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Research Article

Congenital Anomalies

Pattern of Congenital Anomalies among Pediatric Surgical Patients in Bangladesh

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Background: Congenital anomalies are structural or functional abnormalities present from intrauterine life, contributing significantly to neonatal morbidity and mortality, especially in low- and middle-income countries. These conditions often require early surgical intervention, yet limited diagnostic and treatment facilities hinder timely care. Common anomalies in pediatric surgery include gastrointestinal malformations, neural tube defects, and abdominal wall defects.

Methods: This hospital-based cross-sectional descriptive study was conducted over one year at the Department of Pediatric Surgery, TMSS Medical College Hospital and Private Camber, Bogura, Bangladesh from January to December 2024. A total of 135 pediatric patients (aged 0–5 years) with structural congenital anomalies requiring surgical evaluation were selected through purposive sampling from (start) to (end). Data were collected via structured interviews with guardians, clinical examinations, antenatal records, and surgical findings. Variables included demographics, obstetric history, anomaly type, surgical interventions, and outcomes. Patients with acquired anomalies or incomplete data were excluded. Data were analysed using SPSS version 26.0, with results summarised using descriptive statistics and presented in tables.

Results: The study revealed that most pediatric patients with congenital anomalies were aged 1–5 years (33.33%) or neonates (29.63%), with a male predominance (62.96%). Normal vaginal delivery was more common (59.26%), and antenatal detection of anomalies was low (18.52%). Anorectal malformation (22.22%) was the most frequent anomaly, followed by cleft lip/palate (14.81%) and neural tube defects (11.11%). Surgical intervention was required in 81.48% of cases, mostly elective. Postoperative complications occurred in 14.81%, and 70.37% had favourable outcomes. However, 11.11% faced complications, another 11.11% were referred, and 3.70% died. The findings highlight the need for improved prenatal diagnosis and early intervention.

Conclusion: The study reveals a high burden of congenital anomalies in Bangladeshi pediatric surgical patients, notably anorectal malformations, cleft lip/palate, and neural tube defects.

Keywords: Pattern, Congenital Anomalies, Pediatric Surgery

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Introduction

Congenital anomalies, or congenital disabilities or congenital disorders, are structural or functional abnormalities that occur during intrauterine life and can be identified prenatally, at birth, or later in infancy or childhood. These anomalies represent a significant cause of morbidity and mortality in the pediatric population worldwide, particularly in surgical settings where early intervention is often critical to survival and quality of life [1],[2]. Congenital anomalies contribute to approximately 303,000 neonatal deaths annually, and the global burden remains disproportionately high in low- and middle-income countries (LMICs) due to limited diagnostic and surgical facilities, delayed presentation, and poor awareness [3],[4]. Pediatric surgical care plays a crucial role in managing a broad spectrum of congenital anomalies, which include gastrointestinal tract malformations, neural tube defects, genitourinary anomalies, and thoracic deformities. Many of these conditions are amenable to surgical correction if detected early, underscoring the importance of timely diagnosis and proper surgical planning [5].

Common congenital anomalies encountered in pediatric surgery include anorectal malformations, Hirschsprung's disease, esophageal atresia with or without tracheoesophageal fistula, diaphragmatic hernia, and congenital abdominal wall defects such as gastroschisis and omphalocele [6],[7]. The pattern and prevalence of these anomalies can vary significantly by geographic region, socioeconomic status, environmental exposures, maternal health conditions, and genetic predispositions [8]. For instance, folic acid deficiency has been strongly associated with neural tube defects, while maternal infections, uncontrolled diabetes, and teratogenic drugs are linked with other types of malformations [9]. In countries like Bangladesh, where preventive maternal health services and perinatal care are still developing, a comprehensive understanding of the pattern of congenital anomalies is essential for effective resource allocation, prenatal counselling, and the development of targeted public health strategies. Several hospital-based studies across South Asia have revealed that gastrointestinal anomalies account for a substantial proportion of pediatric surgical admissions, often presenting as neonatal emergencies requiring urgent intervention [10].

Despite the high burden, there remains a paucity of region-specific data, particularly in tertiary-level hospitals where most surgical cases are concentrated.

Analysing the pattern of congenital anomalies in such settings can provide critical insights into the current challenges, help identify areas for intervention, and guide policy-making toward improving pediatric surgical outcomes. This study aims to identify the types and frequency of congenital anomalies among pediatric surgical patients admitted to a tertiary care hospital.

Methodology and Materials

This hospital-based cross-sectional descriptive study was conducted over one year at the Department of Pediatric Surgery, TMSS Medical College Hospital and Private Camber, Bogura, Bangladesh. The study was carried out over one year, from January to December 2024. The study included 135 pediatric patients (aged 0 to 5 years) diagnosed with congenital anomalies and admitted to the pediatric surgery department during the study period. Only patients with structural congenital anomalies requiring surgical evaluation or intervention were considered.

Inclusion Criteria

- Pediatric patients (0-5 years) presenting with one or more congenital anomalies.
- Patients were admitted to the pediatric surgery ward during the study period.
- Patients whose guardians provided informed consent.

Exclusion Criteria

- Patients with acquired anomalies.
- Incomplete or missing clinical data.
- Critically ill patients are referred before proper evaluation.

Data Collection and Analysis: One hundred thirty-five pediatric patients fulfilling the inclusion criteria were enrolled in the study through purposive sampling. Data were collected using a structured data collection sheet prepared for this study. Information was gathered through direct interviews with the patients' guardians, review of antenatal records (when available), clinical examination, and surgical and diagnostic findings.

The data sheet included demographic details (age, sex), obstetric and perinatal history (mode of delivery, medication during pregnancy), antenatal diagnosis, type of congenital anomaly, surgical intervention (type, timing), postoperative complications, and short-term outcomes. The collected data were checked for completeness, coded, and entered into Microsoft Excel 2019.

They were then analysed using SPSS version 26.0. Descriptive statistics, such as frequencies and percentages, were used to summarise the categorical variables. For clarity, the results were presented in tabular form.

Results

Most patients (33.33%) were between 1 to 5 years old, followed by neonates aged 0-1 month (29.63%), indicating that a significant proportion of anomalies present early in life (Table 1). Based on Figure 1, males were more commonly affected (62.96%) than females (37.04%). Regarding delivery mode, a majority (59.26%) were born via normal vaginal delivery, with cesarean sections accounting for 40.74% (Table 2).

Antenatal detection of anomalies was relatively low at 18.52%, and another 18.52% had unknown detection status, suggesting limited or delayed prenatal diagnostic practices (Table 3). Only 29.63% of mothers had a documented history of illness or medication use during pregnancy, which may be relevant for identifying risk factors (Table 4). Table 5 shows the congenital anomalies by type among pediatric surgical patients.

Among 135 pediatric surgical patients, it was revealed that anorectal malformation (ARM) was the most frequently observed anomaly, accounting for 22.22% of all cases. This was followed by Hirschsprung's disease(14.81%) and Neonatal Intestinal Obstruction (11.11%), indicating that anomalies involving the gastrointestinal tract and craniofacial regions are relatively common in this population. Other notable anomalies included Hirschsprung's disease (8.89%), tracheoesophageal fistula/esophageal atresia (TEF/EA), and genitourinary anomalies, each comprising 7.41%. Congenital diaphragmatic hernia (5.93%), musculoskeletal anomalies (5.93%), and intestinal atresia/stenosis (5.19%) were observed at lower frequencies.

Less common conditions included abdominal wall defects such as omphalocele (3.70%), congenital heart disease (4.44%), and other rare anomalies (2.96%). Surgical intervention was required in the majority of cases (81.48%), with elective procedures (66.67%) outnumbering emergency surgeries (33.33%) (Table 6-7). Postoperative complications were reported in 14.81% of patients, whereas 85.19% had no complications (Figure 2). The immediate outcomes were favourable in most cases, with 70.37% of patients recovering well. However, 11.11% had complications post-surgery, 11.11% were referred for further management, and 3.70% unfortunately, succumbed to their conditions (Table 8).

Table 1: Age Distribution of Pediatric Surgical Patients with Congenital Anomalies (N = 135)

Age Group	Frequency (n)	Percentage (%)
0-1 month	40	29.63
>1-6 months	30	22.22
>6-12 months	20	14.81
1-5 years	45	33.33
Total	135	100.00

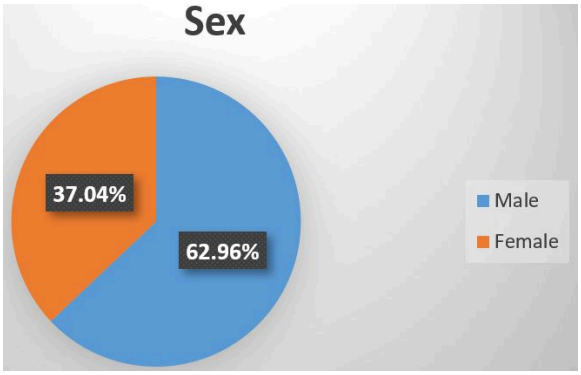

Figure 1: Sex Distribution among Pediatric Patients with Congenital Anomalies (N = 135)

Table 2: Mode of Delivery among Affected Neonates and Children (N = 135)

Mode of Delivery	Frequency (n)	Percentage (%)
Normal Vaginal	80	59.26
Cesarean Section	55	40.74
Total	135	100.00

Table 3: Antenatal Detection of Congenital Anomalies (N = 135)

Detected Antenatally	Frequency (n)	Percentage (%)
Yes	25	18.52
No	85	62.96
Not Known	25	18.52
Total	135	100.00

Table 4: History of Maternal Illness or Medication during Pregnancy (N = 135)

History Present	Frequency (n)	Percentage (%)
Yes	40	29.63
No	95	70.37
Total	135	100.00

Table 5: Distribution of Congenital Anomalies by Type among Pediatric Surgical Patients (N = 135)

Type of Anomaly	Frequency (n)	Percentage (%)
Neonatal Intestinal Obstruction	15	11.11
Hirschsprung's disease	20	14.81
Tracheoesophageal Fistula / EA	10	7.41
Congenital Diaphragmatic Hernia	8	5.93
Anorectal Malformation	30	22.22
Hirschsprung's Disease	12	8.89
Intestinal Atresia / Stenosis	7	5.19
Abdominal Wall Defect (Omphalocele etc.)	5	3.70
Genitourinary Anomalies	10	7.41
Musculoskeletal Anomalies	8	5.93
Congenital Heart Disease	6	4.44
Other	4	2.96
Total	135	100.00

Table 6: Proportion of Pediatric Patients Undergoing Surgical Intervention for Congenital Anomalies (N = 135)

Surgery Done	Frequency (n)	Percentage (%)
Yes	110	81.48
No	25	18.52
Total	135	100.00

Table 7: Distribution of Emergency and Elective Surgeries among Operated Patients (N = 135)

Type of Surgery	Frequency (n)	Percentage (%)
Emergency	45	33.33
Elective	90	66.67
Total	135	100.00

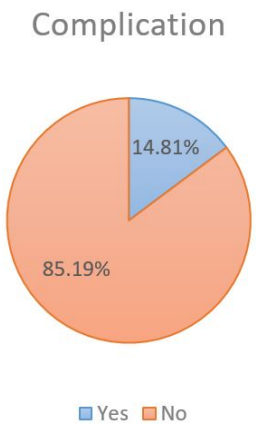

Figure 2: Postoperative Complications among Pediatric Surgical Patients (N = 135)

Table 8: Immediate Clinical Outcomes Following Surgical Management (N = 135)

Outcome	Frequency (n)	Percentage (%)
Recovered	95	70.37
Complicated	15	11.11
Referred	15	11.11
Deceased	5	3.70
Total	135	100.00

Discussion

This study explores pattern of congenital anomalies among pediatric surgical patients in tertiary care hospital in Bangladesh, offering valuable insights into burden, types, & outcomes of these conditions. Congenital anomalies, also referred to as congenital disabilities, are significant cause of childhood morbidity & mortality worldwide. According to World Health Organisation (WHO), an estimated 303,000 newborns die within 4 weeks of birth every year due to congenital anomalies, particularly in low- & middle-income countries where early diagnosis & access to surgical care remain limited [1]. In our study, age distribution revealed that most significant proportion of cases (33.33%) was among children aged 1–5 years, followed closely by neonates (0–1 month) at 29.63%. This trend suggests that while some anomalies become apparent immediately after birth, others may only be diagnosed or surgically relevant during early childhood. Early neonatal presentation is consistent with severe anomalies like anorectal malformations, neural tube defects, & tracheoesophageal fistula, which require urgent intervention. Our findings align with those of Magwesela FM. et al. (2022), who observed similar age distribution, with significant proportion of surgical cases presenting during infancy [11]. Sex distribution in our study showed male predominance (62.96%), which is consistent finding in many similar studies conducted in South Asia [12]. This may reflect true biological predisposition or gender-based differences in healthcare-seeking behaviour & access, with male children more likely to receive surgical attention in specific sociocultural contexts. Mode of delivery data showed that majority (59.26%) of affected infants were born through expected vaginal delivery, with cesarean sections accounting for 40.74%. While cesarean sections can occasionally be scheduled in anticipation of congenital anomalies detected antenatally, our data revealed that only 18.52% of anomalies were detected before birth.

In many cases, this low antenatal detection rate suggests limited access to or utilisation of routine prenatal screening and imaging services. In a setting like Bangladesh, where antenatal ultrasonography may not be universally available or effectively interpreted, missed diagnoses are common. A study by Madrid et al. (2016) also reported similarly low antenatal detection rates in resource-limited settings [13]. Among the various congenital anomalies, anorectal malformation (ARM) was the most frequently reported, constituting 22.22% of the cases. This aligns with several studies from India and Bangladesh, which identified ARM as the most common surgically managed anomaly in pediatric populations [14],[15]. Hirschsprung's disease (14.81%) and Neonatal Intestinal Obstruction (11.11%) were the next most common anomalies. These results reinforce the global pattern where gastrointestinal and craniofacial anomalies are frequently encountered and often necessitate surgical correction [16] [17]. Hirschsprung's disease (8.89%), tracheoesophageal fistula/esophageal atresia (7.41%), and genitourinary anomalies (7.41%) were also significant contributors to the surgical caseload. Less frequently observed anomalies included congenital diaphragmatic hernia, musculoskeletal anomalies, and intestinal atresia, all of which require timely diagnosis and operative care to ensure survival and quality of life. Notably, congenital heart disease, although often managed by pediatric cardiology rather than surgery, was present in 4.44% of cases. Surgical intervention was required in the majority (81.48%) of cases, with elective surgeries (66.67%) outnumbering emergency surgeries (33.33%). This balance suggests effective triaging and planning in the surgical department, although the one-third emergency rate highlights the acute burden posed by congenital anomalies. Postoperative complications were reported in 14.81% of cases, a relatively acceptable rate given the complexity of these surgeries. Outcomes were generally favourable, with 70.37% of patients recovering without major complications. However, 11.11% experienced complications, 11.11% required referral to other institutions for advanced care, and 5(3.70%) of patients died. The mortality rate, although concerning, is within the expected range in low-resource settings and emphasises the need for early detection, specialised surgical expertise, and neonatal intensive care support.

Limitations of the study

The sample size was relatively small, potentially underrepresenting rarer congenital anomalies. Data were collected retrospectively from hospital records, which may be subject to documentation bias and incomplete information, particularly regarding maternal history and antenatal detection. Additionally, long-term follow-up data on surgical outcomes and quality of life were not assessed. Future multicenter studies with larger sample sizes and prospective designs are recommended to better understand the national burden and management outcomes of congenital anomalies.

Conclusion and Recommendations

This study highlights the significant burden of congenital anomalies among pediatric surgical patients in Bangladesh, with anorectal malformation, cleft lip/palate, and neural tube defects being the most prevalent. Most cases presented within the first five years of life required surgical intervention in over 80% of patients. Limited antenatal detection underscores the need for improved prenatal screening and maternal healthcare services. While surgical outcomes were generally favourable, the notable complications and mortality rates emphasise the importance of early diagnosis, timely referral, and enhanced pediatric surgical and neonatal care infrastructure to improve patient outcomes in resource-limited settings.

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