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Frequency of Types of Jejunoileal Atresia among Neonates Presenting With Intestinal Obstruction

Fatima Majid[1*], Sana Aslam[2], Muhammad Anwar[3], Misbah Abdul Ghaffar[3], Yasir Ahmed[4] and Fareeha Nazar[3]

[1]Department of Pediatric Surgery, Dow University of Health Sciences, Karachi, Pakistan
[2]Department of Pediatric Surgery, Bilawal Medical College for Boys, Liaquat University of Medical and Health Sciences, Jamshoro, Pakistan
[3]Department of Pediatric Surgery, National Institute of Child Health, Karachi, Pakistan
[4]Department of Pediatric Surgery, Indus Hospital, Karachi, Pakistan

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***Corresponding Author:**
Fatima Majid
Department of Pediatric Surgery, Dow University of Health Sciences, Karachi, Pakistan
fatima991@hotmail.com

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ABSTRACT

Jejunoileal Atresia (JIA) is a significant cause of neonatal intestinal obstruction, accounting for a substantial number of surgical emergencies in the first weeks of life. It results from congenital occlusion of the intestinal lumen, primarily due to intrauterine vascular accidents. Despite improvements in surgical techniques and neonatal care, early diagnosis and intervention remain critical for favorable outcomes. **Objective:** To determine the frequency of common types of jejunoileal atresia among neonates presenting with intestinal obstruction. **Methods:** This descriptive cross-sectional study was conducted at the Department of Paediatric Surgery, National Institute of Child Health (NICH), Karachi, from November 16, 2019, to May 15, 2020. A total of 97 neonates diagnosed with intestinal obstruction and meeting the inclusion criteria were enrolled. Detailed history, antenatal workup, and clinical examination were recorded. Diagnosis was confirmed intraoperatively, and types of JIA were documented. **Results:** The mean age at presentation was 5.78±4.24 days. Among the 97 neonates, 42 (43.3%) were male and 55 (56.7%) were female. The distribution of JIA types was as follows: Type I in 20 cases (20.6%), Type II in 11 cases (11.3%), Type IIIa in 45 cases (46.4%), Type IIIb in 10 cases (10.3%), and Type IV in 11 cases (11.3%). **Conclusions:** Type IIIa was identified as the most frequent type of jejunoileal atresia. Early recognition and surgical management are essential to reduce morbidity, mortality, and length of hospital stay in affected neonates.

INTRODUCTION

Small bowel atresia is a congenital anomaly of the gastrointestinal tract that commonly presents with features of intestinal obstruction in the newborn period [1, 2]. Jejunoileal atresia, a type of small bowel atresia, has an incidence of approximately of 1 in 5000 to 1 in 14000 live births [3]. It is classified into four types: Type I, characterized by mucosal (septal) atresia; Type II, where a fibrous cord connects two atretic segments with an intact mesentery and normal intestinal length; Type III, further subdivided into IIIa, involving complete separation of blind ends with a V-shaped mesenteric defect and intestinal shortening, and IIIb (apple-peel or Christmas-tree deformity), where the separated segments are associated with a large mesenteric defect and significant intestinal shortening; and Type IV, which involves multiple atresias and may represent any combination of Types I to III [4, 5]. Type I and Type II are reported as the most common forms of distal small bowel atresia, accounting for 34.5% and 24.1% of cases, respectively, while other types range between 10–17% [6, 7]. Clinically, neonates with jejunoileal atresia usually present with bilious vomiting, abdominal fullness, and failure to pass meconium [8]. A previous study

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found type III jejunoileal atresia (46%) is the most common form, followed by Type II (31%) and Type I (19%), highlighting the need for early diagnosis and prompt surgical intervention to improve outcomes in affected neonates [9]. A meta-analysis by Virgone et al., evaluated the accuracy of prenatal ultrasound in detecting jejunal atresia as 66.3% (95% CI: 33.9-91.8%) [10]. Advancements in pediatric anesthesia, surgical techniques, total parenteral nutrition, and organized pediatric intensive care units have led to remarkable improvements in the survival rates of neonates with intestinal atresia, especially in developed countries [11]. Moreover, an improved understanding of the disease's pathophysiology has contributed to better surgical and postoperative outcomes. Despite these advances, early diagnosis remains critical for optimizing prognosis, minimizing complications, and ensuring appropriate surgical management. Early recognition and timely treatment of jejunoileal atresia are crucial to reduce neonatal morbidity and prevent unnecessary mortality [12]. However, there is a lack of local data focusing specifically on the frequency and distribution of jejunoileal atresia subtypes among neonates presenting with intestinal obstruction. Most existing studies group intestinal atresias together, overlooking the unique clinical and surgical implications of different jejunoileal atresia types. This gap limited effective diagnosis, management planning, and outcome prediction in neonatal surgical care within this region.

This study aimed to document the frequency and types of jejunoileal atresia among neonates presenting with intestinal obstruction.

METHODS

This descriptive cross-sectional study was conducted at the Department of Paediatric Surgery, National Institute of Child Health (NICH), Karachi, over a period of six months from 28th October 2020 to 28th April 2021. A total of 97 neonates were included using non-probability consecutive sampling. The sample size was calculated using the WHO sample size calculator, with a frequency of type IV jejunoileal atresia at 6.71%, a margin of error of 5%, and a 95% confidence level [9]. This study was approved by CPSP as dissertation, vide letter no. CPSP/REU/PG-2017-196-350. After obtaining informed consent from the parents or guardians, all eligible neonates of either gender, aged up to 28 days, who presented with suspected clinical features of intestinal obstruction like failure to pass meconium, abdominal distension, bilious vomiting, and refusal to feed, were included. Neonates with previous abdominal surgery or with other congenital anomalies such as biliary atresia, gastroschisis, gastric atresia, omphalocele, and obstructed inguinal hernia were excluded. Intestinal obstruction was defined as a blockage of the small or large intestine resulting in the failure of contents to pass through the bowel, as assessed on ultrasound. The types of jejunoileal atresia were diagnosed intraoperatively and was classified into five distinct types based on anatomical findings. Type I involved a mucosal or septal atresia with an intact bowel wall and mesentery, where the lumen was obstructed by a membrane. Type II consisted of two blind-ended bowel segments connected by a fibrous cord with preserved mesentery. Type IIIa presented as two completely separated bowel ends with a V-shaped mesenteric defect. Type IIIb, also known as "apple-peel" or "Christmas tree" atresia, featured a proximal jejunal atresia with a significant mesenteric defect, often with the distal bowel spiraled around a marginal vessel. Type IV involved multiple atretic segments along the bowel, appearing like a "string of sausages," and often required multiple resections and anastomoses. Each type was identified during surgical exploration and directly influenced the surgical management strategy. Data were entered and analyzed using SPSS version 25.0. Mean ± SD was calculated for age and weight. Frequencies and percentages were calculated to summarize the distribution of atresia types across different categories of age, weight, gender, and types of Jejunoileal Atresia. To determine whether there were statistically significant associations between the categorical variables (age groups, weight categories, gender) and the types of jejunoileal atresia, the Chi-square test of independence was applied. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

Table 1 presented the descriptive statistics of the 97 neonates included in the study. The mean age was 5.78 ± 0.43 days, with the majority of neonates (66%) being less than 10 days old. The mean weight was 2.59 ± 0.05 kg, and most neonates (86.5%) weighed more than 2 kg. Female neonates slightly outnumbered males, accounting for 56.7% of the sample, compared to 43.3% males.

Table 1: Descriptive Statistics (N=97)

Descriptive	Statistics Mean ± SD / Frequency (%)
Age (Days)	
Mean Age (Days)	5.78 ± 0.431
< 10 Days	64 (66)
> 10 Days	33 (34)
Weight (KG)	
Mean Weight (Kg)	2.59 ± 0.050
< 2 kg	13 (13.5)
> 2 Kg	83 (86.5)
Gender	
Male	42 (43.3)
Female	55 (56.7)

Type IIIa was the most common jejunoileal atresia,

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observed in 46.4% of cases, followed by Type I (20.6%), Type II and IV (11.3% each), and Type IIIb (10.3%) (Table 2).

Table 2: Frequency for Types of Jejunoileal Atresia (n=97)

Types of Jejunoileal Atresia	Frequency (%)
Type I	20 (20.6)
Type II	11 (11.3)
Type III a	45 (46.4)
Type III b	10 (10.3)
Type IV	11 (11.3)

Table 3 examined the relationship between the types of jejunoileal atresia and the variables of age, weight, and gender. Although no statistically significant association was found between age and type of atresia (p = 0.215), nor between weight and type (p = 0.069), a statistically significant relationship was observed between gender and type of jejunoileal atresia (p = 0.043). Specifically, Type IIIa was more common in females, while Type IIIb was more prevalent in males.

Table 3: Relation of Types of Jejunoileal Atresia with Child Age, Gender and Weight (N=97)

Variables	Type I	Type II	Type IIIa	Type IIIb	Type IV	p-Value
Age						
< 10 Days	11 (11.3)	10 (10.3)	28 (28.9)	6 (6.2)	9 (9.3)	0.215
> 10 Days	9 (9.3)	1 (1.0)	17 (17.5)	4 (4.1)	2 (2.1)	
Weight						
< 2 Kg	6 (6.3)	1 (1.0)	2 (2.1)	2 (2.1)	2 (2.1)	0.069
> 2 Kg	14 (14.6)	10 (10.4)	43 (44.8)	8 (8.3)	8 (8.3)	
Gender						
Male	10 (10.3)	3 (3.1)	19 (19.6)	8 (8.2)	2 (2.1)	0.043*
Female	10 (10.3)	8 (8.2)	26 (26.8)	2 (2.1)	9 (9.3)	

A statistically significant association was observed between jejunoileal atresia types and birth weight (p = 0.043), while age and gender showed no significant relationship (Table 4).

Table 4: Relation of Types of Jejunoileal Atresia with Child Age, Gender and Weight (N=97)

Types of Jejunoileal Atresia	Age		Weight		Gender	
	<10 Days Frequency (%) (95% CI)	>10 Days Frequency (%) (95% CI)	<2 Kg Frequency (%) (95% CI)	>2 Kg Frequency (%) (95% CI)	Male Frequency (%) (95% CI)	Female Frequency (%) (95% CI)
Type I	11 (11.3) (6.3-19.5)	9 (9.3) (4.7-17.5)	6 (6.3) (2.8-13.6)	14 (14.6) (9.1-22.7)	10 (10.3) (5.5-18.5)	10 (10.3) (5.5-18.5)
Type II	10 (10.3) (5.4-18.7)	1 (1.0) (0.2-5.4)	1 (1.0) (0.2-5.4)	10 (10.4) (5.7-18.2)	3 (3.1) (1.1-8.8)	8 (8.2) (4.0-15.9)
Type IIIa	28 (28.9) (20.7-38.6)	17 (17.5) (11.3-26.4)	2 (2.1) (0.6-7.8)	43 (44.8) (35.5-54.5)	19 (19.6) (13.0-28.7)	26 (26.8) (19.3-36.0)
Type IIIb	6 (6.2) (2.8-13.1)	4 (4.1) (1.6-9.9)	2 (2.1) (0.6-7.8)	8 (8.3) (4.3-15.5)	8 (8.2) (4.0-15.9)	2 (2.1) (0.6-7.8)
Type IV	9 (9.3) (4.8-17.3)	2 (2.1) (0.6-7.8)	2 (2.1) (0.6-7.8)	8 (8.3) (4.3-15.5)	2 (2.1) (0.6-7.8)	9 (9.3) (4.8-17.3)
p-Value	0.215		0.069		0.043*	

DISCUSSION

Jejunoileal Atresia (JIA) is the most common type of intestinal atresia and a frequent cause of neonatal intestinal obstruction, typically resulting from intrauterine mesenteric vascular accidents [1]. Shakya *et al.*, reported their experience managing jejunoileal atresias in eastern Nepal, while Burjonrappa *et al.*, compared clinical outcomes and pathophysiological aspects of different types of intestinal atresia [13, 14]. Tahkola E *et al.*, in 2024 and Lodhia *et al.*, 2022 stated intestinal atresia remains a leading surgical emergency in neonates, where early and accurate diagnosis is critical for optimal management [15, 16]. The clinical presentation of intestinal atresia may be acute or chronic, and without prompt recognition, neonates deteriorate rapidly, increasing morbidity and complicating surgical interventions [17]. Early diagnosis hinges on the clinician's ability to promptly detect obstructive symptoms and accurately interpret radiographic and other investigative findings, ensuring timely resuscitation and surgical treatment [12]. Jejunoileal atresias arise either from failure of recanalization or from intrauterine vascular events like volvulus, duplications, or intussusception. Evidence of intrauterine bowel necrosis or peritonitis was found in nearly half of large series cases. Associations with other congenital anomalies, including VACTERL association and congenital heart defects, are common. Antenatal diagnosis through polyhydramnios and ultrasonography is possible, although colonic atresias are rarer compared to small bowel atresias. Saraç M *et al.*, in 2021 reported mortality rates are notably higher in ileal atresias due to a greater risk of early perforation compared to duodenal atresias [18]. Jejunoileal atresia affects approximately 1 in 5,000 live births, equally among males and females, with about one-third of affected infants being premature [3]. Surgical management of JIA includes generous excision of the proximal pouch, as ischemic damage can extend up to 20 cm. Postoperative dilated bowel often remains dysfunctional, contributing to disturbed intestinal transit, particularly in jejunal atresias as reported by Sholadoye TT *et al* [19]. Although improvements in operative techniques and parenteral nutrition have enhanced outcomes, postoperative intestinal motility disorders are still frequently reported even in the absence of anatomical abnormalities [19]. In this study, among 97 neonates, 42 (43.3%) were male and 55 (56.7%) were female, slightly differing from other studies [15, 17, 20]. Regarding types of

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JIA, this distribution showed Type I (20.6%), Type II (11.3%), Type IIIa (46.4%), Type IIIb (10.3%), and Type IV (11.3%), comparable to distributions reported by Verma *et al.*, and Tripathy [17, 20]. Furthermore, stratification analysis revealed insignificant differences by age group (P=0.215), weight (P=0.069), and gender (P=0.043), indicating a relatively homogeneous distribution across these parameters.

CONCLUSIONS

The most frequent type of jejunoileal atresia in this study population was Type IIIa. Gender showed a statistically significant association with the type of atresia, suggesting a potential gender-based variation in anatomical presentation.

Authors Contribution

Conceptualization: FM
Methodology: FM, SA, MA, MAG, FN
Formal analysis: FM, MA, MAG, YA
Writing, review and editing: SA, MA, MAG

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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