Original Article

Neonatal Surgery at a Regional Hospital in Northern Ghana: Case Profiles and Early Outcomes

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Abstract

Background: Congenital anomalies requiring surgical intervention are a major cause of neonatal morbidity and mortality in low- and middle-income countries (LMICs). In 2023, the Upper East Regional Hospital, Ghana, received its first resident paediatric surgeon and established a neonatal surgical unit. **Aim**: This study reviewed the case profile, surgical procedures, and early outcomes of neonates managed at the unit. **Methods**: We conducted a retrospective review of medical records for all neonates admitted to the neonatal surgical unit from September 2023 to September 2025. All neonates admitted to the unit were included. Data were obtained from the hospital's health information system, admission and discharge registers, and operative notes. **Results**: A total of 107 neonates were admitted, with 52.8% being males. The most common diagnoses were jejunal atresia (n=14, 13.0%), anorectal malformation (n=13, 12.0%), exomphalos (n=12, 11.1%), gastroschisis (n=10, 9.3%), and Hirschsprung disease (n=10, 9.3%). Thirty-eight neonates underwent major surgery, most frequently resection and anastomosis (39.5%) and colostomy (36.8%). Overall mortality was 20.6%. Duodenal atresia (50.0%), jejunal atresia (42.9%), and necrotising enterocolitis (40.0%) accounted for the highest case-specific mortalities. **Conclusion**: The establishment of a paediatric surgeon-led neonatal surgical unit has improved access to specialised care in Northern Ghana, with survival outcomes comparable to other African settings. However, mortality remains high for complex intestinal anomalies. Strengthening referral systems, neonatal intensive care capacity, and specialised workforce training will be critical to improving outcomes further.

Keywords: Neonatal Surgery, Congenital Anomalies, Surgical Outcomes, Paediatric Surgery

Introduction

Globally, an estimated 453 million children under five lack access to surgical care, and in many low and middle-income countries (LMICs), only about 3% receive even basic surgical services.[1] Neonates are particularly vulnerable, as some congenital anomalies often require urgent surgical intervention.[2] In Africa, congenital anomalies occur in up to 3% of live births, and about one-third of neonates admitted to neonatal intensive care units (NICUs) present with surgical conditions.[3,4]

The most frequently reported anomalies include those causing intestinal obstruction, particularly anorectal malformations.[5,6] Other studies, however, highlight anterior abdominal wall defects such as gastroschisis and omphalocele as common presentations.[7,8] Neurosurgical anomalies (spina bifida, hydrocephalus) and posterior urethral valves also contribute to the neonatal surgical burden. In addition to these congenital anomalies, acquired surgical conditions further threaten the survival of most neonates.[9] These conditions translate into high neonatal mortality in sub-Saharan Africa. At Cocody University in Abidjan, neonatal surgical mortality was 25%, with congenital anomalies and acquired conditions accounting for 37.2% and 8.8% of deaths, respectively.[9] Other studies have reported mortality rates of up to 36% among neonates with surgical congenital defects.[10,11] Documented contributors to mortality in similar settings include delayed presentation, prolonged referral pathways, sepsis, hypothermia, prematurity, low birth weight,

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and limited access to specialised neonatal and surgical care. Yet evidence shows that timely neonatal surgery significantly improves survival.[12,13] Despite this, Ghana faces an acute shortage of paediatric surgeons. In the Upper East Region, neonates with surgical defects were historically referred to tertiary hospitals in Tamale, Kumasi, or Accra, with journeys lasting 4 to 18 hours. Such delays expose neonates to serious risks, including hypothermia, sepsis, and cardiorespiratory compromise during transfer. Until 2023, the absence of a resident paediatric surgeon in the region further limited timely surgical intervention and continuity of care. The posting of the first paediatric surgeon that year led to the establishment of a neonatal surgical unit, now serving as a referral centre for the Upper East and neighbouring regions. Neonatal surgical outcomes are also closely linked to the quality of obstetric care. In the Upper East Region, access to comprehensive antenatal services, including routine obstetric ultrasonography for prenatal detection of congenital anomalies, remains limited.

Consequently, most surgical anomalies are not diagnosed antenatally, resulting in unplanned deliveries, delayed postnatal diagnosis, suboptimal early stabilisation, and late referral to surgical care. These upstream obstetric challenges may further contribute to adverse surgical outcomes. Although the unit is managing a growing number of cases, there is no systematically generated evidence on the case profile, types of surgeries performed, or outcomes achieved. Without such data, it is difficult to benchmark outcomes, strengthen clinical protocols, allocate resources, and advocate for investment in neonatal surgical services.

This study therefore seeks to describe the case profile of neonates admitted to the neonatal surgical unit at the Upper East Regional Hospital, assess the outcomes of cases managed, and identify factors associated with neonatal mortality.

Methods

Study Design and Setting

This was a retrospective review of medical records of neonates admitted to the neonatal surgical unit of the Upper East Regional Hospital in Ghana. The hospital, established in 1946 and designated a regional hospital in 1983, established a dedicated neonatal surgical unit in September 2023 following the posting of its first paediatric surgeon. The unit, which forms part of the paediatric surgical ward, is staffed by one paediatric surgeon, one general surgeon, three medical officers, one paediatric clinical nurse specialist, three paediatric nurses, and nine general nurses. Facilities include two incubators, four cots, and one radiant warmer.

Study Population and Sample

The study included all neonates admitted to the neonatal surgical unit from its inception on the 1st September 2023 to 2nd September, 2025. A census approach was used, and no sampling was performed.

Study Variables

Data were extracted on patient demographics (sex, age at admission), clinical profile (diagnoses, type of surgical condition), procedures performed (type and frequency of surgery), and outcomes (discharge, referral, or death).

Data Collection

Data were collected by a general surgeon and two paediatric nurses from the unit, who were trained on the study objectives and use of a structured data extraction form. Sources included the Lightwave Health Information Management System (LHIMS), admission and discharge registers, and operative notes. Data collection took place from 3–7 September 2025. Completeness and consistency were verified by cross-checking records across sources.

Data Analysis

Data were entered into Microsoft Excel and exported to Stata version 18.0 (StataCorp, College Station, TX, USA) for analysis. Descriptive statistics (frequencies and percentages) were used to summarise patient demographics, diagnoses, procedures, and outcomes. This analysis made it easier to quantify the number of cases admitted and the types of neonatal surgical conditions presented. It further helped to quickly identify patterns in admission outcomes and the major surgeries performed on the neonates. Findings were presented in tables and figures.

Ethical Considerations

No identifying patient information was collected. Confidentiality and anonymity were strictly maintained, with data stored on password-protected devices accessible only to investigators. The Institutional Review Committee of the Research and Grant Institute of Ghana has declared that, given the nature and type of data collected, ethics approval prior to data collection was not necessary.

Results

Patient Characteristics

During the study period, 107 neonates were admitted to the neonatal surgical unit. Of these, 57 (52.8%) were males and 50 (47.2%) females. Majority (n=69, 64.5%) were aged 0-7 days, with the mean age of all neonates being 11.2 days. Table 1 presents the detailed characteristics of neonates in this study.

Table 1: Demographic characteristics

Variable	Frequency (Percentage)
Sex	
Male	57 (52.8)
Female	50 (47.2)
Age (days)	
0-7	69 (64.5)
8-14	17 (15.9)
15-21	12 (11.2)
22-28	9 (8.4)

Clinical Profile

The most frequent diagnoses were jejunal atresia (n=14, 13.1%), anorectal malformation (n=13, 12.1%), exomphalos (n=12, 11.2%), gastroschisis (n=10, 9.3%), and Hirschsprung disease (n=10, 9.3%). Other intestinal conditions included duodenal atresia (n=6, 5.6%), necrotising enterocolitis (n=5, 4.7%), and malrotation (n=4, 3.7%). Rare anomalies such as OEIS syndrome, cloaca, biliary atresia, spina bifida, oesophageal atresia, congenital varus of the feet, hypospadias, and cutaneous abscesses were observed in fewer than three cases each (Table 2).

Table 2. Diagnoses of Neonates Admitted to the Neonatal Surgical Unit (N=107)

Variables	Frequency (Percent)
Anterior Abdominal Wall Defects	
Gastroschisis	11 (10.3)
Exomphalos	12(11.2)
Other[1]	4 (3.6)
Neonatal Intestinal Obstructions	
Jejunal Atresia	14 (13.1)
Anorectal malformation	13(12.1)
Hirschsprung Disease	8 (7.5)
Duodenal Atresia	6 (5.6)
Necrotising Enterocolitis	5 (4.7)
Malrotation	4 (3.7)
Enema Colitis	3 (2.8)
Hypertrophic Pyloric Stenosis	2 (1.9)
Urinary Obstructions	
Posterior Urethral Valve	6 (5.6)
Prune Belly Syndrome	1 (0.9)
Oesophageal Atresia	
Oesophageal Atresia	2 (1.9)
Abscesses	
Cutaneous Abscess	5 (4.7)
Orthopaedics	
Fracture of Humerus	2 (1,9)
Fracture of femur	2 (1.9)
Congenital Varus of Feet	1(0.9)
Other conditions[2]	**6 (5.4)**

[1] Anterior abdominal wall defects with one (1) case each: OEIS syndrome, cloaca, umbilical hernia, unilateral inguinal hernia,
[2] These other conditions also had one (1) case each: hypospadias, sebaceous cyst, pressure ulcer of the head, haemangioma, biliary atresia, spina bifida

Surgical Procedures

Thirty-eight neonates underwent major surgical interventions. The most common procedures were resection and anastomosis (n=15, 39.5%) and colostomy (n=14, 36.8%). Other procedures included Ladd's procedure (n=2, 5.3%) and duodenoduodenostomy (n=2, 5.3%). The number of major surgeries performed was illustrated in Figure 1. Of the 107 admissions, 84 neonates (78.5%) were discharged, one (0.9%) was referred, and 22 (20.6%) died.

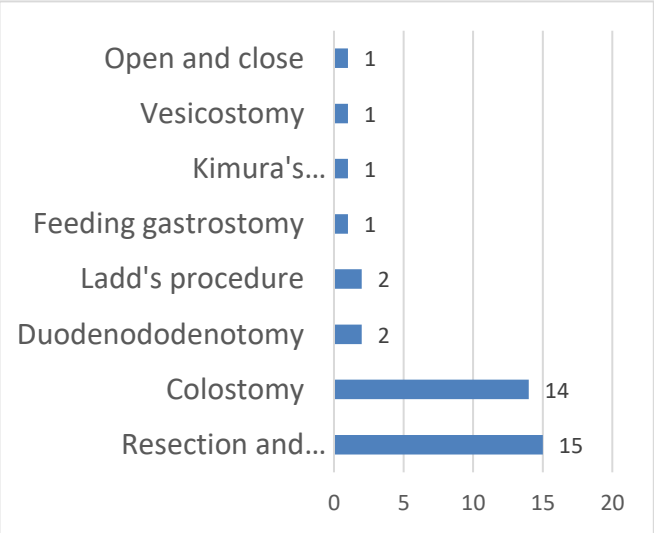


Figure 1: Surgical Procedures Performed

Case-specific Mortality

The highest case-specific mortality was observed in duodenal atresia (50.0%), followed by jejunal atresia (42.9%), necrotising enterocolitis (40.0%), enema colitis (33.3%), gastroschisis (27.3%), and malrotation (25.0%). Anorectal malformation (7.7%), posterior urethral valve (16.7%), and exomphalos (16.7%) had comparatively lower mortality rates. (Table 3).

Table 3: Case-Specific Mortality Among Neonates with Surgical Conditions

Condition	Number of Cases	Number of Deaths	Mortality Rate (%)
Jejunal Atresia	14	6	42.9
Duodenal Atresia	6	3	50.0
Necrotising Enterocolitis	5	2	40.0
Hirschsprung Disease	8	2	25.0
Gastroschisis	11	3	27.3
Enema Colitis	3	1	33.3
Anorectal Malformation	13	1	7.7
Posterior Urethral Valve	6	1	16.7
Exomphalos	12	2	16.7
Malrotation	4	1	25.0
Cutaneous Abscess	5	0	0.0
Other conditions[1]	20	0	0.0
Total	107	22	20.6

[1]Includes all other anomalies with <3 cases each.

Discussion

This was a systematic review of neonatal surgical cases managed at the Upper East Regional Hospital, following the establishment of a dedicated neonatal surgical unit in 2023. The findings demonstrate that intestinal obstruction, particularly jejunal atresia and anorectal malformation, constituted the most frequent surgical conditions, while duodenal atresia and jejunal atresia accounted for the highest case-specific mortalities.

The predominance of intestinal obstruction aligns with reports from other low- and middle-income countries (LMICs), where bowel anomalies remain the leading neonatal surgical presentations.[5,6] However, in contrast to studies in Uganda and Iran where anorectal malformation was most common,[5,6] jejunal atresia was most frequent in our cohort. These differences may reflect regional variations in congenital anomaly prevalence or referral patterns.

This current finding, therefore calls for timely laparotomy and enhanced postoperative care for better outcomes for children with intestinal obstruction. In our study, we found that resection and anastomosis were the most frequent surgery performed. This was suspected, as most of the neonates presented with conditions that cause intestinal obstruction. For instance, fourteen (14) neonates presented with jejunal atresia and five (5) presented with necrotising enterocolitis, conditions that often require such a surgical procedure.

The overall mortality rate of 20.6% in this study is lower than the 25–36% range reported in multicentre African cohorts.[9,10,14] Nonetheless, mortality for specific anomalies such as duodenal and jejunal atresia (50% and 42.9%, respectively) remains comparable to prior reports.[6,11] Late presentations and delays in referral from the surrounding hospitals to the neonatal surgical unit contributed significantly to the high death rate in this current study. This is consistent with other African studies where late referral worsened prognosis.[15] Additionally, the lack of a properly functioning neonatal intensive care unit, the absence of total parenteral nutrition for these neonates, inadequate numbers of experienced staff and logistical challenges at the facility could have directly contributed to the mortality. One can further speculate that the absence of gynaecologists in the thirteen districts in the region could also have contributed to these deaths.

Outcomes for gastroschisis in this study (27.3% mortality) were more favourable than previous reports from Nigeria, where mortality exceeded 50%,[14] and far lower than the 90% mortality described in multicentre LMIC studies.[16] This may reflect early recognition, improved perioperative care, or sample size effects. Nonetheless, gastroschisis remains a condition requiring enhanced neonatal intensive care and specialised nursing to further reduce mortality.

The establishment of a paediatric surgeon-led neonatal surgical unit in a regional hospital is a major milestone for Ghana. Decentralizing surgical services has reduced dependence on distant tertiary centres and enabled timely interventions.

However, persistent challenges including inadequate neonatal intensive care infrastructure, shortage of specialized nurses, and delayed referrals, must be addressed to consolidate these gains. Expanding paediatric surgical training and strengthening referral networks are critical priorities for improving neonatal outcomes in northern Ghana. Limitations

This study provides novel evidence from a previously undocumented neonatal surgical unit in northern Ghana. Its retrospective design and reliance on medical records may have introduced information gaps, and findings from a single centre may not be generalisable to all Ghanaian settings. Nevertheless, the results provide valuable baseline data to guide service planning, policy formulation, and further research.

Conclusion

Neonatal intestinal obstructions and anterior abdominal wall defects were the most common surgical anomalies managed at the Upper East Regional Hospital, and these conditions accounted for the highest mortality rates. The establishment of a paediatric surgeon-led dedicated neonatal surgical unit has significantly expanded access to specialised neonatal care in northern Ghana, with survival outcomes comparable to those reported in other African settings.

To further improve outcomes, health system efforts should focus on strengthening early referral pathways, expanding neonatal intensive care capacity, and investing in specialised nursing and surgical workforce development. Continued monitoring of surgical outcomes and multi-centre collaborations will be essential to guide policy and optimise the quality of neonatal surgical care in Ghana and similar resource-limited contexts.

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Data Availability

The dataset used for the study is available upon request from the corresponding author.

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