study, survival rate was 88.0% in group A after the operative procedure which is close to the result in a study by Imran et al.(89.7%) but superior than Eltayeb (80%) and Rahman et al(77%).[13,16,15] On the other hand 60% survived in Group B which is much higher than the result Eltayebet al (50%) and Rahman et al(0%).[13,15]

Within one week, stool passed through anus and passage of intestinal content through stoma reduced and eventually stopped. So far, distal loop stoma was closed in four patients.

Finally, in the unadjusted model, group B exhibited 7.667 (95% CI 1.470-39.987), 8.500 (95% CI 2.338-30.908), and 4.889 (95% CI 1.150-20.790) times greater likelihoods of experiencing postoperative complications such as anastomotic leakage, prolonged hospital stay, and mortality; respectively. In the adjusted bivariate regression analysis model, the likelihood of hospitalization was determined to be 10 times (95% CI 2.356-46.578) greater in group B than in group A.

From above findings, it can be deducted that Bishop Koop procedure is a safe and effective technique for Jejunoileal atresia, especially in case of marked discrepancy between proximal and distal gut.

Limitations

The study has some limitations. Operations were not performed by single surgeon, which might have an influence on the result. Due to short study period, small sample size was taken and long-time observation could not be performed which may influence the validity of the study.

Conclusion

In summary, this study reinforces the findings from earlier literature that Bishop Koop ileostomy offers advantages in shorter recovery time, reduced postoperative complications, and lower mortality rates compared to Primary Anastomosis in cases of Jejunoileal Atresia. The findings advocate for a careful consideration of Bishop Koop ileostomy, particularly in resourced-limited settings where minimizing postoperative complications and hospital stay is a priority.

Declarations

Ethics approval and consent to participate

Before data collection, all ethical issues were maintained.

Consent for publication

All authors have approved this manuscript for publication.

Availability of data and materials

The datasets supporting the conclusions of this article are included within the article generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Author contributions

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Original Article

Understanding the Unseen Burden of Common Health Problems of School-going Children in Sub-urban Area: Insights from a Single-day Health Programme

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Abstract

Background: Children are considered as the future leaders of a nation. But, in developing countries like Bangladesh, school-age children often face a specific burden of preventable health issues that are aggravated by poor living conditions, inadequate hygiene, and health knowledge.

Objective: The study aimed to assess the common health problems among school-going children in a sub-urban area of Chattogram city, Bangladesh.

Methodology

This was a descriptive cross-sectional study conducted among 181 school children going to a sub-urban school in Chattogram city on April 9, 2025. A semi-structured questionnaire was used for data collection. Sociodemographic information, health practices and problems related data were recorded and analyzed. Descriptive statistics were performed using Microsoft Excel.

Results: Age of the participants ranged from 5 to 16 years, with a mean age of 9.43 (±2.76). Majority of them were boys (62.43%). Deworming and immunization status were 70.17% and 33.15% respectively. Common health complaints included dental caries (46.41%), undernutrition (39.78%), dental plaque (34.81%), scabies (30.39%), and anemia (27.07%).

Conclusion: Dental health problems are the commonest complaints among school-age children. The study also addressed a high burden of other preventable health conditions such as undernutrition, scabies and anemia. These findings underscore the need for regular school health screening programs and large-scale studies to improve health promotion initiatives in school level.

Key words: School children, malnutrition, anemia, scabies, dental health, sub-urban area.

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Introduction

Children are the most valuable asset of any nation [1]. They are defined as human beings from the moment of birth up to the age of 18, unless legal adulthood is attained earlier [2,3]. This is the most vulnerable period that influences a child's growth, development, and long-term well-being [3]. In low-income and middle-income countries (LMICs), children face a wide range of health issues, including both communicable and non-communicable diseases [4]. School-age children go through a phase of physical and mental development that shapes them into potential adults [5]. As children between 6 to 15 years spend a significant hour of the day in school, their health status greatly impacts their ability to learn. As a consequence, healthy children are more likely to succeed academically and grow into productive adults who can contribute to the nation's progress [1,3].

Although there has been tremendous development in the world at addressing health care issues over the last few decades, there are still disparities in health care among countries and areas within countries [8]. Common health conditions in high-income countries (HICs) differ from those in LMICs [6]. HICs such as Great Britain, USA, and Japan made a substantial progress in the control of infectious diseases. While the prevalence of visual defects, dental caries and malnutrition is still high in developing countries [7]. School going children often suffer from numerous health issues such as infections, malnutrition, vitamin deficiency, upper respiratory tract infections, and anemia. Due to low economic status, limited resources, prevalent socio-cultural beliefs, health service facilities are not available to all Bangladeshis [2, 20].

Although most of the studies were done in rural, urban settings, there still lacks nationwide school health related data [10]. There are inadequate literatures on under privileged school going children, particularly in sub-urban area. Therefore, this study aims to investigate the common health problems affecting the sub-urban school going children of Chattogram city, Bangladesh.

Methodology

Study setup: The present study was conducted at a school of sub-urban area on 9th April, 2025 in the district of Chattogram. This was an outreach health program organized by Chittagong Research Institute for Children Surgery (CRICS) and supported by A.K. Khan Foundation, a non-profit social welfare organization in Chattogram. Since its establishment (1991), the foundation is actively contributing to different types of philanthropic activities including health, education, social welfare and more in Chattogram city and across the country. Our study site (school) is also a part of its humanitarian activities. This was a single-day cross-sectional study conducted among 181 students aged from 5 to 16 years.

Survey administration: There were two pediatric surgeons, two pediatricians, one gynecologist, two dermatologists, and one oral and maxillofacial surgeon. In addition, there were two postgraduate trainees, twelve CRICS research assistants. There was also a team of SANDHANI Chittagong Medical College Unit who are medical students. There were six stations for overall health screening including medical conditions, surgical conditions, dermatological problems, gynecological assessment and oral health conditions of the students. There were a senior doctor, a post graduate trainee, one or two medical students and a research assistant in every station. There was an additional station for blood grouping and hemoglobin measurement which was done by SANDHANI team.

A comprehensive program schedule was sent to the A.K. Khan foundation two weeks before the visit to ensure that the program was properly organized. A questionnaire was developed to record the relevant information of the students. All the data collectors were briefed on the procedure of the data collection. Students who agreed to participate in the study with consent from their parents were included. Each student was given with a questionnaire and they were asked to carry the form at every station and return the forms after completing the survey. However, some information was collected from their parents as some students were unable to give accurate answer. ABO blood grouping and hemoglobin measurement was done at first and then clinical assessments of the students were performed by the panel of specialists at every station.

Study instrument: The health record form included sociodemographic and health practice related information- age, gender, religion, residence, occupation of parents, housing condition, source and treatment of drinking water, hand washing habit, height, weight, BMI, immunization, deworming status. The students were asked to report any present illness and any known congenital anomalies, regular health checkup history. These data were recorded in the general health section.

ABO blood grouping, Rh typing and the assessment of hemoglobin level were also performed and noted as general health related data. Nutritional status was defined based on BMI according to CDC age-for-BMI growth chart. Questions related to systemic conditions such as presence of any surgical condition, complaints of pain (abdomen/chest/others), respiratory distress, ENT problems, skin diseases, dental caries, calculus were recorded in the clinical section. A patient diagnosed with surgical condition (Left sided posterior auricular abscess) was referred to our center for better treatment. All these problems were identified by expert opinion. Only the students who completed the survey were considered for the analysis. (Appendix 1)

Statistical Analysis: Data were analyzed using Microsoft Excel. Categorical data were presented as frequency and percentage, and continuous data as mean and standard deviation. This study guaranteed the confidentiality of data by expressly omitting names from the case record forms and data were collected and processed in absolute anonymity with restricted user.

Results

A descriptive analysis was performed on a sample of 181 school going students to understand the health practice and burden of health (general and oral) conditions among them. The age of the participants ranged from 5 to 16 years with a mean of 9.43 (± 2.76), with the maximum representation of boys (n=113, 62.43%) and girls (n=68, 37.57%). Number of students from KG, class 1, class 2, class 3, class 4, class 5 and above class 5 were respectively 27 (14.92%), 22 (12.16%), 25 (13.81%), 36 (19.89%), 26 (14.36%), 37 (20.44%) and 8 (4.42%). A great number of students were Muslim (n= 167, 92.27%), followed by Hindu (n= 11, 6.07%) and Buddhist (n= 3, 1.66%). Majority of their fathers were manual worker (n= 95, 52.49%), followed by professional/managerial/technical employee (n= 44, 24.31%) and self-employed (n= 12, 6.63%). Most of the mothers were housewives (n= 119, 65.74%), followed by manual laborers (n=35, 19.33%) and 7.73% (n= 14) in professional or technical roles.

Majority of the students lived in semi-paka houses (n= 96, 53.04%), 28.73% (n= 52) in paka houses, and 7.18% (n= 13) in kancha houses, while a few students (n= 20, 11.05%) could not mention about their housing facility. Additionally, the source of drinking water was pipe water (n= 94, 51.93%), tube well water (n= 29, 16.02%), ground water (n= 25, 13.81%) and combined source (n= 1, 0.55%). However, 17.69% students (n= 32) could not specify the water source. Most children consumed water directly from the source (68.51%), while some used boiled water (8.83%) or filtered water (4.97%). [Table 1]

Table 1: Characteristics of the participants (N= 181)

Variables	N	%
Age (mean ± SD)	9.43 ± 2.76	
Gender		
Boys	113	62.43
Girls	68	37.57
Class		
KG	27	14.92
Class 1	22	12.16
Class 2	25	13.81
Class 3	36	19.89
Class 4	26	14.36
Class 5	37	20.44
Above class 5	8	4.42
Religion		
Islam	167	92.27
Hinduism	11	6.07
Buddhism	3	1.66
Father's Occupation		
Not alive	5	2.76
Manual worker	95	52.49
Professional/Technical/Managerial	44	24.31
Non Resident Bangladeshi (NRB)	2	1.1
Self-employed	12	6.63
Unknown	23	12.71
Mother's Occupation		
Not alive	2	1.1
Manual worker	35	19.33
Professional/Technical/Managerial	14	7.73
Housewives	119	65.74
Unknown	11	6.1

Housing Facility		
Semi paka	96	53.04
Paka	52	28.73
Kancha	13	7.18
Unknown	20	11.05
Source of drinking water		
Pipe water	94	51.93
Tube well water	29	16.02
Ground water	25	13.81
Pipe and ground water	1	0.55
Unknown	32	17.69
Household water treatment method		
Direct from source	124	68.51
Boiled water	16	8.83
Filtered water	9	4.97
Unknown	32	17.69

N= Number of participants, SD= Standard Deviation

Table 2 summarizes 70.17% (n= 127) had history of complete immunizations, with only 33.15% (n= 60) having dewormed. The most common blood group was O (+ve) (n= 53, 29.28%), followed by followed by B(+ve) (n= 47, 25.97%) and A(+ve) (n= 24, 13.26%). In terms of blood group Regarding blood group distribution, the most common was O (29.28%), followed by B(+ve) (25.97%) and A(+ve) (13.26%). In terms of nutritional status based on BMI, the majority of children (59.12%) were of normal weight, while 39.78% were underweight, and only 1.1% was overweight. Health complaints were reported by 72.38% of the participants, with 27.62% reporting no such issues. Hygiene habits showed that 79.01% of the children practiced hand washing both before eating and after using the toilet, while 20.99% followed only one of these practices. Additionally, a high proportion (83.43%) reported brushing their teeth regularly, whereas 16.57% did not maintain this habit.

Table 2: Health and hygiene status of the participants (N= 181)

Variables	**N**	**%**
Immunization status		
Yes	127	70.17
No	40	22.10
Unknown	14	7.73
Deworming		
Yes	60	33.15
No	88	48.62
Unknown	33	18.23
Blood Group		
A(+ve)	24	13.26
B(+ve)	47	25.97
O(+ve)	53	29.28
AB(+ve)	14	7.73
A(-ve)	1	0.55
B(-ve)	2	1.10
Unidentified	40	22.11
Nutritional status based on BMI		
Normal weight	107	59.12
Under weight	72	39.78
Over weight	2	1.1
Presence of complaints		
Yes	131	72.38
No	50	27.62
Hand washing habit (Before eating/after using toilet)		
Both	143	79.01
Any of them	38	20.99
Habit of regular teeth brushing		
Yes	151	83.43
No	30	16.57

N= Number of participants, SD= Standard Deviation

The bar plot in Figure 1 shows the prevalence of various common health problems identified by the panel of specialists dentists in the school going children. The most common health problems were dental caries (n= 84, 46.41%), under nutrition (n= 72, 39.8%), dental plaque (n= 63, 34.81%), scabies (n= 55, 30.39%), anemia (n= 49, 27.07%). Some other skin infections such as impetigo, eczema, allergic dermatitis (n= 23, 12.71%) were also reported along with scabies. However, other reported health problems including abdominal pain (n= 17, 9.39%), ENT problems (n= 15, 8.29%), headache (n= 12, 6.63%), cough (n=11, 6.08%) and over nutrition (n= 2, 1.11%) were less likely reported.

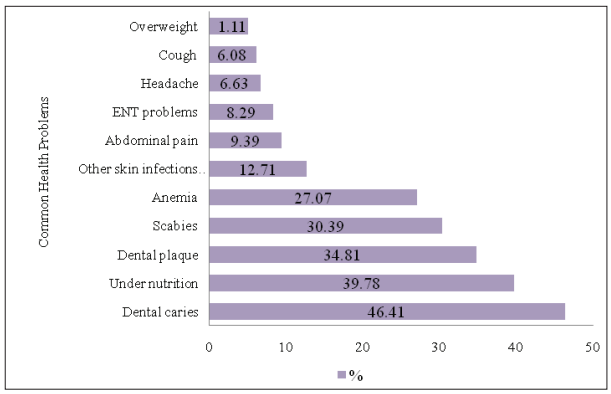


Figure 1: Bar plot showing the prevalence of common health problems among the students

Discussion

School Health Programs are a coordinated set of planned and continuous strategies, activities, and services associated with schools, designed to promote the best possible physical, emotional, social, and academic growth of students within the educational environment [1]. Understanding the distribution of easily preventable health issues is crucial for developing necessary health initiatives. The present study highlights a notable burden of preventable health conditions among school-going children, particularly in disadvantageous population. It underscores several obstacles they face due to socioeconomic, behavioral, and environmental factors.

We found that approximately 72.38% participants reported of some health problems. Dental caries, dental plaque, malnutrition, anemia are commonly found. Nearly half of the participants were affected by dental caries (46.41%), which not only affects oral health but also has implications for nutrition, self-esteem, and school attendance. This finding aligns with the result of Zhou et al. that found dental caries was prevalent in 41.15% of Chinese youngsters, linking high caries rates to inadequate brushing practices, sugary diets, and a lack of preventive care [8]. According to a national survey in Saudi Arabia, dental caries is still one of the most common non communicable diseases in children, with a rate of 65.6% prevalence [10] . Systemic problems restricting access to dental care, low parental awareness, and the lack of school-based dental screening programs are reflected in these numbers.

The higher prevalence of undernutrition (39.78%) and anemia (27.07%) among the participants that linked to the inadequate consumption of vital nutrients, including iron, protein, and vitamins. These nutritional deficits are one of the leading causes of illness in children worldwide. A systematic review on Ethiopian children highlighted similar facts regarding the prevalence (21%) of anemia [11]. Furthermore, another study addressed that stunting, cognitive delays, and an increased vulnerability to infectious diseases are all major consequences of undernutrition, especially in its acute and chronic forms. This vicious cycle impairs both individual development and societal productivity [12]. Additionally, our study found a remarkable distribution of scabies (30.39%) that raises serious public health concern, as the disease is extremely contagious and is closely linked to crowded housing, inadequate sanitation, and a lack of access to clean bedding and clothes [13]. Previous studies support this finding, emphasizing that poor hygiene maintenance, negligible attitude contributes to the increasing incidence of scabies [14,15].

Environmental and behavioral factors have significant contribution to child health problems. In our study, 48.62% of the participants were not dewormed, 68.51% of them drank untreated water and about 21% did not practice regular handwashing habit. Studies revealed that such behaviors increase the risk of exposure to intestinal parasites and waterborne pathogens in children. Disease transmission is high in school-settings due to suboptimal hand washing practices. [16]. For this reason, regular deworming programs are warranted in school going children to reduce the infestation of soil-transmitted helminths [17].

Nevertheless, sociodemographic disparities are also a major concern for the occurrence of health problems. The present study primarily focused on a center where majority of the students belong to lower-income families. These trends are indicative of more widespread structural injustices that restrict access to quality healthcare, education, and housing. Health disparities based on socioeconomic position can have a major impact on child growth, nutrition, and survival [18]. In order to address these factors holistically, the World Health Organization (2021) also supports comprehensive, school-based health promotion programs that incorporate dietary assistance, hygiene education, dental care, and family involvement [19].

Limitations

This study had certain limitations. It is unable to prove a causal relationship between risk variables and health

issues due to the nature of the study design. Single day visit, small sample size and purposive sampling technique produce potential biases. As data were collected via face to face interview, recall bias may be present. Health related data were recorded only based on verbal history and clinical examination. No confirmatory investigations were done. More vulnerable individuals may have been excluded due to participation bias. Nonetheless, the study has provided some major concern areas to be considered for further large-scale research in such less privileged, sub-urban areas.

Conclusion

This study highlights that dental health conditions are prevalent among half of the students living in low income areas. Additionally, the rate of scabies, undernutrition, and anemia among school going children are also alarming. Therefore, our findings emphasized the need for providing regular basic health services to the children who often suffer a lot from minor illnesses. Furthermore, this study also supports the idea to conduct large scale study for mapping the health profile of school-age children in future.

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Original Article

Perspective Determination of the relationship between Bacteriuria and D-J Stent Colonization due to the indwelling of D-J Stent following A-H Pyeloplasty

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Abstract

Background: The Double J (D-J) stent is commonly used following A-H pyeloplasty to facilitate the drainage of urine from the kidney to the bladder. One of the most frequent complications associated with the D-J stent is bacterial colonization, which can occur both on the stent itself and in the urine. However, bacterial colonization of an indwelling D-J stent may serve as a nidus for bacteriuria. The aim of this study was to identify the microbiological characteristics associated with stent colonization and urinary tract infection (UTI) in these patients, as well as to determine the drug susceptibility of the microorganisms involved.

Methods: This study was conducted in the Department of Pediatric Surgery at Chittagong Medical College and Hospital over a period of twenty-four months, from January 2018 to December 2019. A total of 31 patients with unilateral PUJ obstruction who underwent A-H pyeloplasty were included in this study. D-J stents were placed and left in situ for four weeks. The main outcome variables were UTI, stent colonization, microorganisms cultured from both the D-J stent and urine, and their antibiotic sensitivities. Post-operative follow-ups were conducted at 2 weeks, 1 month, 3 months, 6 months, and 12 months following A-H pyeloplasty, utilizing urine routine microbiological examination (R/M/E) and culture and sensitivity (C/S) tests.

Results: There was a total of 31 patients included in this study. The median age was 5 years (IQR: 1.7 years to 7 years), and the male-to-female ratio was 2.44:1. The affected side was right in 14 cases (45.2%) and left in 17 cases (54.8%). One month after the pyeloplasty, 41.9% of cases had positive urinary culture, and the proximal and distal segments of the D-J stent were colonized in 32% and 61.3% of patients, respectively. However, no statistically significant association was found between stent colonization and urine culture. The most commonly identified organisms colonized in both the stent and urine wereEscherichia coli. These cultured organisms were mostly sensitive to nitrofurantoin and meropenem.

Conclusion: Bacterial colonization in the D-J stent does not always induce UTI. Escherichia coli was the most frequently identified organism found in both the stent and urine, while nitrofurantoin and meropenem demonstrated high sensitivity against this pathogen.

Keywords: Double-J stent,urinary tract infection, stent colonization, microorganism, antibiotic sensitivity.

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Introduction:

Pelviureteric junction (PUJ) obstruction is the most common congenital anomaly causing hydronephrosis in neonates, infants, and children[1]. Anderson-Hynes (A-H) pyeloplasty is a well-established technique for PUJ obstruction with a 90–95% success rate [2]. The double J (D-J) stent is an important adjunct in pyeloplasty. Many pediatric urologists advocate the use of transanastomotic D-J stent for pyeloplasty to facilitate urinary drainage[3]. The main component of the D-J stent is polyethylene, which provides stiffness as an aid for insertion[4]. The most common reasons to leave a stent in place after A-H pyeloplasty are to ensure proper urinary diversion, maintain ureteral caliber, ensure anastomotic alignment,and prevent adhesion of the suture line[5].

Usually, an indwelling ureteral stent is left for 4-6 weeks [5]. It has been thought that a minimum of 4 weeks is needed for ureteral healing to protect the newly formed anastomosis and prevent anastomotic leakage [6]. D-J stent is usually removed by cystoscope under general anesthesia [4].

Any material exposed to the urinary system becomes coated with a biofilm composed of glycoproteins, matrix, and exopolymers[7]. Bacterial adherence to the biofilm by their fimbriae is followed by exopolysaccharide synthesis, which in turn strengthens the bacterial attachment to the stent and initiates the infection process [7,8]. Bacterial adhesion to the D-J stent surface may occur within the first 24 hours after stent insertion [9].

Bacterial colonization is very common in D-J stents that are retained for several weeks after pyeloplasty [8]. Bacterial stent colonization and stent-associated bacteriuria on indwelling ureteral stents were described by Riedl et al. (1999) [10]. Bacterial colonization of an indwelling ureteral stent begins approximately 2 weeks after its placement [3, 7]. The stent colonization rates in female patients were higher than in male patients, but the urinary tract infection rates were approximately equal [11]. They also reported in their study that the proximal and distal segments of the stent were colonized in 24% and 34% of patients, respectively [11]. The main organisms colonized from the stents were Escherichia coli, Enterococcus, and Pseudomonas [3, 9]. Staphylococcus aureus and Staphylococcus epidermidis were also common and considered to derive from the urethra [7].

Even with short courses of antibiotics, colonization of the urine eventually follows stent colonization, and infection often results [3]. Ben-Meir et al. (2009) reported that 70% of patients treated with an indwelling D-J stent following pyeloplasty had a positive urine culture, and 10% had symptomatic infections requiring treatment [7].

Materials and methods:

This study represents a prospective observational research conducted over a significant period of twenty-four months, from January 2018 to December 2019. The research was carried out in the Department of Pediatric Surgery at Chittagong Medical College Hospital (CMCH). The study population included all patients under the age of 12, irrespective of gender, who were admitted to the Pediatric Surgery Department for pyeloplasty due to PUJ obstruction at CMCH.

Selection criteria:

A. Inclusion criteria:

1. Age: Under 12 years.
2. Sex: Both (Male and Female).
3. Unilateral hydronephrosis due to PUJ obstruction.
4. Normal functioning of the contralateral kidney.

B. Exclusion criteria:

1. Patient with other congenital urological anomaly.
2. Bilateral PUJ obstruction.
3. Solitary kidney with PUJ obstruction.
4. Pyonephrosis.
5. History of previous nephrostomy.
6. Redopyeloplasty.
7. The patient's guardian who was refused to participate in this study.
8. Patient who did not complete at least 12 months of follow-up.

Variables of this study:

1. Urinary tract infection (UTI).
2. Stent colonization.
3. Microorganism cultured from D-J stent and urine.
4. The pattern of antibiotic sensitivity of cultured bacteria.

Pre-operative preparation:

During pre-operative preparation, correction of UTI was done as per culture and sensitivity (C/S) report, and again confirmed with negative urine culture according to the C/S report.

Antibiotics:

All patients were given a single dosage of broad-spectrum IV antibiotic just prior to induction of anesthesia, and the antibiotic was continued up to the 5thpostoperative day (POD). On 7th POD, a mid-stream urine sample was collected and sent for urine R/M/E and C/S.

Plain X-ray of the KUB region:

The position of the D-J stent was confirmed by plain X-ray of the KUB region just before the discharge of patients and before cystoscopic removal of the D-J stent.

Removal of D-J stent:

Cystoscopic removal of the D-J stent was done under general anesthesia between the 28th and 30th POD. 1 cm of the proximal end and distal end of the D-J stent were sent for quantitative bacteriological cultures and were given special instructions for both intraluminal

and extraluminal stent washout to exclude stent colonization.

Follow-up schedule:
a) First follow-up: On 14th POD.
b) Second follow-up: After around 1 month of operation.
c) Third follow-up: After around three months of operation.
d) Fourth follow-up: After around six months of operation.
e) Fifth follow-up: After around twelve months of operation.

Investigations: Urine for R/M/E and C/S were routinely done in every follow-up.

Operational definitions:
Bacteriuria: >105 colony-forming units (CFU) per milliliter of mid-stream urine with the cultureyielding only one or more bacteria[12,13].
Pyuria: Presence of >10 leucocytes per microlitre of mid-stream urine [12].
UTI: Presence of significant bacteriuria and pyuria with or without symptoms (fever, malaise, lethargy, irritability, poor feeding or reluctance to feed, vomiting, abdominal pain, failure to thrive, dysuria, passing frequent and small amounts of urine, foul-smelling and cloudy urine)[12].
Stent colonization: A colony count of >10 per high power field (HPF) in each segment of D-J stent [13].

Results:

Our study, which included a total of 31 patients, had a median age of 5 years (IQR: 1.7 years to 7 years) with male predominance (male to female ratio 2.44:1). The affected side was right in 14 (45.2%) cases and was left in 17 (54.8%) cases. Only 6 (19.4%) patients were diagnosed antenatally, as detailed in Table I.

Table I: The demographic characteristics of the patients

Variables		Patients of the study group (n=31)
Age, in months	Median (IQR)	63 (20-84)
	Range	1-132
Sex	Male	22 (71.0%)
	Female	9 (29.0%)
Affected side	Right	14 (45.2%)
	Left	17 (54.8%)
Antenatal diagnosis	Yes	6 (19.4%)
	No	25 (80.6%)

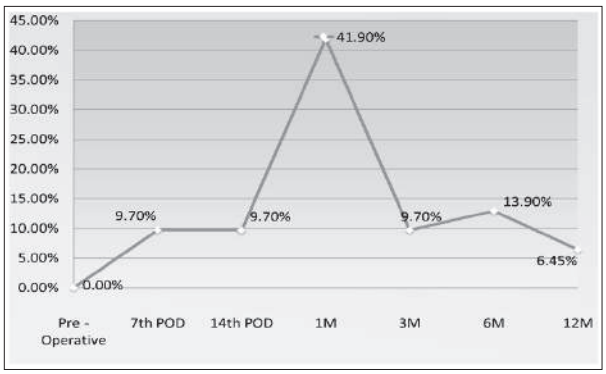


Figure 1: Trends of positive growth in urine culture at different time interval in the study group.

As shown in Figure 1, pre-operatively, both groups had confirmed negative urine culture, and features of UTI were also absent. On the 7thpostoperative day following pyeloplasty, 9.7 % of cases had a positive urinary culture, which remained consistent at 14thdays postoperatively. By one month after the pyeloplasty, 41.9% of cases had positive urinary culture.Followingthe removal of the D-J stent, urine culture became negative; at three months following pyeloplasty, only 9.7 % of cases had positive urinary culture. At six months following the operation, this figure was 13.9%, and by one year after the operation, only two patients (6.45%) had positive urinary culture.

In our study, the proximal and distal segments of the D-J stent were colonized in 32% and 61.3% of patients, respectively (Table II).

Table II: The site of D-J stent colonization

Site of stent colonization	Patients of the study group (n=31)
Stent colonization (Total)	19 (61.3%)
Proximal end	10 (32%)
Distal end	19 (61.3%)

Out of the 31 patients, 19 had positive stent cultures; among these, nine patients (47.4%) had negative urine cultures. Conversely, among the 12 patients who had negative stent culture, three patients (25%) had a positive urine culture (Table III).There was no statistically significant association observed between stent colonization and urine culture ($P > 0.05$). This finding indicates that stent colonization does not demonstrate a significant correlation with concurrent urinary infections at the time of stent removal.

Table III: Relationship of stent colonization with urine culture status

		Urine culture		Total	P value
		Positive	Negative		
Stent colonization	Positive	10 (52.6%)	9 (47.4%)	19 (100.0%)	0.252^{NS}
	Negative	3 (25%)	9 (75%)	12 (100.0%)	

Table IV: Pathogens cultured from D-J stent and urine on the day of stent removal

Microorganism	D-J stent culture: no. of patients (%)	Urine culture: no. of patients (%)	P value
Escherichia coli	7 (36.8%)	5 (38.4%)	
Enterococcus faecalis	3 (15.8%)	1 (7.7%)	
Staphylococcus aureus	2 (10.5%)	2 (15.4%)	0.832^{NS}
Staphylococcus epidermidis	1 (5.3%)	1 (7.7%)	
Proteus mirabilis	3 (15.8%)	2 (15.4%)	
Klebsiella pneumonia	2 (10.5%)	0	
Pseudomonas aeruginosa	1 (5.3%)	1 (7.7%)	
Serratia species	0	1 (7.7%)	
Total	19	13	

P values are derived from the Chi-square test. NS: Statistically not significant.

Bacterial colonization of the D-J stent was detected in 19 out of 31 patients (61.3%).The most commonly identified organisms colonized in the stent were Escherichia coli(36.8%), followed by Enterococcus faecalis (15.8%), Proteus mirabilis (15.8%), Staphylococcus aureus (10.5%), Klebsiella pneumonia (10.5%), Pseudomonas aeruginosa(5.3%) and Staphylococcus epidermidis (5.3%) (Table IV). The most frequently isolated pathogen in urine was Escherichia coli, found in 5 out of 13 patients (38.4%). Additional isolated pathogens are listed in Table IV. There is no statistically significant difference in the types of organisms found between D-J stents and urine samples ($P > 0.05$). This high p-value suggests a strong lack of evidence against the null hypothesis, which states that the distribution of organisms is the same in both stent and urine cultures.

The cultured organisms from both the D-J stent and urine were most sensitive to nitrofurantoin and meropenem.In contrast, they exhibited poor sensitivity to tetracycline, a combination of amoxicillin and clavulanic acid, as well as erythromycin, as shown in Table V. There is no statistically significant difference in the sensitivity patterns between D-J stents and urine cultures ($P > 0.05$). This elevated p-value indicates that there is no statistically significant difference in the antibiotic sensitivity profiles of bacteria isolated from D-J stents compared to those obtained from urine cultures.

Table V: The Antibiotic sensitivity pattern of the bacteria cultured in D-J stent and urine

Antibiotic	D-J stent: no. of patients (%)	Urine: no. of patients (%)	P value
Nitrofurantoin	16 (84.2%)	11 (84.6%)	
Vancomycin	13 (68.4%)	10 (76.9%)	
Linezolid	12 (63.2%)	9 (69.2%)	
Amikacin	14 (73.7%)	10 (76.9%)	
Meropenem	15 (78.9%)	11 (84.6%)	0.999^{NS}
Gentamicin	14 (73.7%)	10 (76.9%)	
Levofloxacin	10 (52.6%)	7 (53.8%)	
Ceftriaxone	8 (42.1%)	6 (46.2%)	
Ceftazidime	8 (42.1%)	6 (46.2%)	
Ciprofloxacin	9 (47.4%)	7 (53.8%)	
Trimethoprim and sulphamethaxole	9 (47.4%)	5 (38.5%)	
Tetracycline	4 (21.1%)	3 (23.1%)	
Imipenem	8 (42.1%)	5 (38.5%)	
Amoxicillin and clavulanic acid	3 (15.8%)	2 (15.4%)	
Erythromycin	3 (15.8%)	2 (15.4%)	

P values are derived from the Chi-square test. NS: Statistically not significant.

Discussions

The placement of a D-J stent following A-H pyeloplasty can lead to several complications, which have been extensively documented in the literature [14]. This study aimed to investigate one of the primary complications associated with D-J stents: the incidence of post-operative urinary tract infections (UTIs) and stent colonization over time. The findings of this study indicated that stent colonization after A-H pyeloplasty does not exhibit a significant correlation with concur

rent urinary infections. Furthermore, the distribution of microorganisms and the antibiotic sensitivity profiles of the bacteria were nearly identical in both the D-J stent cultures and the urine cultures.

This study was conducted on 31 patients, and all of the patients were followed up for 12 months according to the case record form. In this study, the median age of the patients was 5 years. Senguttuvan and Jigy (2014) stated that the median age at presentation of PUJ obstruction was 11 months (3 months to 11 years) [15]. Luis et al. (2003) showed that median age at the time of surgery was 6.3 years, with ages ranging from 4 months to 16 years [16]. Our study showed a male predominance, with a male-to-female ratio of 2.44:1. Out of the total patients, 14 (45.2%) patients had left PUJ obstruction, and 17 (54.8%) patients had right PUJ obstruction. Similarly, Senguttuvan and Jigy (2014) noted that boys (57%) were affected more commonly with PUJ obstruction than girls (43%), and the left side (52.3%) was more frequently involved than the right side [15]. In our study, six patients (19.4%) were diagnosed during antenatal check-ups using ultrasound. Similarly, an Indian study conducted by Laddha et al. (2018) reported a low rate of antenatal diagnosis at 21.3% [17]. In contrast, other studies indicated higher rates, with 53.9% in England and 52% in the USA [3, 18]. It appears that developed countries have better antenatal check-up facilities compared to our own [3, 18]. This discrepancy calls for increased attention and awareness in our country. However, it is encouraging to note that more people are now seeking antenatal consultations for fetuses diagnosed with hydronephrosis.

The colonization of bacteria on the ureteral stent is an important problem.In this study, we found that the occurrence of post-operative UTI was 41.9% on the day of stent removal, while the rate of stent colonization was 61.3%. After removal of the D-J stent, urine culture returned negative, and only two patients (6.45%) had positive urinary culture one year after the operation. However, there was a notable discrepancy between the urine culture and the stent culture. D-J stents act as a nidus for bacteria, and long-term stent retention in the urinary tract was associated with a high risk of bacterial colonization, whereas the risk of urine infection was much lower [12,13]. In our findings, stent colonization was often followed by colonization of the urine. Interestingly, 19 had positive stent cultures; among these, nine patients (47.4%) had negative urine cultures. Islam et al. (2022) reported that out of 14 stent-positive cases, 10 (71%) had negative urine cultures [19]. All of these results demonstrated inconsistencies between urine and stent colonization. However, our study did not find a statistically significant association between stent colonization and urine culture results. This observation was also supported by some other studies, where Farsi et al. (1995) reported a 68% stent colonization rate and a 30% prevalence of bacteriuria, and Paick et al. (2003) reported that the incidence of stent colonization was 44% and bacteriuria was 21% in the 4-week stenting group [20, 21]. Additionally, Ozgur et al. (2013) found that the rate of colonization was 2.2% and 25% when the indwelling time was less than 4 weeks and more than 4 weeks, respectively [22]. These data suggest that colonization in the stent is an essential step of UTI and precedes colonization in the urine. However, bacterial colonization in ureteral stents does not always induce urinary tract infection.

The colonization rate of D-J stents was found to be higher in the distal segment (61.3%). Akay et al. (2006) also reported in their study that the proximal and distal segments of the D-J stent were colonized in 24% and 34% of patients, respectively [11]. Factors such as frequent contact with urothelium, the curling properties of the stent, and the presence of multiple holes at both ends of the D-J stent could play an important role in bacterial colonization [14, 20]. Various pathogens were identified in our study, with the most commonly isolated organisms being Escherichia coli (36.8%), followed by Enterococcus faecalis and Proteus mirabilis (both at 15.8%), Staphylococcus aureus and Klebsiella pneumonia (both at 10.5%), Pseudomonas aeruginosa (5.3%), and Staphylococcus epidermidis (5.3%). In urine samples, Escherichia coli was the most frequently isolated pathogen, detected in 5 out of 13 patients (38.4%). Additionally, Ben-Meir et al. (2009) found Escherichia coli, Enterococcus and Pseudomonas were the main organisms colonized in the stents [7]. While most pathogens detected were not clinically significant, UTI caused by Pseudomonas were noted to be highly virulent [7].

In this study, we found that the cultured organisms from both the D-J stent and urine exhibited the highest sensitivity to nitrofurantoin and meropenem. This aligns with findings from Abu et al. (2022), which reported that the organisms cultured from the D-J stent and urine were most sensitive to nitrofurantoin [23].They noted poor sensitivity to cephalosporins and quinolones, along with resistance to tetracycline and ceftriaxone [23]. Bouassida et al. (2023) observed that organisms isolated from urine were slightly more susceptible to the antibiotics tested compared to those cultured from stents, particu

larly regarding Escherichia coliand Pseudomonas spp [24]. In their study, both norfloxacin and ciprofloxacin were effective against various Gram-negative and Gram-positive urinary pathogens [24]. Shabeena et al. (2018) reported that most of the isolated organisms were sensitive to the tested antibiotics, with multiple coloniesdetected in D-J stents that were placed for more than 4 weeks [25]. Conversely, Yuehua Li et al. (2022) noted significant drug resistance among bacteria causing UTI associated with D-J stents [26]. They recommended using empirical antibiotics with relatively low drug resistance rates, such as piperacillin /tazobactam, meropenem, tigecycline, cefoperazone/sulbactam, teicoplanin, imipenem, and vancomycin, prior to conducting drug sensitivity tests [26]. Additionally, Lifshitz et al. (1999) found that prophylactic antibiotic treatment does not prevent bacterial adherence to ureteral stents [27]. Their data implied that bacterial adherence is an early event; thus, while antibiotic treatment may not prevent stent colonization, it can alter the bacterial flora.

Conclusion:

An indwelling D-J stent poses a considerable risk of stent colonization and UTI. However, bacterial colonization in D-J stents does not always induce UTI, and stent colonization does not demonstrate a significant correlation with concurrent urinary infections. Escherichia coli is the most commonly identified organism found in both the stent and urine. The bacteria cultured from both the D-J stent and urine are highly sensitive to nitrofurantoin and meropenem, which indicates effective treatment options are available.

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Original Article

Advancement in Paediatric Laparoscopic Surgery: Two Years' Experience in A Tertiary Level Medical College Hospital in Bangladesh

Reza S[1], Rahman S[2], Afroz E[3], Alam M[4], Alam M M[5], Fatema U[6]

Abstract

Introduction: Laparoscopic surgery has evolved rapidly in recent years and is considered a standard procedure in Paediatric surgery[1]. Recent advanced in the paediatric laparoscopy have largely concentrated on reducing the size of incisions needed to operate[2]. Now a days an increasing number of diagnostic and therapeutic surgical procedures are being done laparoscopically[3].

Methods: This retrospective paediatric laparoscopic study was carried in Dhaka Medical College and Hospital over a period of 2 years from Jan 2023 to Dec 2024. For different surgical conditions, age ranged 2 months to 12 years were operated laparoscopically for different surgical conditions.

Results: A total 264 patients were operated laparoscopically. Out of them laparoscopic hernia repair was done on 85 patients, followed by laparoscopic appendectomy was in 59 patients, laparoscopic orchiopexy was in 51 patients, laparoscopic cholecystectomy was in 24 patients, laparoscopic assisted pull through was in 11 patients, diagnostic laparoscopy was in 10 patients, laparoscopic assisted ano rectoplasty was in 07 patients, laparoscopic pyeloplasty was in 03 patients, laparoscopic ovarian cystectomy was in 03 patients, laparoscopic excision of prostatic utricle was in 03 patients, others procedures was in 8 patients.

Conclusion: Laparoscopic surgery is becoming the standard of care for many paediatric conditions. There is an increased demand from referring physicians as well as the public for laparoscopic surgery. Careful preparation and training are the cornerstones of successful outcome.

Key Words: Advance Laparoscopy, Paediatric Surgery, DMCH.

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Introduction:

Laparoscopic surgery has existed since the development of diagnostic laparoscopy in 1960s. The process of laparoscopic surgery from diagnostics to a surgical procedure at the beginning of the 1980s; and since it has become a frequently applied technique for a wide field of indication.

The benefit of laparoscopic surgery is improved visualization, minimal surgical trauma, enhanced cosmetic outcome, precise dissection, reduce risk of infection, shorter hospital stays, decreased blood loss, faster return to normal activities, early recovery and less post operative pain.

Methods: Two hundred sixty-four patients in paediatric age group were operated laparoscopically for various conditions in department of paediatric surgery

in Dhaka medical college and hospital, Dhaka, Bangladesh, from Jan 2023-Dec 2024, to see the feasibility and surgical outcomes of different laparoscopic procedures of paediatric age group 2 months to 13 years. All patients underwent laparoscopic procedures for various surgical conditions for both therapeutic and diagnostic purposes.

The various condition for which laparoscopic procedure was performed are inguinal hernia, appendicitis, impalpable testes, cholelithiasis, Hirschsprung's diseases, anorectal malformation, adnexal mass, DSD, PUJ obstruction, prostatic utricle, removal of retained DJ stent etc.

After elaborate history taken, through clinical examination and proper investigation diagnosis was made and the patients or guardians were counselled for the procedure whether therapeutic or diagnostic. Informed written consent were taken from parents or guardians before the procedures.

All the cases were done under general endotracheal anesthesia.

The first port placement for telescope in laparoscopy was made at supraumbilical region, initially was in open method but later on with experience switched over to blunt method in fresh cases. Pneumoperitoneum was achieved by using carbon dioxide and pressure was maintained at 6-12 mm of mg dependent upon age and contour of abdomen. 2nd, 3rd, or 4th port were made according to principle of baseball diamond concept for proper ergonomic.

A 5mm 0o or 30o telescope was used in majority of cases and 10 mm 30o telescope was used in few cases in older children or some time where the procedure involved removal of a large specimen under direct vision.

A though search of whole abdominal cavity was made to confirm preoperative diagnosis as well as any existence of other pathology in abdominal cavity.

Results: There were 264 patients of pediatric age group were operated laparoscopically for various surgical conditions.

Hepatobiliary system:

Laparoscopic cholecystectomy: We performed laparoscopic cholecystectomy in 24 patients for cholelithiasis. All cases were diagnosed by ultrasonogram. Age range between 2 years to 13 years. Two patients had hemolytic diseases. 8 patients were female and 16 were male. Conventional four port lap cholecystectomy was done. 3 patients required abdominal drain due to per operative oozing. Operating time range from 30 to 80 minutes with mean time 40 minutes. One case required conversion. Specimen retrieval was done via 10mm epigastric port. Majority discharged on 2nd POD after oral feeding established which was given on 1st POD after getting bowel sound. All patients followed up on 7th POD. Two patients had epigastric port site infection which managed by oral antibiotics.

Gastrointestinal system:

Laparoscopic appendectomy: 59 patients underwent laparoscopic appendectomy. Among them 30 were girls and 29 were boys, age range from 3 years to 13 years. 10 were acute cases and rest were elective cases. Three ports were used, one 10 mm or 05 mm umbilical port for telescope and other two ports -one 05 mm port in the midline above pubic symphysis and one 05 mm port in right iliac fossa just below the umbilical level at mid clavicular line. In initial cases metallic or hemo clips were used at base of the appendix, later on after gaining experience intracorporeal knotting was done in maximum cases. Specimens retracted through 10 mm umbilical port with the help of long reducer. Operating time ranged from 20 minutes to 60 minutes, mean operating time was 35 minutes. Two patients had port site infection which was managed by oral antibiotic. Elective cases were discharged on 1st POD and acute cases were discharged on 2nd POD after oral feeding established.

Hirschsprung's disease: 11 patients including 07 males and 04 females, age ranges 1 year to 7 years. All patients underwent; laparoscopy assisted Swenson procedure. Three ports were used, one 10 mm umbilical port used as camera port and two ports on right and left iliac fossa below umbilical region in midclavicular line as working ports. Operating time ranged from 90 minutes to 140 minutes, mean time was 100 minutes. 10 patients had covering colostomy and one patient underwent single stage.

Anorectal malformation: 7 patients including 5 males and 2 females, age range 1 year to 4 years, anorectal malformation with pelvic colostomy in situ underwent laparoscopy assisted anorectoplasty. Three ports were used – umbilical port used as camera port and two

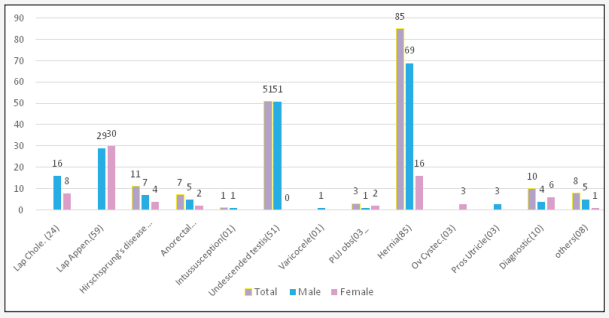
other ports used as working ports on either side at level of umbilicus in midclavicular line. Distal pouch dissected and fistulas were transfixed and cut where present then pulled through a hole made in the centre of the muscle complex and anoplasty was done.

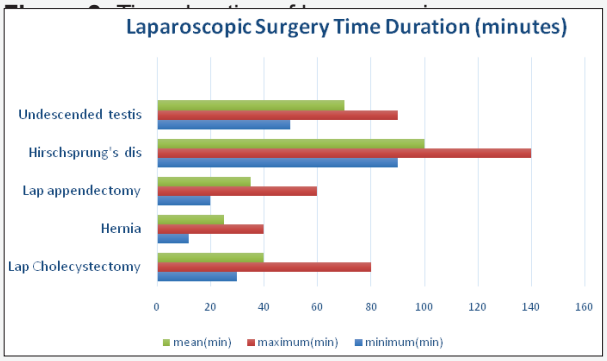
Intussusception: One 08 months old boy diagnosed as intussusception on the background of history, clinical examination & ultrasonogram underwent laparoscopy. Three ports were used – umbilical port used as camera port and two other ports used as working ports on either side below level of umbilicus in midclavicular line. Ileocecal intussusception reduced laparoscopically and patient was discharged on 2nd POD after feeding established.

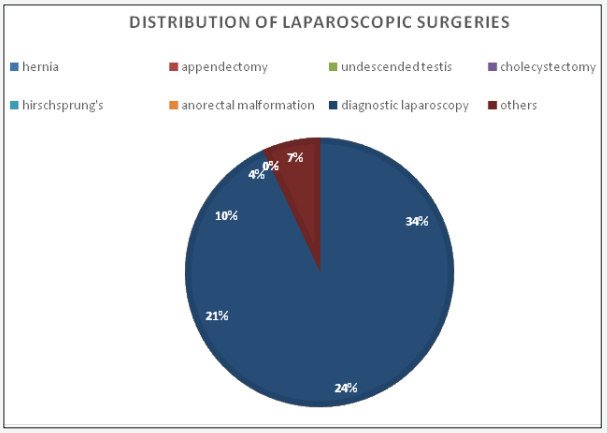
Table-1 : Laparoscopic surgeries age and sex distribution

Surgery		Age range	Total	Male	Female
Hepatobiliary system	Lap. cholecystectomy	2yr-13yr	24	16	08
Gastrointestinal system	Lap. appendectomy	3yr-13yr	59	29	30
	Hirschsprung's disease	1yr-7yr	11	07	04
	Anorectal malformation	1yr-4yr	07	05	02
	Intussusception	08 mon	01	01	00
Genitourinary system	Undescended testes	07mon-06yrs	51	51	
	Varicocele	07 yrs	01	01	
	PUJ obstruction	1yr-3yr	03	01	02
	Hernia repair	02mon-12yr	85	69	16
	Ovarian cystectomy	7yrs-11yrs	03		03
	Prostatic utricle excision	4yrs-7yrs	03	03	
Diagnostic laparoscopy		2yrs-12yrs	10	04	06
others			08	05	03
Total		02 mon-13 yrs	264	192	74

Figure-1: Laparoscopic surgery sex distribution







Genitourinary system:

Undescended testes (Non palpable): A total 51 patients, age ranged 7 months to 6 years, underwent laparoscopic orchiopexy for NPUDT. Three cases underwent stage procedure, (Fowler Stephen stage 1and stage 2) second stage was done after 6 months later. Operation time ranged from 50 minutes to 90 minutes, mean time was 70 minutes. Three ports used, umbilical port as camera port, on either side of umbilicus two ports as working ports. Lengthening of cord was achieved very carefully without injuring vas and vessels. When testes moved on opposite internal ring easily then it was fixed to sub dartos pouch with absorbable suture. Majority of cases testes was brought out into the sub dartos pouch making a tunnel medial to inferior epigastric vessel.

Varicocele: One patient underwent varicocelectomy at the age 7 years, port position same as hernia, and time needed 50 minutes.

PUJ obstruction: Three patients were diagnosed as PUJ obstruction and underwent laparoscopic pyeloplasty age ranged 1 year to 3years, 2 were girls one was boy. Three ports used, 5 mm umbilical as camera port and two others as working on either side of

camera port as baseball diamond concept. After identifying pelvis, it was dissected and dismembered properly. PUJ removed and lateral spatulation was done. The posterior layer was closed with 5/0 vicryl in continuous manner and DJ stent was placed properly. Anterior layer was closed with 5/0 vicryl in same manner as posterior layer. A drain was kept in anastomotic bed. All patients were discharged on 3 POD after removing drain. Patient were followed up after 7 days, 4 monthly for 1 year, 6 monthly for next 2 year and annually thereafter.

Hernia repair: A total 85 patients underwent hernia repair laparoscopically, among them 69 were boys and 16 were girls. Age ranged from 2 months to 12 years. 8 patients were diagnosed as bilateral after introducing camera. 3 patients were bilateral hernia diagnosed preoperatively. Single port (60), two ports (10) and three ports (15) were used for hernia repair. In single port and two ports extracorporeal knotting were done whereas in three ports intracorporeal knotting were done. For extracorporeal knotting 3/0 prolein and intra corporeal knotting 4/0 vicryl were used.

In single port, operation time was 12 minutes to 25 minutes. In two port operation time was 20 to 30 minutes. In three ports operation time was 20 to 40 minutes.

4 patients developed hematoma in single port, 1 patient developed hematoma in two ports and 2 patients developed hematoma in three ports. All patients were managed conservatively.

There was one recurrence in single port hernia repair.

Discussion: Laparoscopic surgery has continuously developed over the past years, advancing from an invasive diagnostic tool to an efficient for surgical treatment. On going training, experience and development in images and laparoscopic instrument have facilitated extension of the application of laparoscopic surgery.

Faster convalescence, reduced hospital stays, and faster return to normal activity are the most evident advantages of laparoscopic surgery.

The outcome, efficiency, decreased incidence of wound infection and reduced perioperative morbidity of minimally invasive procedure have been shown across different application[4,5].

Majority of procedure were simple including hernia repair, orchiopexy, cholecystectomy, and appendectomy. We also performed some advance cases like Lap assisted pull through, Lap assisted ano rectoplasty, Lap pyeloplasty, removal of retained DJ stent, excision of prostatic utricle.

Early study we mostly used open technique for camera port but with the gaining of experience we used blind technique for camera port.

We presented our experience of performing laparoscopic surgeries in paediatric age group over last two years.

Based on difficulties encountered and expertise available we divided this procedure in to simple and advanced procedures.

Laparoscopy in paediatric age group is gaining momentum day by day with increased pouring in of reports from many studies conducted all around the globe[5,7].

Laparoscopic cholecystectomy is the most common laparoscopic procedure performed in adults[8]. Non haemolytic cholelithiasis is the commonest indication for lap cholecystectomy in children in our study which corroborated with the global scenario[9]. Laparoscopic approach offers the advantages of minimal morbidity, shorter hospital stays, earlier return to school and better cosmetic results[10]. In our study we found the patients guardians was highly satisfied with early recovery of child with less hospital stay, less pain, and small scar.

Appendectomy is a common surgical procedure in paediatric population. In 1981, Semm from Universitals Frauenklinik, Keil, Germany performed the first laparoscopic appendectomy which is now considered as a safe alternative to open appendectomy in paediatric patients and our study shows shorter hospital stay, less post operative pain, less post operative complications, less post operative ileus, and of course, a better cosmesis (11,12,13).

Hirschsprung's disease: The surgical management of Hirschsprung's disease has developed rapidly from two stage or three stage procedures to a single stage surgery and the clinical practice has been modified in the last three decade from open to trans anal and laparoscopic assisted surgery (14,15,16,17).

Laparoscopic assisted Swenson pull through is a feasible, safe, and suitable technique for the treatment of

classical Hirschsprung's disease in the children with favorable outcomes (14,15,16,17).

Due to less pain, short hospital stays, less post operative complications and high cosmetic outcomes laparoscopic assisted pull through is gaining popularity in recent year.

The first LAARP for imperforate anus was applied in 2000 by Georgeson et al. The procedure combines minimal perineal dissection, preservation of the distal rectum within the levator ani and external anal sphincter muscle complex[18]. The cosmetic results, the wound infection, the requirement of post operative analgesia and the consequent surgical stress, are in favor of the LAARP technique. On contrary the extensive perineal dissection of the PSARP predisposes the patient to increased risk of wound infection and post operative pain and stress[19]. As in LAARP muscle complex are not divided, continent of LAARP is better.

The use of laparoscopy for the repair of inguinal hernia remains a topic of debate, although evidence of the various advantages over open surgery has been increasing in recent years[20].

The overall operative time in single port and two ports hernia repair was less in both unilateral or bilateral inguinal hernia pair. Less hospital stays, less post operative pain and operative time are paramount issue for the patient's guardian. The diagnosis of contralateral inguinal hernia is an additional advantages of laparoscopic hernia repair. Three ports intracorporeal inguinal hernia repair is time consumes and needs more expertisation in intracorporeal knotting[21]. The recurrence rate in laparoscopic inguinal hernia repair is less than open surgery.

Open dismembered pyeloplasty described by Anderson Hynes in 1949, has been for many years the gold standard in treatment of UPJO in children with a success rate around 90% (22;23). Since the 1990, laparoscopic and later Robot assisted, pyeloplasty have become more and more popular (24,25,26,27). Despite this fact, operation still remains the most common operation in children with hydronephrosis. The major advantages of laparoscopic pyeloplasty for UPJO are less post operative pain, shorter hospital stay, early recovery and a better cosmetic result.

Conclusion: Laparoscopic procedures in paediatric patients has proven to be a game changer in the field of paediatric surgery. Its minimal invasive nature offers several benefits including less pain, faster recovery, shorter hospital stays, minimal scarring, reduced risk of infection, improved visualization, more precise surgery, reduced blood loss, enhanced cosmetic outcomes and faster return to normal activities. Despite lot of advantages there are also some challenges like technical expertise development, equipment, cost, limited surgical field, pneumoperitoneum, patient selection, and ergonomic.

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Original Article

Outcomes and Predictors of Ventriculoperitoneal Shunt Failure in Children with Hydrocephalus

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Abstract

Background: Pediatric hydrocephalus is a common neurological condition requiring surgical intervention, primarily through ventriculoperitoneal (VP) shunt placement. Despite widespread use, VP shunt systems face complications, with failure rates remaining high, particularly in low- and middle-income countries (LMICs). Identifying risk factors for shunt failure is critical for improving outcomes. This study aimed to determine the incidence, types, timing, and predictors of VP shunt failure in children with hydrocephalus at a tertiary pediatric neurosurgical center in Bangladesh.

Methods: This prospective observational study was conducted in the Department of Pediatric Neurosurgery, Bangladesh Shishu Hospital and Institute, from July 2021 to June 2024. A total of 226 pediatric patients (aged 0–18 years) who underwent primary or revision VP shunt procedures were included in this study. Baseline demographic and clinical data were collected. Patients were followed for one year postoperatively to assess shunt failure incidence and timing. Statistical analyses included chi-square and t-tests to identify risk factors associated with failure.

Results: The overall shunt failure rate was 32.7%, predominantly due to mechanical obstruction (20.4%) and infection (10.2%). Most failures occurred within six months post-surgery (75.7%). Significant predictors of failure were age under six months (p=0.004), emergency surgery (p=0.024), post-infectious hydrocephalus (p=0.001), and longer surgery duration (p<0.001).

Conclusion: VP shunt failure in pediatric hydrocephalus is influenced by patient age, surgical urgency, etiology, and operative factors. Tailored surgical strategies and stringent perioperative care are essential to improve outcomes in this vulnerable population.

Keywords: Ventriculoperitoneal shunt, hydrocephalus, pediatric neurosurgery, shunt failure, risk factors, Bangladesh.

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Introduction:

Hydrocephalus, defined by an overload of cerebrospinal fluid (CSF) inside the brain's ventricles, is frequently found in children and affects both their intellectual growth and daily life. It occurs in about 0.5 to 1 in 1,000 live births globally and typically leads to emergency neurosurgical treatment for children[1,2]. The standard treatment is to insert a ventriculoperitoneal (VP) shunt, which channels fluid from the brain's ventricles to the abdomen to relieve pressure on the brain and avoid more harm[3].

Even though VP shunt systems help patients, they are often troubled by mechanical problems, infections and migrations that must be fixed by revision surgery[4]. Shunts have a higher risk of failure in the first year, and more than half of these cases require another opera

tion within two years[5,6]. Problems in the early stages are mostly mechanical, but infections tend to appear in the later, subacute stage after the operation[7,8].

Patients in Bangladesh and similar regions, who have shunt complications, are affected more than others because they have less access to neurosurgeons, tend to present their symptoms late and lack proper follow-up opportunities[9]. Before, studies from regional institutions found that failed CSF shunt surgeries happen in between 20% and 50% of patients and this is often linked to individual cases, the surgical method and postoperative management[10,11]. Because congenital stenosis, post-infectious challenges, and intraventricular bleeding can all be causes, it adds more difficulties in managing and predicting these outcomes[12].

Risk factors for shunt failure have been extensively explored in the literature. Younger age, particularly infants under six months, has consistently been associated with a higher risk of shunt malfunction, potentially due to immature immune systems and technical difficulties during surgery[13,14]. Emergency surgeries, often performed under suboptimal conditions, have also been linked to higher complication rates compared to elective procedures[15]. In addition, longer operative durations and underlying post-infectious etiologies are significant contributors to poor shunt survival[16].

However, there remains a lack of context-specific data from Bangladesh regarding the incidence, timing, and predictors of VP shunt failure in children. Understanding these variables is essential for developing targeted strategies to reduce complications and improve outcomes. While international studies provide useful insights, local variations in healthcare delivery, patient demographics, and etiological profiles necessitate region-specific research.

This study aims to fill that gap by examining the outcomes and predictors of VP shunt failure in a large cohort of pediatric patients at a leading neurosurgical center in Bangladesh. By analyzing patient demographics, clinical presentations, surgical factors, and postoperative complications, the study seeks to identify key risk factors associated with shunt failure. This evidence can inform surgical planning, patient counselling, and resource allocation for pediatric hydrocephalus management in similar settings.

Methodology & Materials

This prospective observational study was conducted at the Department of Pediatric Neurosurgery, Bangladesh Shishu Hospital and Institute, Dhaka, a tertiary level hospital yearly admitted patients are more than ten thousand with an organized strong manpower and wide range of surgical expertise from July 2021 to June 2024. A total of 226 pediatric patients diagnosed with hydrocephalus and undergoing ventriculo-peritoneal (VP) shunt surgery were included.

Sample Selection

Inclusion Criteria:

- Children aged 0–18 years with a clinical and radiological diagnosis of hydrocephalus
- Underwent primary or revision VP shunt surgery
- Provided informed consent from parents or guardians

Exclusion Criteria:

- Patients with prior endoscopic third ventriculostomy (ETV)
- Lost to follow-up within the study period
- Patients who hadother gross congenital anomalies.

Data Collection Procedure: Data were prospectively collected using a standardized case report form to capture demographic details, clinical presentation, hydrocephalus etiology, surgical details, and postoperative outcomes. The surgical duration was recorded intraoperatively. Follow-up assessments were conducted at regular intervals up to one-year post-surgery to monitor shunt functionality and to detect failures. Clinical assessments were performed by experienced neurosurgeons, and all relevant surgical and postoperative data were documented accurately and consistently. Data entry was cross-checked to ensure reliability and to minimize errors.

Ethical consideration: This study received ethical approval from the Institutional Review Board of Bangladesh Shishu Hospital. Written informed consent was obtained from the parents or guardians before inclusion. Participant confidentiality was strictly maintained by anonymizing the data and limiting access to authorized personnel only.

Statistical analysis: Data were analyzed using SPSS version 25.0. Descriptive statistics were used to summarize the demographic and clinical characteristics. Inferential statistics, including chi-square and independent t-tests, were used to assess the association between risk factors and shunt failure. Statistical significance was set at $p < 0.05$.



A-Non-functioning VP shunt



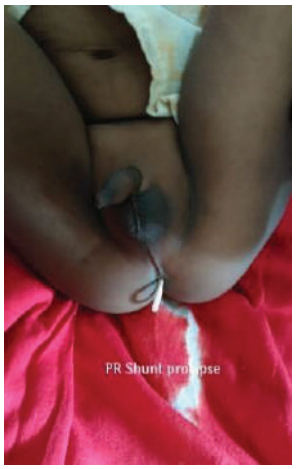
B- CSF Varix



C- CSF leakage through the subcutaneous tunnel



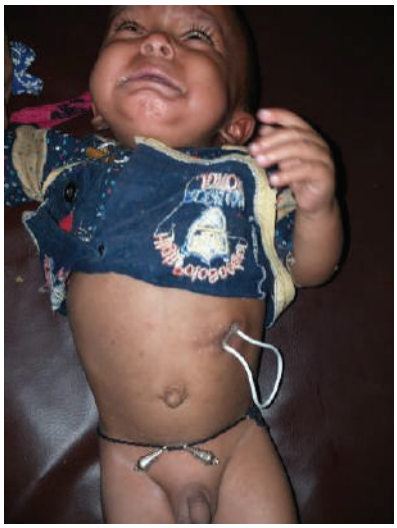
D- Over drainage of CSF



E- Extrusion of shunt tube through anus



F- Extrusion of shunt tube through para spinal lumber region



G- Extrusion of shunt tube through abdominal wound

Figure I: Children with hydrocephalus

Table I: Baseline Characteristics of the Study Population (n = 226)

Characteristic		Number of patients (n)	Percentage (%)
Mean age at surgery (months)		6 ± 4	
Age group	<6 months	125	55.3
	6–12 months	81	35.8
	>12 months	20	8.8
Gender	Male	118	52.2
	Female	108	47.8
Etiology of hydrocephalus	Congenital aqueductal stenosis	108	47.8
	Post-infectious	32	14.2
	Communicating hydrocephalus	16	7.1
	Blockage of ventricular end	29	12.8
	Blockage of peritoneal end	12	5.3
	Intra ventricular haemorrhage	7	3.1
	Others	22	9.7
Type of surgery	Initial shunt	164	72.6
	Revision	62	27.4
Surgery urgency	Elective	215	95.1
	Emergency	11	4.9
Mean duration of surgery (minutes)		65 ± 15	

Table I summarizes the demographic and clinical characteristics of the 226 children included. The mean age at surgery was 6 ± 4 months, with 55.3% aged under 6 months. Males comprised 52.2% of the cohort. The leading etiology was congenital aqueductal stenosis (47.8%), followed by post-infectious hydrocephalus (14.2%). Most patients underwent initial shunt placement (72.6%) electively (95.1%). The average surgery duration was 65 ± 15 minutes.

Table II: Incidence and Types of Shunt Failure

Failure Type	Number of Cases (n)	Percentage (%)
Mechanical obstruction	46	20.4
Infection	23	10.2
Abdominal pseudocyst	3	1.3
Shunt migration/ disconnection	2	0.9
Total shunt failures	74	32.7

Table II reports shunt failure incidence and classification. Out of 226 patients, 74 (32.7%) experienced shunt failure. Mechanical obstruction was the predominant failure type, accounting for 20.4%, followed by infections at 10.2%. Less frequent complications included abdominal pseudocyst (1.3%) and shunt migration or disconnection (0.9%).

Table III: Timing of Shunt Failure Post-Surgery (n=74)

Time Interval	Number of Failures (n)	Percentage of Failures (%)
Within 1 month	27	36.5
1–6 months	29	39.2
6–12 months	12	16.2
After 12 months	6	8.1
Total	74	100.0

Table III details the timing of shunt failure among the 74 affected cases. Failures were most common within the first six months after surgery (75.7%), with 36.5% occurring within one month and 39.2% between one and six months. Failures beyond one-year post-surgery were less common, at 8.1%.

Table IV: Risk Factors Associated with Shunt Failure

Clinical Variable	Shunt Failure (n = 74)	No Failure (n = 152)	p-value
Age < 6 months	51 (68.9%)	74 (48.7%)	0.004
Emergency Surgery	7 (9.5%)	4 (2.6%)	0.024
Post-Infective Hydrocephalus	19 (25.7%)	13 (8.6%)	0.001
Mean Duration of Surgery	71.2 ± 11.4 min	61.6 ± 9.3 min	<0.001

Table IV compares clinical variables between patients with and without shunt failure. Significant associations with failure included age under 6 months (68.9% vs. 48.7%, p=0.004), emergency surgery (9.5% vs. 2.6%, p=0.024), post-infectious hydrocephalus (25.7% vs. 8.6%, p=0.001), and longer mean surgery duration (71.2 ± 11.4 minutes vs. 61.6 ± 9.3 minutes, p<0.001).

Discussion

The present study provides valuable insights into the outcomes and determinants of ventriculoperitoneal (VP) shunt failure in pediatric hydrocephalus in a tertiary care setting. Our observed failure rate of 32.7% aligns with prior findings, which typically range between 20% and 40%[1,4]. This consistency suggests a persistent global challenge in ensuring long-term shunt functionality despite advances in neurosurgical techniques.

Mechanical obstruction was the most common cause of failure in our study, accounting for 20.4% of cases. This is consistent with findings by Fayaz et al., who reported mechanical issues, particularly proximal catheter blockage, as a leading cause of malfunction in pediatric patients[17]. These blockages are often the result of choroid plexus or cellular debris occluding the catheter tip, especially in infants. Infection was the second most common cause (10.2%), similar to results described by Hanak et al., who identified infection rates of 8–12% in pediatric populations[18]. The first six months following shunt placement were found to be the most vulnerable period for failure, in agreement with McGirt et al., who showed that early failure is typically due to technical and infectious complications[6].

Age under six months significantly predicted shunt failure in our cohort. Infants possess smaller ventricular systems, fragile tissues, and immature immune responses, which increase the risk of obstruction and infection. This observation is well-supported in the literature. Tuli et al. highlighted age as a critical factor, demonstrating that infants have higher failure rates and require more frequent revisions than older children[19]. Berry et al. similarly found age under one year to be associated with reduced shunt survival[20]. Our results emphasize the need for enhanced surveillance and individualized perioperative planning for this vulnerable age group.

Emergency surgery also emerged as a significant risk factor for shunt failure. In emergency settings, insufficient time for preoperative optimization may lead to higher infection rates and compromised surgical precision. Paudel et al. found that patients undergoing urgent VP shunt procedures had a significantly higher risk of early failure compared to those undergoing elective surgeries[21]. Elective surgery allows for better planning, proper sterilization, and stabilization of the patient's condition, contributing to improved outcomes.

Postinfectious hydrocephalus was another important predictor of failure. Infections such as meningitis not only damage cerebrospinal fluid (CSF) pathways but also increase the risk of postoperative complications. Hossain et al. noted that Bangladeshi patients with post-infective hydrocephalus had significantly more complications and a higher revision rate than those with congenital hydrocephalus[22]. This correlation may be due to residual inflammation, loculated ventricles, and pre-existing CSF contamination, which predispose patients to shunt failure.

The association between prolonged operative duration and failure was also noted. Longer surgeries may increase tissue exposure and raise the likelihood of contamination and technical errors. Venable et al. observed a higher rate of shunt revisions when the duration of surgery exceeded 60 minutes[16]. Thus, while surgical accuracy must not be compromised, improving intra-operative efficiency is essential in reducing complications. Interestingly we found many patient presented to us with tube extrusion following wound infection.

Although the majority of cases in this study were elective (95.1%), failure was more frequent in emergency cases, reinforcing the benefits of planned procedures. Lazarus et al. documented lower failure rates in patients who underwent scheduled surgeries in a South African pediatric cohort23. This supports the need for strong preoperative protocols and multidisciplinary coordination.

Our findings reinforce broader trends observed in both high- and low-resource settings. While shunt technology and surgical expertise continue to advance, the rates of failure remain a concern, particularly in developing countries where infectious causes of hydrocephalus dominate. As highlighted by Salek et al., addressing these systemic healthcare challenges requires integrating public health strategies with neurosurgical care to reduce the incidence of preventable complications[9].

Overall, the results underscore the multifactorial nature of VP shunt failure, with patient-related factors (age and etiology), surgical timing, and operative factors all contributing. Our study highlights the importance of tailored patient assessment, optimization of surgical conditions, and vigilant postoperative monitoring, especially in younger children and those undergoing emergency or post-infective shunt placement.

Future research should focus on improving shunt design to minimize obstruction, refining perioperative infection control practices, and developing clinical decision tools that incorporate known predictors to guide the timing and technique. Addressing these

areas could substantially improve outcomes in pediatric hydrocephalus care, particularly in settings similar to ours in the future.

Conclusion

This study highlights a substantial ventriculoperitoneal shunt failure rate of 32.7% in children with hydrocephalus, primarily due to mechanical obstruction and infections. Younger age (<6 months), emergency surgery, post-infectious etiology, and prolonged operative time significantly increased the risk of failure. These findings underscore the importance of individualized surgical planning and vigilant postoperative care to improve shunt survival and patient outcomes in the management of pediatric hydrocephalus.

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Original Article

Impact of single dose versus multidose prophylactic use of antibiotics in elective inguinal herniotomy in children: A prospective study

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Abstract

Aim: to compare the difference of outcome from single dose versus multidose of prophylactic antibiotics use in elective herniotomy in children.

Introduction: There are lot of studies to find out the role of using prophylactic antibiotics in clean surgery, but still there is controversies whether it is necessary or not for preventing post operative surgical site infection. Irrational use of antibiotics in surgery is a major problem in our country and it also increases the total treatment cost. This study will help our surgeons to take decision about the use of prophylactic antibiotic in clean surgery like herniotomy.

Methodology: This prospective comparative study was conducted in the Department of Paediatric Surgery, Shaheed Ziaur Rahman Medical College Hospital, Bogura, Bangladesh.

Results: Out of 100 patients of group A (single dose antibiotic) only four patients developed serous wound discharge (seroma 4%) and none of them developed wound infection. In 100 patients of group B (multiple dose antibiotic) single patient developed seroma and none of them developed wound infection.

Conclusion: In this study we found that the difference of postoperative outcome in terms of surgical site infection between single dose versus multiple doses antibiotic use in herniotomy is minimum and statistically insignificant. We conclude that single dose antibiotic prophylaxis is sufficient in clean surgery like herniotomy that is also cost effective.

Key words: Single dose, multiple doses, prophylactic antibiotic, wound infection, haematoma, herniotomy.

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Introduction:

Surgical site infection is a common problem encountered by the surgeons that results from several risk factors, although some of them are related to patients and others are related to operation theatre environment and perioperative wound care.[1] In case of clean surgery like herniotomy, where there is almost no entry of organism, expected rate of infection is less than 2%. Most of the surgeons in our country use preoperative single dose injectable antibiotic followed by post-operative 7 days oral systemic antibiotic after inguinal herniotomy. These oral antibiotics can be avoided by practicing good surgical technique, strict aseptic measures taken during operation and post operative wound care.[2] Meta analysis of similar studies recommended use of preoperative single dose injectable antibiotic only.[3] Inguinal herniotomy is a very common routine operation in paediatric surgery ward of a tertiary hospital in our country. Inguinal herniotomy is done for indirect inguinal hernia and congenital hydrocele for male children and hernia of

canal of Nuck for female children. Use of prophylactic antibiotic is a common practice in anysurgical procedure, because post-operative surgical site infection increases morbidity of the patient.[4] Operation theatre (OT) sterilization, autoclaving of instruments and linen, technical expertise of the operating surgeon, post-operative wound care all have a major role in surgical site infection.[5] Risk of post-operative wound infection is lowest in clean surgical procedure like inguinal herniotomy.[6] But still, antibiotics are used irrationally for unduly long periods in an attempt to reduce surgical site infection that increase the financial burden to the hospital and probable emergence of drug resistance and drug related adverse effects. Our study is aimed to compare the impact of single dose versus multiple doses of antibiotics in inguinal herniotomy in children in terms of post operative infection.[7]

American Society of Health System Pharmacist has published therapeutic guidelines on anti-microbial prophylaxis in surgery.[8] The guidelines are intended to provide practitioners with a standardized approach to the national safe and effective use of anti-microbial agents for prevention ofsurgical site infections (SSIs) based on currently available clinical evidence and emerging issues. According to the guidelines, an anti-microbial agent should be active against the pathogens most likely tocontaminate the surgical site, given in an appropriate dose and at the time before giving incision that ensures adequate serum and tissue concentration during the period of potential contamination.[4]

Materials and methods:

This prospective observational study was conducted in the Department of Paediatric Surgery at Shaheed Ziaur Rahman Medical College Hospital Bogura from July 2020 to June 2023. Total 200 patients were included in this study who were admitted in ward for elective inguinal herniotomy. Patients were randomly assigned to two groups, group A: 100 patients for preoperative single dose injectable antibiotic and group B: 100 patients for multiple dose antibiotics.

Inclusion criteria:

- patients undergoing elective inguinal herniotomy
- age range from 3 months to 12 years (144 months) from both sexes.

Exclusion criteria:

- obstructed and strangulated inguinal hernia
- patients with scabies and other skin diseases

Informed written consent was taken from parents or legal guardians after proper counselling for operation under general anesthesia. Both groups were homogenized in terms of age. Institutional ethical review committee approval was taken for conducting the study. In a structured data sheet, all information of the patient including clinical examination, investigation reports, operative findings and follow up findings were recorded.

Group A (n=100): Received prophylactic preoperative single dose prophylaxisinjectionceftriaxone (100mg/kg) intravenously prior to making the incision of operation.

Group B (n=100): Received preoperativeprophylactic singledose injectable ceftriaxone followed by oral cefixime (10 mg/kg/day) twice daily for 7 days.

Surgical procedure:

All patients were operated under general anesthesia. Skin preparation of the operating field was done with 10% povidone iodine solution. Injection ceftriaxone was given to all the patients at a dose of 100 mg/kg/day before incision of the operation. Incision was made over lower inguinal crease line. Surgery was done with autoclaved instruments and linens. Standard surgical protocol was followed, like meticulous dissection, minimum tissue handling and proper hemostasis.Woundclosedintradermally with polyglactin suture. Oral cefixime was given to all patients of group B from first post operative day to 7th post operative day. Patients were discharged on 3rd post operative day and advised to come on 7th and 14th post operative day for follow up. If any patient had discharge from the wound, it was sent for culture and sensitivity test and antibiotic was given accordingly. Findings of both follow up report was recorded in data sheet that included wound discharge and hematoma forcomparison.

Statistical analysis:

Data collected from both groups and statistical analysis was done by using statistical package for social science (SPSS 23) software and expressed in tables. To determine any significant associationbetween the two study groups was analyzed applying chi-square test and ‘p’ value less than 0.05 was taken as statistically significant.

Results:

The demographic profile of the patient in both group A (single dose) and group B (multiple doses) shows a similar distribution in terms of age and sex with no significantdifference.Theage distribution of participants in Table 1 ranged from 3 months to144months.

Table I: Age distribution of children (months) between two groups:

	Group A Single dose antibiotic (n=100)	Group B Multiple dose antibiotic	Total
		n=100	N=200
Age range in months	3-132	6-144	3-144

Out of 100 in group A, 86 were male (86%) and 14 were female (14%), and in group B, 82 were male (82%) and 18 were female (18%).

The difference in sex distribution between the study groups (Table II) was not statistically significant.

Table II: Sex distribution of children between two study groups:

Sex	Total (N=200)	Group A (single dose) (n=100)	Group B (multiple doses) (n=100)	*p* value
Male	170 (85%)	86 (86%)	84 (84%)	0.301
Female	30 (15%)	14 (14%)	16 (16%)	0.277

Scrotal swelling is observed in 3 male patients of Group A on 3rd POD and disappeared on follow up on 7th POD and 14th POD. Scrotal swelling is observed in 2 male patients of Group B on 3rd POD and disappeared on follow up on 7th POD and 14th POD. The difference of scrotal swelling between two study groups was statistically insignificant.

Table III: Comparison of scrotal swelling in male patients between two study groups:

Postoperative day (POD)	Scrotal swelling	Grouo A (single dose (n=86)	Group B (multiple dose (n=84)	'p' value
3rd	Present	3(3.5%)	2 (2.4%)	0.273
7th	Absent	100%	100%	
14th	Absent	100%	100%	

Wound discharge was found in 4 patients of group A and one patient of group B on third post-operative day (POD) that was serous in nature. But no discharge was found on follow up of 7th and 14th POD of both groups..

Serous discharge was sent for culture and sensitivity test and there was no growth of bacteria in culture. The difference between two groups was shown in Table IV and result was statistically insignifican

Table IV: Comparison of presence of post operative wound discharge (N= 200)

Post-operative day (POD)	Serous discharge from wound	Group A (single dose) (n=100)	Group B (multiple doses) (n=100)	'P' value
$_{3}$rd	Present	4 (4%)	1 (1%)	0.025
$_{7}$th	Absent	100%	100%	
$_{14}$th	Absent	100%	100%	

The average treatment cost of both study groups was shown in Table V. The difference in treatment cost between two groups was statistically significant.

Table V: Comparison of average treatment cost in BDT between two groups:

Average treatment cost in BDT (single dose user) n=100	Average cost in BDT (multiple doses user) n=100	'*p*' value
800 BDT	1500 BDT	<0.001

Discussion:

Antibiotic prophylaxis is still indicated in elective surgical procedures where prosthesis is implanted, anticipating chances of infection that can be fatal. But the benefit of antibiotic prophylaxis in clean elective surgical procedures such as inguinal herniotomy is considered debatable. Surgical site infection following hernia repair is associated with a high rate of recurrence.[8] Our study was done to compare the effectiveness of single-dose versus multiple-dose antibiotics in herniotomy surgery. [10] In both study group A and B, injectable antibiotic were given prior to the surgical incision, that is also recommendedin most of the studies. [11]

In our study, among single-dose applied male patients (n = 86), 3 patients developed scrotal swelling observed on the 3rd postoperative day but disappeared on subsequent follow-up on the 7th and 14th postoperative days (POD). Whereas, among multidose male patients (n = 84), 2 patients developed scrotal swelling observed on the 3rd postoperativeday but were absent on subsequent follow-ups at 7 & 14 POD. Although some difference was found up to 3rd POD but became self-limited and non-significant after the 3rd POD in both groups.In this study among the single dose group (n=100), only 2 patients developed postoperative discharge on the 3rd postoperative day, and no discharge was seen on the 7th and 14th postoperative days. On the other hand, the multi-dose group (n=100)single patient developed serous discharge at the 3rd POD and no discharge was found on follow up of 7th, and 14th postoperative days.

Although the difference was significant up to the 3rd POD, afterward discharge became absent and non-significant. The serous discharge was sent for culture and sensitivity study but revealed no growth of organism. The finding is similar to the study findings of Sajjad et al. (2005).[12]

In our study, the average cost of antibiotics in the single-dose group was significantly lower than the average cost of multiple-dose patients (Table 5). The difference of treatment cost between groups was found to be statistically significant. A similar observation was noted by the study of Arjuna et al.

Conclusion:

In this study, we observed that the rate of postoperative infection and events is almost similar for single-dose and multiple-dose users. So, we can conclude that single-doseantibiotic prophylaxis is sufficient in the case of clean surgery. In addition, single-dose antibiotic prophylaxis is cost-effective as well.

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Case Report

Staged Pediatric Scalp Reconstruction for Extensive Lacerations with Necrosis Following Agricultural Machinery Injury: A Case Report

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Abstract

Pediatric scalp injuries caused by agricultural machinery are rare but potentially devastating with long-term implications on craniofacial growth and psychosocial development. These injuries present unique reconstructive challenges due to the scalp's limited elasticity, robust vascularity and the need to preserve both function and cosmesis in a developing child. This report describes the staged surgical management of a 1.5-year-old boy who sustained extensive scalp lacerations and calvarial fractures following entrapment of scalp hair in a rice-cutting machine. Initial wound closure was followed by partial flap necrosis. Then a secondary procedure involving transposition flap reconstruction and split-thickness skin grafting (STSG) was performed. This case underscores the importance of a systematic, adaptive reconstructive strategy, adherence to the principles of the reconstructive ladder and long-term multidisciplinary follow-up. Psychological support, parental counseling and vigilance for late sequelae were integral components of care.

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Introduction:

Pediatric scalp trauma most commonly results from blunt force mechanisms such as falls or road traffic accidents. Agricultural machinery-related injuries are less common but tend to be more severe due to their high-energy mechanisms.[1] Rotatory blades of devices of agricultural devices can cause complex lacerations, avulsion injuries and comminuted calvarial fractures.[2] Pediatric patients are particularly susceptible to such trauma due to smaller cranial dimensions, thinner soft tissue envelopes and less developed musculocutaneous support.[3]

The scalp consists of five histological layers: skin, dense connective tissue, galea aponeurotica, loose areolar tissue and pericranium. The tightly adherent nature of the first three layers results in limited elasticity. While the subgaleal space allows for the propagation of hematoma and infection.[4] Pediatric scalp tissue demonstrates reduced thickness and redundancy compared to adults and increases the difficulty of tension-free closure. Reconstruction must accommodate future cranial growth and minimize long-term psychosocial morbidity.[5]

Management is guided by the reconstructive ladder—ranging from primary closure to local flaps, skin grafts, tissue expansion and microvascular free tissue transfer- depending on defect size and complexity. Local flaps are preferred for moderate defects due to their reliable vascularity and preservation of hair-bearing tissue. Successful outcomes depend on timing,

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infection control, adequate debridement and close postoperative surveillance.[6]

Case Presentation

Patient Demographics and Initial Trauma

A 1.5-year-old boy was brought to the emergency department following traumatic scalp avulsion caused by entanglement of scalp hair in the rotating blades of a rice-cutting machine two hours ago. The incident resulted in multiple deep scalp lacerations with partial avulsion and comminuted fracture of the underlying skull bone.



Figure 1: Initial Presentation

Initial Clinical Assessment and Imaging

Initial assessment was performed following Advanced Trauma Life Support (ATLS) guidelines. Pediatric Glasgow Coma Scale (GCS) was used to evaluate of patient. The Pediatric GCS is a validated tool for assessing neurologic function in young children, accounting for age-adjusted verbal and motor responses.[7] No focal neurological deficits were noted.

Hemostasis in the emergency room was achieved with pressure dressing. Non-contrast cranial CT revealed multiple calvarial bone fractures with intact dura and without any intracranial hemorrhage. No cervical spine or systemic injuries were identified. Given the mechanism of injury and patient age, wound exploration was performed under general anesthesia.

Initial Operative Management (Primary Closure)

Initial operative management was undertaken by combined approach of the neurosurgery and plastic surgery team. Neurosurgical team ruled out any need for neurosurgical intervention and the plastic surgery team did the initial wound management. Thorough irrigation with normal saline and sharp debridement of devitalized tissue were performed. Multiple linear viable scalp flaps found. Avulsed bone fragments were removed and intact dura mater was found. After primary evaluation of wound and considering patients massive haemorrhage proceeding to shock, the surgical team decided not to proceed for flap coverage and decided for primary closure. Primary closure was achieved using non-absorbable (Prolene) sutures. A closed-suction drain was placed to prevent seroma and hematoma formation and removed after 48 hours. The family was counseled regarding the provisional nature of the reconstruction and the potential need for secondary procedures due to risk of complications such as wound dehiscence or flap necrosis.[8]



Figure 2: Intraoperative Findings



Figure 3: After first operation

Early Postoperative Complication

On postoperative day 4, clinical signs of ischemia were noted in the distal portions of the scalp flaps. The area appeared dusky with patchy black discoloration and surrounding edema—features suggestive of partial flap necrosis.8 There was an absence of granulation tissue and a delayed healing response, indicating vascular compromise, likely secondary to excessive tension or insufficient perfusion.[9]



Figure 4: After partial flap necrosis after first operation

Secondary Surgical Reconstruction

A second stage reconstruction was planned 3 weeks after initial injury. Under general anesthesia, necrotic tissue was excised and the wound bed was reassessed. A transposition flap was raised from an adjacent well-perfused scalp region and transposed to cover the defect. The donor site was resurfaced with a split-thickness skin graft harvested from the thigh. Flap design followed angiosomal principles to ensure adequate perfusion and flap survival.[10] The patient tolerated the procedure well and both flap and graft demonstrated complete take without complications.

Follow-Up and Outcomes

The patient was followed regularly for 12 months. Clinical assessments included evaluation of flap viability, scalp sensation and hair regrowth. Serial photographs and imaging studies were used to monitor cosmesis and cranial contour. The outcome was satisfactory from both functional and aesthetic standpoints. The patient exhibited normal developmental milestones and no signs of infection or alopecia at the reconstruction site. Cranioplasty for the underlying calvarial defect was scheduled for a later date to align with age-appropriate cranial growth.[11] Another additional observation in this case is that, over time the transposition flap donor site has reduced in dimension.



Figure 5: After 3 months follow up

Discussion

Unique Considerations in Pediatric Scalp Trauma

The pediatric scalp presents distinct challenges due to its anatomical and physiological characteristics. Compared to adults, children have a thinner dermis, reduced subcutaneous fat and tighter skin adherence to the pericranium, especially over the parietal and occipital regions. This results in limited mobility and tissue redundancy, making primary closure difficult, even in a relatively small defect. Scalp high vascularity is advantageous for healing but may predispose to significant hemorrhage. It can rapidly destabilize pediatric patients due to their smaller circulating blood volume.[4,5,6]

The preservation of hair-bearing tissue is crucial in pediatric patients to prevent long-term disfigurement and psychological distress.[12] A failure to consider these factors in primary reconstruction can result in poor cosmetic results, secondary alopecia and a need for future correction surgeries. Calvarial fractures with exposed dura increase the risk of a lot of complications, notably central nervous system infection, trauma to the brain and cerebrospinal fluid leakage.[13] This necessitates a multidisciplinary approach involving neurosurgery.

In this case, the presence of multiple lacerations, fractured calvarial bones, exposed dura and high blood loss made immediate hemostasis and stabilization the top priorities.

Application of the Reconstructive Ladder

The reconstructive ladder offers a systematic approach to wound closure. Primary closure is ideal but often unachievable in large or complex scalp defects. Local flaps—such as rotation, advancement or transposition flaps—are frequently the next option. These flaps maintain the native skin quality, hair-bearing surface and provide robust perfusion. In pediatric cases, flap design must also accommodate ongoing craniofacial development.[5,10]

Tissue expansion may be useful for later staged corrections but is less applicable in the acute setting due to risk of infection and time constraints. Free tissue transfer is rarely required in pediatric scalp reconstruction but may be considered in cases with extensive avulsion or devascularization.[5]

In this case, the transition from primary closure to a transposition flap highlights the importance of intraoperative judgment and postoperative reassessment. The transposition flap provided robust vascularity, tension-free closure and excellent tissue matching—all critical elements for long-term functional and aesthetic success. Flap success was optimized by adherence to angiosomal territories, ensuring a vascular base and tension-free inset.[10]

Management of Flap Necrosis

Flap necrosis is a feared complication after any flap surgery. Contributing factors for flap necrosis include poor flap design (e.g., length-to-base ratio), excessive tension, compromised vascular pedicle and patient-related factors such as infection or hypotension. Early

recognition is critical. Postoperative flap monitoring should include inspection for color change, temperature, turgor, capillary refill and bleeding on pinprick.8

Adjunct tools like handheld Doppler ultrasound or indocyanine green angiography can aid in perfusion assessment in high-risk cases. In this patient, timely debridement followed by well-vascularized flap coverage and STSG minimized further morbidity (for example- risk of infection) and preserved function and cosmesis.[9]

Psychosocial and Developmental Implications

The psychological impact of disfiguring scalp injuries in children is well documented. Visible alopecia or asymmetry can result in peer exclusion, bullying and long-term self-esteem issues. Parental anxiety is also a common occurrence following pediatric trauma.[12]

In this case, preoperative and postoperative counseling helped align expectations and fostered trust. Planning for future cranioplasty and psychological support ensured comprehensive care. Consideration of cranial growth patterns is essential, as improper timing or technique can lead to deformities requiring secondary correction.

Public Health Relevance

This case emphasizes the complex interplay of surgical planning, age-specific anatomy and psychological care in managing pediatric scalp trauma. It also reflects the need for community education and improved agricultural equipment safety in rural areas.[1,2] Preventive strategies, including mechanical guards, child supervision and public awareness, are crucial in reducing such injuries.

Conclusion

This case report illustrates the staged surgical management of extensive pediatric scalp trauma following agricultural machinery injury. Early stabilization, staged reconstruction with a transposition flap and STSG and diligent postoperative monitoring resulted in a favorable functional and aesthetic outcome. The case highlights the importance of anticipating complications such as flap necrosis, adhering to reconstructive principles and addressing the broader psychological and developmental needs of the pediatric patient.

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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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