

## MORTALITY RISK FACTORS FOR NEONATAL INTESTINAL OBSTRUCTION

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### Abstract

This study aimed to determine the type of neonatal intestinal obstruction, their mortality, and the significance of the direct causes of death.

A retrospective study of all neonates managed for neonatal intestinal obstruction (total number studied was 161 child) at Basrah Children's Specialty Hospital (BCSH) between June 2012 and June 2014. Data were collected from patients' hospital records (neonatal intensive care unit) and analyzed for age, sex, clinical features, diagnosis, surgical procedure performed, prematurity, birth weight, duration of symptoms, complications and their management.

The mortality due to neonatal intestinal obstruction is still high in our setting (25.5%). The significant factors associated with mortality were prematurity, birth weight, sepsis; reoperation, short bowel syndrome, and proximal intestinal stoma. Certain causes of neonatal intestinal obstruction were associated with high mortality e.g. jejunoileal atresia (52.6%), meconium ileus (50%), perforated viscus (46%), and duodenal atresia. Male are affected more than female with M:F ratio of 2.4:1. The most common cause of intestinal obstruction in neonates in this series was anorectal malformations (33.5%). Other causes of neonatal intestinal obstruction included Hirschsprung's disease (24.2%), small intestinal atresias (11.8%), intestinal malrotation with or without volvulus (9.3%), perforated viscus (8.1%), meconium ileus (7.5%), duodenal atresia (2.5%), annular pancreas (1.2%), and meconium plug syndrome, necrotizing enterocolitis and segmental dilatation (0.6%, each).

In conclusion, neonatal intestinal obstruction is a common cause of admission accounting for 28.2% of all admission. Mortality from intestinal obstruction is still high in our society and strict measures regarding prenatal, natal and postnatal management should be addressed to save those neonates.

### Introduction

Congenital intestinal obstruction occurs in approximately 1:2000 live births and is a common cause of admission to neonatal surgical units, accounting for up to one-third of all admissions<sup>1</sup>. Bile-stained vomiting in the infant is a sign of intestinal obstruction until proved otherwise<sup>2</sup>. Prompt recognition and treatment of neonatal intestinal obstruction (NIO) can truly be lifesaving<sup>3</sup>. The management of NIO in developing countries remains challenging, with poorer outcomes compared with the results from the industrialized countries<sup>4,5</sup>. The mortality associated with NIO ranges between 21-45% in developing countries, unlike the less than 15% in Europe<sup>4,6</sup>. Some factors attributing to the high

mortality in developing countries include prematurity, late presentation, associated severe congenital anomalies and complications of surgery as well as lack of neonatal intensive care facilities<sup>4,7</sup>.

### Aims

1. To determine the types of neonatal intestinal obstruction in Basrah society.
2. To study the mortality of different causes of neonatal intestinal obstruction.
3. To analyze the direct causes of neonatal deaths due to congenital intestinal obstruction and their statistical significance.

## Patients and methods

This is a retrospective study of all neonates managed for NIO at BCSH between June 2012 and June 2014. Data were collected from patients' hospital records (neonatal intensive care unit) and analyzed for age, sex, clinical features, diagnosis, surgical procedure performed, prematurity, birth weight, duration of symptoms, complications and their management using the Statistical Package for Social Sciences (SPSS) version 20. Chi square test was used to test the statistical significance. A P-value of <0.05 was assumed to be significant.

One hundred eighty two patients presented with NIO during the study period but complete records were available for only 171. Further 10 patients (4 ileus and 6 conservatively treated undiagnosed cases) were excluded. Within the same period, a total of 572 neonates had admitted to the NICU various conditions, with NIO representing about 28.2% of the neonatal surgical conditions.

## Results

Of the 161 neonates who had neonatal intestinal obstruction, 114 (70.8%) were males and 47 (29.2%) were females (M:F ratio is 2.4:1).

Table (I) show the most common causes of intestinal obstruction in neonates. Anorectal malformations accounted for 33.5% (n= 54) of the cases. Forty (74.1%) patients had high anorectal malformation while 14 patients (25.9%) had low malformations. Other causes of NIO include Hirschsprung's disease in 39 (24.2%) patients, small intestinal atresias in 19 patients (11.8%), intestinal malrotation and volvulus in 15 patients (9.3%), perforated viscus in 13 (8.1%), meconium ileus in 12 (7.5%), duodenal atresia in 4 (2.5%) which is much less than that found in text<sup>1</sup>, annular pancreas in 2 (1.2%), and meconium plug syndrome, necrotizing enterocolitis and segmental dilatation in 1 patient each (0.6%).

The mean age of the survivors was 6.9 days (SD: 7.7 days) while the mean age of those who died was 4.4 days (SD: 5.5 days). This high mortality in earlier presentation may reflect the severity of disease.

**Table I: Frequency of causes of neonatal intestinal obstruction**

Type	Frequency	Percent
High imperforate anus	40	24.8
Low imperforate anus	14	8.7
Hirschsprung`s disease	39	24.2
Jejunioileal atresia	19	11.8
Malrotation	15	9.3
Perforated viscus	13	8.1
Meconium disease	12	7.5
Duodenal atresia	4	2.5
Annular pancreas	2	1.2
Necrotizing colitis	1	0.6
Meconium plug syndrome	1	0.6
Segmental dilatation	1	0.6
Total	161	100.0

Regarding the types of neonatal intestinal obstruction, the mortality was high in jejunioleal atresia (52.6%), meconium ileus (50%), perforated viscus (46%), and duodenal atresia (25%) as demonstrated in table II.

**Table II: Type-specific mortality of neonatal intestinal obstruction**

Type	Mortality				Total
	Alive	%	Dead	%	
High imperforate anus	35	87.5%	5	12.5%	40
Low imperforate anus	12	85.7%	2	14.3%	14
Hirschsprung`s disease	31	79.5%	8	20.5%	39
Jejunioleal atresia	9	47.4%	10	52.6%	19
Duodenal atresia	3	75%	1	25%	4
Malrotation	14	93.3%	1	6.7%	15
Meconium disease	6	50%	6	50%	12
Annular pancreas	1	50%	1	50%	2
Necrotizing colitis	0	0%	1	100%	1
Perforated viscus	7	53.9%	6	46.1%	13
Meconium plug syndrome	1	100%	0	0%	1
Segmental dilation	1	100%	0	0%	1
Total	120	74.5%	41	25.5%	161

Even type specific mortality is still high for example; the mortality of jejunioleal atresia and meconium ileus was 52.6% and 50% respectively.

In general, forty one (25.5%) patients died. Table (III) Sepsis was the major cause of death (n= 20), followed by reoperation (n=8) due to anastomotic leak (n=4) and unrelieved symptoms (n=4). Three patients died due to congenital heart disease (all suffered of high anorectal malformation), three patients died due to short bowel following massive intestinal resection. Two patients died due to severe

respiratory distress while, dehydration and insufficient absorption due to proximal jejunostomy was the cause of death in 2 patients. Severe irreversible hypoglycemia was the cause of death in 2 patients and significant bleeding in one patient.

When these risk factors were subjected to statistical analysis, the only significant factors were prematurity ( $\chi^2=6.4$ ,  $P=0.01$ ), birth weight ( $\chi^2=6.3$ ,  $P=0.01$ ), sepsis ( $\chi^2= 40.38$ ,  $P=0.00$ ), reoperation ( $\chi^2=20.20$ ,  $P=0.00$ ), short bowel syndrome ( $\chi^2=8.95$ ,  $P=0.03$ ), and proximal stoma ( $\chi^2=5.93$ ,  $P=0.015$ ).

**Table III: Analysis of factors that determine the outcome of neonatal intestinal obstruction**

Criteria	Alive	died	Total	x value	p-value
Age (n = 161)				0.46	0.5
< 72 h	7	15	52		
> 72 h	83	26	109		
Gestational age (n =161)				6.4	0.01
< 37 weeks	9	9	18		
37–42 weeks	111	32	43		
Birth weight (n = 161)				6.3	0.01
< 2.5 Kg	38	22	60		
> 2.5 Kg	82	19	101		
Sepsis (n = 161)				40.38	0.00
Present	7	20	27		
Not present	113	21	134		
Reoperation (n =161)				20.20	0.00
Yes	1	8	9		
No	119	33	152		
SBS (n=161)				8.95	0.03
Yes	0	3	3		
No	120	38	158		
Proximal stoma (n=161)				5.9	0.015
Yes	0	2	2		
No	120	39	159		
CHD (n=145)				0.57	0.45
Yes	12	3	15		
No	92	38	130		
Respiratory distress (n=161)				4.76	0.29
Yes	23	2	25		
No	97	39	136		
Postoperative bleeding (n = 154)				0.00	0.98
Yes	3	1	4		
No	116	34	150		
Hypoglycemia (n=161)				1.01	0.32
Yes	12	2	14		
No	108	39	147		

## Discussion

Neonatal intestinal obstruction is a common indication for surgery in the newborn. During this study period in our centre, NIO represented 28.2% of the neonatal surgical admission which is fairly similar to other study<sup>8</sup>.

The male preponderance in this report agrees with reports from other centres<sup>4,8</sup>.

The most common cause of neonatal intestinal obstruction in this series was anorectal malformations (33.5%) which

are less than the value reported by a similar study (57.1%)<sup>2</sup>.

The overall mortality is high in this study (25.5%), which is similar to that found in developing countries, 21.1% (4), 28.6% (8), but much higher than mortality in developed countries, less than 15%<sup>5</sup>.

The mortality of certain types of neonatal intestinal obstruction is still high e.g. the mortality rate of jejunoileal atresia and meconium ileus was 52.6% and 50%,

respectively which should be less than 10% in atresia and between 15-23% in meconium ileus<sup>9</sup>. The high mortality observed in neonates with jejunoileal atresia may be due to high occurrence of type III atresia (IIIa=4 cases, IIIb=3 cases), all cases of Christmas tree type died. Excellent survival was noticed in malrotation that is close to text<sup>1</sup>.

Sepsis, reoperation, prematurity, birth weight, short bowel syndrome and proximal stoma were associated with poor outcome. Sepsis contributed significantly to mortality in this report, as in other reports<sup>4,8</sup>. The increased mortality associated with reoperation may be related to repeated exposure to anaesthesia within short intervals, their immature livers not being able to sufficiently metabolize the anaesthetic drugs, some of which are hepatotoxic<sup>10</sup>. In addition to stress of surgery. Prematurity also contributed to mortality in surgical neonates in this study. In most developed countries, prematurity has ceased to be an important determinant of the outcome of neonatal surgery. This is probably due to the availability of well-equipped neonatal intensive care units<sup>8</sup>.

Unavailability of total parental nutrition was a contributory factor for death of neonates complained of short bowel

syndrome and those with proximal stomas.

Mortality of perforated viscus neonates can be reduced by early diagnosis and referral.

Many death of Hirschsprung's disease patients was due to sepsis followed enterocolitis, which may also be reduced by prompt early diagnosis.

In conclusion, sepsis, reoperation, massive bowel resection, proximal stomas, prematurity and birth weight were major determinants of mortality in neonates with intestinal obstruction. In a similar study, reoperation, postoperative bleeding, and perioperative sepsis were significant contributors to mortality<sup>8</sup>.

Prevention of postoperative sepsis and complications e.g. anastomotic dehiscence, which require a repeat surgery, are necessary for improved survival after surgery for NIO.

## Conclusion

Neonatal intestinal obstruction is a common cause of admission to a neonatal intestinal obstruction, accounting for 28.2% of all admission. Mortality of intestinal obstruction is still high in our society and strict measures regarding prenatal, natal and postnatal management should be addressed in order to save the neonates with intestinal obstruction.

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