

# Pattern of Neonatal Surgical Admissions and Outcome of the Surgeries

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## ABSTRACT

**Objective** To evaluate the pattern of neonatal surgical admissions and outcomes of surgeries.

**Study design** Retrospective descriptive case series.

**Place & Duration of study** Neonatal Intensive Care Unit (NICU), King Fahad Hospital, Al-Baha, Saudi Arabia, from May 2021 to May 2023.

**Methods** The medical records of neonates admitted with surgical congenital anomalies were analysed for the pattern of diseases and the outcome of the treatment provided at a tertiary care hospital. Variables analyzed included demographic data, surgical details, complications, and follow-up. SPSS v28 was used with descriptive statistics to summarize key findings.

**Results** A total of 41 neonates were managed. There was a slight female preponderance (n=24 - 58.5%). All patients were Saudi nationals. The mean age of the patients was 26.6±8.3 days and 27 (65.9%) were preterm births. Mean birth weight was 2.47±0.79 kg. There were 14 (34.1%) low birth weight babies. The common surgical conditions included anorectal malformations (n=12 - 29.3%), necrotizing enterocolitis (n=6 - 14.6%), and hypertrophic pyloric stenosis (n=6 - 14.6%). Common surgeries were anoplasty (14.7%) and pyloromyotomy (14.6%). The mean age at surgery was 16.24 days. Postoperative complications occurred in 4.9%. The mortality rate was 17.1%, primarily due to necrotizing enterocolitis. The mean hospital stay was 29.12 days, and 9.8% required additional surgical intervention.

**Conclusion** The mortality rate was high due to babies who developed necrotizing enterocolitis.

**Key words** Neonatal surgery, Necrotizing enterocolitis, Surgical outcome, Anorectal malformations.

## INTRODUCTION:

Neonatal surgery poses different challenges for the surgeons. A team approach is required in order to obtain a success. Different specialists work together to achieve this target. A regular audit, which is a process to systematically collect records to

analyse current policies helps in improving standards by revisiting existing methods.<sup>1</sup> The ultimate goal is to improve the outcome of the patients' management including quality of life.<sup>2,3</sup>

Neonatal surgery has made a remarkable progress worldwide due to advancements in surgical techniques, perioperative care, evolving standards and guidelines.<sup>4</sup> Ensuring the highest levels of quality and safety in these procedures remains paramount. By identifying gaps or deviations from the established protocols the outcome may be improved for those hospitals where morbidity and mortality are still high. In this context it is important to analyse the pattern of surgical conditions and their outcome. The objective of this study was to report the pattern of surgical conditions at our hospital and compare the

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management and outcome against standards set at international level.

#### **METHODS:**

**Study design, place & duration:** This retrospective descriptive case series was conducted in the Neonatal Intensive Care Unit, King Fahad Hospital, Al-Baha, Saudi Arabia, from May 2021 to May 2023.

**Ethical considerations:** The hospital records were accessed after getting approval from the Ethical Review Board (KFH/IRB23052023/12).

**Inclusion criteria and exclusion criteria:** All neonates from day-1 to one month of age, having surgical issues and operated, were included. The babies who were managed conservatively or not underwent surgical procedures were excluded. Babies who were operated in other hospitals and referred out to our facility were also excluded.

**Sample size estimation:** All surgical patients who were managed during the study period were included in the study.

**Study protocol:** The data were collected across several domains including demographic particulars such as birth term, birth weight, and age at diagnosis; details of surgical procedures performed including type and associated complications, postoperative complications related to both surgical intervention as well as the underlying pathologies, and subsequent follow-up data.

**Statistical analysis:** Data were entered into SPSS version 28. Descriptive statistics (frequencies, percentages, means, medians, and standard deviations) were used to summarize the dataset related to variables including weight, age at diagnosis, age at intervention, and duration of hospital stay.

#### **RESULTS:**

A total of 41 neonatal surgical cases were included in the study. There were 24 (58.5%) females and 17 (41.5%) males. All were Saudi nationals and resided in the Al-Baha region. The mean age of the patients was  $26.6 \pm 8.3$  days (median of 27.5 days). The majority of the patients ( $n=34$  - 82.9%) were delivered by cesarean section. Twenty-seven (65.9%) neonates were preterm. Twenty-two (53.7%) neonates had a normal birth weight and 14 (34.1%) low birth weight. The mean birth weight was  $2.47 \pm 0.79$  kg (median of 2.6 kg). The mean height was  $45.03 \pm 3.97$  cm (median of 45.0 cm).

The most common conditions managed were

anorectal malformations (29.3%), necrotizing enterocolitis (14.6%), and infantile hypertrophic pyloric stenosis (14.6%). The mean age at diagnosis was  $13.54 \pm 21.34$  days (median of 3.0 days). Thirty-four (82.9%) presented with symptoms, while three (7.3%) were diagnosed on neonatal examination.

The most common symptoms reported were abdominal distension (29.4%), vomiting (29.4%), respiratory distress (14.7%), and inability to pass meconium (11.8%). Sixteen (39.0%) patients had additional congenital abnormalities, including small patent ductus arteriosus (31.3%), patent foramen ovale (37.5%), tetralogy of Fallot (6.3%), sacral dimple (12.5%), congenital cataract (12.5%), and others. None of the patients had siblings with the same pathology, and only one (2.4%) patient experienced complications related to the pathology before the operation. Details are given in table I.

The most common surgical interventions were anoplasty (14.7%) and pyloromyotomy (14.6%). The mean age at the time of intervention was 16.24 days (median= 4 days and a range of 22.25 days). There were no reported intraoperative issues. Postoperative complications were observed in 4.9% of cases. The mean length of hospital stay was 29.12 days (median=21 days and a range of 29.23 days). Additional interventions were required in 9.8% of neonates, such as anal dilatation ( $n=2$ ), closure of ileostomy ( $n=1$ ), and re-exploration. ( $n=1$ ). The long-term outcomes showed a mean age of 102.15 days at the last follow-up (median=60 days and a range of 105.152 days). Sequelae were observed in 14.6% of the neonates. The overall mortality rate was 17.1%. Details are given in table II.

#### **DISCUSSION:**

In this study the total number of patients managed in two years in regional referral centre is quite small when compared with other countries.<sup>5</sup> However, considering the small population of the region a justification may be given. Another reason is presence of other specialists in the hospital like urology, thoracic, neurosurgery and provision of referring complex cases related to these to higher centres. Our focus remained on gastrointestinal congenital anomalies.

In our cohort, females constituted more than half of the patients which is different from other studies that reported male predominance.<sup>6</sup> Additionally, in our study 65.9% of the neonates were preterm, and 34.1% had a low birth weight (<2.5 kg) as compared to the previous data from our hospital.<sup>3</sup> This reflects temporal change in the patient population related to an increase in the number of referrals of

<b>Table I: Medical Diagnosis and History Details</b>			
<b>Items</b>		<b>Number</b>	<b>Percentage</b>
<b>Diagnoses</b>	Gut atresia	03	7.3%
	Volvulus	03	7.3%
	Diaphragmatic hernia	03	7.3%
	HPS*	06	14.6%
	NEC**	06	14.6%
	ARM***	12	29.3%
	TOF****	03	7.3%
	Omphalocele	02	4.9%
	Other	03	7.3%
<b>Types of symptoms</b>	Abdomen distension	10	29.4%
	Abdominal distension with gastric aspiration	01	2.9%
	Constipation	04	11.8%
	Intestinal obstruction	01	2.9%
	No suckling	01	2.9%
	Respiratory distress	05	14.7%
	Sepsis	02	5.9%
	Vomiting	10	29.4%
<b>Other anomalies</b>	No	25	61.0%
	Yes	16	39.0%
<b>Anomaly types</b>	Small PDA#	05	31.3%
	PFO*#	06	37.5%
	TOF****	01	6.3%
	Sacral dimple	02	12.5%
	Congenital cataract	02	12.5%
	Truncus arteriosus	01	6.3%
	Dysmorphic features	01	6.3%
	Down syndrome	02	12.5%
	Cyanotic heart disease	01	6.3%
	Rare genetic anomaly	01	6.3%
	Trisomy 18	01	6.3%
	Complex cardiac anomalies	01	6.3%
<b>Complications related to the pathology (pre-op)</b>	No	40	96.6%
	Yes	01	2.4%

\*= Hypertrophic pyloric stenosis, \*\* = Necrotizing enterocolitis, \*\*\* = Anorectal malformations  
\*\*\*\*= Tetralogy of Fallot, # = Patent ductus Arteriosus, \*# =Patent foramen Ovale

high-risk pregnancies to our hospital due to improved healthcare infrastructure, availability of specialized neonatal care, and probably changes in referral policies.

Anorectal malformations were the most common surgical condition in our series followed by necrotizing enterocolitis. This aligns with findings from other studies.<sup>5</sup> In one study congenital diaphragmatic hernia was notably common.<sup>6</sup> This reflects different pattern of the congenital anomalies that may relate to genetic or environmental factors.

However, the overall pattern in our study has remained largely consistent, but the rate of surgeries for NEC has declined. This reduction is primarily attributed to a shift towards favoring non-operative management over surgical intervention depending upon stage of disease as well. The change can be credited to advancements in perinatal care, earlier detection of NEC, and the availability of specialized milk products. This has been the overall trend reported from other countries.<sup>7-9</sup>

Postoperative complications occurred in 4.9% of

**Table II: Surgical and Postsurgical Details**

Items	Number	Percentage	
<b>Intervention</b>	Anoplasty	06	14.7%
	Ant. sagittal anorectoplasty	01	2.4%
	Bowel resection and jejunostomy	01	2.4%
	Closure of colostomy	01	2.4%
	Repair of omphalocele	02	4.8%
	Duodenoduodenostomy	01	2.4%
	Exploratory laparotomy and ileostomy	05	12.5%
	Exploratory laparotomy resection and anastomosis	03	9.6%
	Gastrostomy tube placement	01	2.4%
	Laparotomy, resection of small intestine, ileostomy, mucus fistula	01	2.4%
	Pyloromyotomy	06	14.6%
	Re-exploration	01	2.4%
	Excision of duodenal web	01	2.4%
	Repair of diaphragmatic hernia	03	7.3%
	Sigmoid colostomy	05	12.5%
	TOF repair	03	7.7%
<b>Postoperative complications</b>	No	39	95.1%
	Yes	02	4.9%
<b>Type of intervention</b>	Anal dilatation	02	50.0%
	Closure of ileostomy	01	25.0%
	Re-exploration	01	25.0%

patients. This included anal stenosis, colostomy prolapse, wound infection, and sepsis. Seven neonates expired in this series. This could be improved especially in patients with NEC. Different mortality rates have been reported in literature which is based upon number of variables related to particular socioeconomic status of those countries.<sup>10,11</sup> It is low in developed countries like South Korea and Japan,<sup>12,13</sup> and high from India and Nigeria, a rate up to 35% and 45%.<sup>14,15</sup> Three neonates with NEC died in our series. All had extensive bowel necrosis. In 9.8% of patients additional surgical interventions were required. This included anal dilatation, ileostomy closure and one patient was re-explored who had NEC. Overall, the outcome of the care provided appeared satisfactory though there is still a room for improvement.

**Limitations of the study:** The small sample size of 41 cases over two years may affect the reliability of the findings. As a single-centre study, its results may not be generalizable to other regions or healthcare settings. Additionally, the retrospective design introduces potential biases, such as incomplete or missing medical records.

**CONCLUSION:**

There were less number of complications though

mortality rate remains high compared to other studies mostly in patients with necrotizing colitis.

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Amal S. Alghamdi: Data collection and contribution to results section.

Muhammad Faisal Alzahrani: Data collection and contribution to results section.

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