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A Cross Sectional Study of Gastrointestinal Obstruction in Neonates and Its Management

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Abstract
Introduction: *Gastrointestinal tract obstructions are the most common surgical emergencies in neonatal period. The aetiology of these disorders is diverse and mostly the consequences prenatal developmental malformations. The management and survival are still a challenge, especially in developing countries like India.*
Materials and Methods: *A prospective observational study was conducted in a tertiary care paediatric institute from October 2016 to September 2019. Newborns in the age group of one to 28 days, who were operated in the hospital for gastrointestinal tract obstruction were analysed. Institutional Ethics Committee approval was taken. Data with regard to demographic patterns, clinical profile, management approach and outcome, were collected and analysed.*
Results: *Out of 531 newborns operated for gastrointestinal obstruction, 80% cases presented within first week of life. Male neonates were more commonly affected than females (M: F=2.2:1) and 58% cases were having low birth weight. Anorectal malformation was the commonest cause of obstruction (40.7% cases) followed by intestinal atresia (18% cases). Hirschsprung's disease, malrotation, meconium ileus and hypertrophic pyloric stenosis were among the important aetiologies. The overall mortality in this study was 13% and septicaemia was the leading cause.*
Conclusion: *Aetiology of gastrointestinal obstruction in newborn is diverse ranging from oesophageal atresia to anorectal malformations. Low birth weight and other co-morbidities are associated in many cases. The overall outcome is in improving trend due to gradual understanding about the pathology and advancement of neonatal care. Early diagnosis, surgical intervention and availability of well-equipped neonatal intensive care unit facility are essential for better survival.*
Key Words: *Anorectal Malformation, Oesophageal Atresia, Hirschsprung's Disease, Malrotation, Meconium Ileus*

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I. Introduction

Intestinal obstruction is one of the most common emergencies accounting for about 20% of admissions.[1] In U.K., it is accounted for 23% of total admissions in a neonatal surgical unit. Unlike adults, obstruction of small intestine and colon in a paediatric age group are almost always due to congenital anomalies. Vomiting, abdominal distension and failure to pass meconium are symptoms of neonatal intestinal obstruction.[2] It is a dictum that "any new born who has a yellow vomitus should always be considered as a case of intestinal obstruction unless proved otherwise".[3] Clinical history, plain x-ray abdomen i.e. erect and supine films are sufficient to make diagnosis, ultrasonography may also be helpful to diagnose a condition like duplication of gastrointestinal tract.[4] The purpose of these investigations is to know the cause of intestinal obstruction pre-operatively so that we may chart out a plan for further management.[5] The aim for early diagnosis is to plan for prompt resuscitation and exploration to minimize the resultant morbidity and mortality in high risk neonates. Post operative outcome in these patients is determined by co-morbid factors like (1) delay in diagnosis and operative intervention (2) association of congenital anomalies (3) presence of necrotic bowel at laparotomy (4) low birth weight and preterm babies.

II. Materials And Methods

This prospective observational study was conducted in the Paediatric department of GVR Children Hospital, Kurnool from October 2018 to September 2020. Newborns admitted in the hospital for features of obstruction in gastrointestinal tract such as vomiting, regurgitation of feeds, abdominal distension and non-passage of meconium were studied. A written informed consent was taken from parents or guardians. Sample size was calculated using Open Epi software (version 3), taking 95% Confidence interval, 80% power and the

expected change in outcome as 13% from a baseline of 20%. Data were collected in respect of age, sex, weight at presentation, clinical features, associated anomalies, management approach, complications and survival or mortality.

Inclusion Criteria

(i) Newborns presenting between 1 to 28 days of life.
(ii) Both male and female newborns were included.
(iii) Newborns operated for obstruction anywhere in the gastrointestinal tract.

Exclusion Criteria

(i) Neonates who were detected, but not operated due to severe septicemia or parental refusal for surgery.
(ii) Neonates who were absconded or died before surgery.
(iii) Neonates in whom a definite diagnosis or aetiology was not reached during the study period.

Initial Resuscitation and Surgical Management

All newborns were kept warm and nil orally. They were stabilized with oxygen inhalation, intravenous fluids and antibiotics. Routine investigations like hemogram, serum electrolytes and urea/creatinine were done. Erect abdominal X-ray including chest was done in all cases and ultrasonography of abdomen was done in selected cases such as pyloric stenosis and malrotation. Cross table prone lateral radiography (CTPL) was done in anorectal malformation (ARM) cases to determine the position of rectal gas shadow. Colostomy was planned in high ARM cases and anoplasty in low ARM cases. The newborns were operated after correction of dehydration and serum electrolyte imbalance. All excised tissue and biopsy samples were sent for histopathological study. Postoperative care continued with oxygen inhalation, nasogastric decompression, intravenous fluids and antibiotics. Sick newborns were transferred to the neonatal intensive care unit. The patients were discharged only after full feeds and with follow up advice like colostomy care. The operative findings and procedure, morbidity and mortality were recorded. They were followed for a minimum period of 3 to 6 months. The final outcome was recorded in terms of postoperative complications and survival.

Statistical Analysis

Statistical analysis was done in Microsoft Excel using QI Macros software. The gender distribution in different aetiology was depicted as a bar diagram. The number of cases with varied aetiology was presented as percentage (%). Fisher exact test was used to calculate probability of events. A value of $p < 0.05$ was taken as significant.

III. Results

A total of 531 newborns were operated for gastrointestinal tract (GIT) obstruction during the 3-year study period. Male neonates (n=364) outnumbered female neonates (n=167) giving a M: F ratio of 2.2:1 (fig. 1). Majority of the newborns presented to us during first week of life (80% cases), especially within first 3 days (table No-1). Fifty eight percent of neonates were of low birth weight and 3% were very low birth weight. Anorectal malformation was the commonest cause of obstruction. The spectrum of ARM varies from simple perineal fistulas to complex pouch colon and cloacal anomalies along with involvement of genitor-urinary tract. High ARM cases were more commonly encountered, including 17 cases of congenital pouch colon 12 cases of cloacal anomaly and 2 cases of rectal atresia. Absence of anal opening, non-passage of meconium and abdominal distension were the presenting features. These cases were associated with other congenital anomalies like oesophageal atresia (3 cases), intestinal atresia (3 cases), Down syndrome (3 cases), congenital talipes equinovarus (CTEV) deformity in 2 cases and lumbosacral meningomyelocele in one case. The colostomy was done in all cases of high ARM but, it required revision in 7 cases due to stoma related complications.

Intestinal atresia was the second most common cause of GIT obstruction in neonates and duodenum was the commonest site of atresia. Bilious vomiting, abdominal distension and visible bowel loops were common presenting features. A double bubble appearance in plain X-ray abdomen was suggestive of duodenal atresia (DA). DA cases were associated with Down syndrome in 5 cases and ARM in 2 cases. Both the cases of pyloric atresia were associated with epidermolysis bullosa. Colonic atresia patients were associated with gastroschisis (2 cases), malrotation (2 cases) and ARM (one case). Oesophageal atresia (EA) with or without tracheo-oesophageal fistula (TEF) was the third most cause of obstruction. Regurgitation of feeds, excessive salivation and respiratory distress were the principal modes of presentation. Diagnosis was made by inability to pass 10fr firm red rubber tube from mouth into stomach. X-ray shows tip of nasogastric tube in proximal oesophageal pouch or coiling. Additional finding of gas-less abdomen points towards pure EA, i.e. without TEF. Right side thoracotomy, ligation of fistula and end-to-end anastomosis was the standard operative procedure in EA with TEF. Oesophagostomy and gastrostomy was performed in long gap cases and in cases with pure EA.

A diverting colostomy, usually in left lower abdomen was the most common surgical procedure performed in 46% cases followed by thoracotomy for EA with TEF (15%) and bowel resection with anastomosis in 13% cases (table 2). Postoperative complications like septicaemia, pneumonia, anastomotic leak and colostomy related complications were reported in 20% cases. However, the complications were more significantly noted in EA cases (p=0.00006). The overall mortality in this study was 13% and septicaemia was the leading cause (table 3). A significantly higher mortality was noted in EA and TEF cases (p=0.02) due to associated pneumonia, septicaemia and other co-morbidities.

S.No	Etiology	Number of cases	1-3 days	4-7 days	8-28 days	<1.5 kg	1.5-2.49 kg	≥2.5 kg
1	EA with or without TEF	89 (16.8)	51	30	8	2	67	21
2	IHPS	27 (5.1)	-	-	27	-	3	24
3	Intestinal Atresia	96 (18.1)	42	28	26	8	70	18
4	Duplication cyst	1 (0.2)	1	-	-	-	1	-
5	Malrotation	22 (4.1)	-	8	14	-	11	11
6	MI	16 (3.0)	7	7	2	1	8	7
7	Herniation Umbilical cord	5 (0.9)	4	1	-	-	3	2
8	HD	55 (10.4)	18	19	18	-	29	26
9	NEC	4 (0.7)	-	1	3	2	2	-
10	High ARM	184 (34.7)	158	22	4	4	83	87
11	Low ARM	32 (6.0)	24	5	3	-	17	15
12	Total	531 (100)	305 (57%)	121 (23%)	105 (20%)	16 (3%)	294 (55%)	221 (42%)

Table 1: Age and Weight at the Time of Presentation

S.No	Surgical procedure	Pathology	Number of cases (%)
1	Thoracotomy, ligation of fistula and end to end anastomosis	EA with TEF	79 (15)
2	Oesophagostomy and Gastrostomy	Pure EA (7), Long gap EA with TEF (3)	10(1.9)
3	Ramstedt's pyloromyotomy	Pyloric stenosis Intestinal artesia (60) MR with Volvulus (4)	27(5)
4	Resection and anastomosis	Herniation of umbilical cord (2) NEC (4), Duplication Cyst (1)	71 (13)
5	Excision of web and closure of of enterotomy	Type I intestinal atresia	20 (3.8)
6	Duodeno-Duodenostomy	DA	16(3)
7	Ladd's Procedure	MR	24 (4.5)
8	Colostomy	High ARM and HD	242 (46)
9	Anoplasty	Low ARM	32 (6)
10	Laparotomy and repair	Herniation of Umbilical Cord	3 (0.5)

Table 2: Neonatal Operative Procedures

S.No	Aetiology (No of cases)	Complications (No. of Cases)	P*	Survival (No. of Cases)	Mortality
1	EA (89)	Anastomotic Leak Septicaemia(35)	0.0006	69	20(22%)
2	High ARM (184)	Pneumonia septicaemia, colostomy complications, Redo Colostomy (31)	0.47	166	18(10%)
3	Low ARM (32)	-	-	32	0
4	Intestinal Atresia (96)	Anastomotic Leak, Septicaemia (20)	0.88	78	18(19%)
5	IHPS (27)	Redo pyloromyotomy (1)	0.07	27	-
6	HD (55)	Colostomy Complications, Redo colostomy (6)	0.16	52	3(5%)
7	Malrotation (22)	Wound dehiscence and redo- laparotomy (4)	0.91	19	3(14%)

8	MI(16)	Septicaemia and Re-laparotomy (4)	0.82	16	3(19%)
9	Herniation of Umbilical cord (5)	Septicaemia (1)	0.58	4	1(20%)
10	NEC (4)	Septicaemia (2)	0.37	3	1(25%)
11	Duplication Cyst (1)	-	-	1	0
12	Total (531)				

Table 3: Outcome in Cases of GIT Obstruction

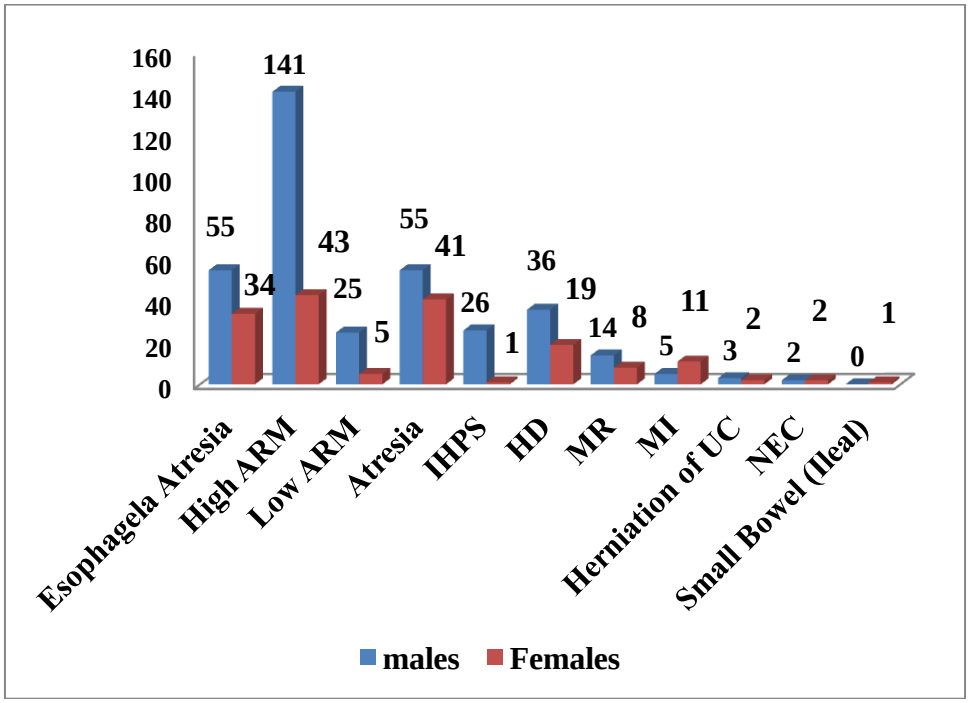

Figure 1: Gender Distribution of GIT Obstructions (M:F::2.2:1)

IV. Discussion

Anorectal malformation was found to be the most common cause of GIT obstruction in this series accounting for 40.7% of the cases. This anomaly was reported between 35.6 to 48% of cases in different series. So our findings are similar to these series. However, Ameh et al from Nigeria found a much higher incidence (68.9% of cases).[6] This may be partly due to non-inclusion of oesophageal atresia, a major contributing aetiology in their series. Traditionally, ARMs are categorized as high or low types, depending on the position of distal end of rectum in relation to the puborectalis sling. When the rectum ends above the puborectalis sling, it is called high anomaly.[7] High anomalies are more commonly reported than low anomalies. This malformation was managed in staged approach in our institution, which is a standard protocol. Initial diverting colostomy was done and definitive surgery, i.e. posterior sagittal anorectoplasty is planned at a later stage.[8] Unlike low ARMs, High ARMs were associated with other co-morbidities like EA, DA, Down syndrome and CTEV as in other studies and a resultant higher mortality. Low ARMs were managed by anoplasty and none of these patients died during the study period.[9] In congenital pouch colon, a part or entire colon exhibit pouch-like dilatation along with fistulous communication to the urogenital system. This anomaly has an unique geographical distribution in world and majority of these cases were reported from northern and western part of India. Detection of 17 cases of congenital pouch colon within a period of 3 years in our hospital, located in eastern part of India is a remarkable feature.

Intestinal atresia was found to be the second most common cause of GIT obstruction, accounting for 18% of cases in this series. Intestinal atresia is also reported in 13.7 to 23% of cases in different series. However, studies by Ameh et al (6.7%) and Seth et al (12%) report lower incidences. Two cases of congenital pyloric atresia (CPA) were operated and managed during the study period. CPAs are rare conditions and commonly occur as an isolated anomaly, with good outcome. However, Epidermolysis bullosa (EB), a hereditary disorder manifesting as blistering lesions on skin are often associated and the association is described as Carmi's syndrome. Both the cases of CPA in our series had associated EB and one neonate died

postoperatively. Carmi's syndrome is a very rare malformation, having mutations in integrin gene with resultant poor prognosis. In this study, DA was not only the most common type of small bowel atresia, but also associated with higher incidences of other anomalies like Down syndrome (5 cases), malrotation (2 cases) and ARM (2 cases). The developmental disorder behind DA is 'failure of recanalization' which occur between 9 to 11 weeks of embryonic life. This is an early event, when other organs are developing with resultant, increased incidence of other malformations. In contrast, the embryological disorder causing most distal jejunoileal atresias, is 'vascular accident' occurring late in the intrauterine life and by that time other organs are already developed. One case of Apple-peel variety of jejunal atresia in the present study had a rare coexistence with isolated duplication cyst. Although, colon is an unusual location for atresia, 12 cases of colonic atresia were detected and managed during study period. One of these cases had high ARM without fistula, as an association and this coexistence is rarely reported in literature.[10]

V. Conclusion

Our study showed that, anorectal malformation was the most common cause of GIT obstruction during neonatal period. It is followed by intestinal atresia and oesophageal atresia. The initial 3 days of life is crucial as majority of patients presented during that period. Male newborns were more commonly affected or referred to us than female newborns. Majority of neonates were of low birth weight, a risk factor for survival. However, the overall survival rate of 87% in the present study is a reflection of gradual advancement in neonatal care, surgery and anaesthesia. But, the key areas of improvement seen are improved awareness and recognition of the disease spectrum, timely referral from rural hospitals, early resuscitation of these tiny newborns and optimal utilization of advanced neonatal supporting systems.

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