SAS Journal of Surgery ISSN 2454-5104
SAS J. Surg., Volume-1; Issue-4 (Nov-Dec, 2015); p-165-171
Available online at http://sassociety.com/sasjs/

Research Article

Intestinal obstruction in the first year of age: Pattern and outcome of management

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Abstract: Intestinal obstruction in the first year of age is a common cause of morbidity and mortality. The main objective was to identify the causes, presentation and management outcome of intestinal obstruction in the first year of age. Other objectives were to to review modalities of treatment instituted and to study the outcome of treatment (morbidity and mortality). This is a prospective, observational, cross sectional study, conducted at Bahri (Khartoum north) teaching hospital (KNTH), Khartoum, Sudan, the hospital which receives the highest number of paediatric surgical emergencies in Khartoum state, in the period from October 2014 to October 2015, follow up period was 4 to 6 months. A semi-structured questionnaire was used to collect the data after agreed informed consents. SPSS version16 was used to analyze the results. The study showed that 42 out of 54 patients (77.8%) were males while 12 patients (22.2%) were females. All of them are aged less than one year on first admission by intestinal obstruction, The mean age was 3.1±3.5 months, range fron 2days to 11.5 months. (48.1%) were aged less than one month as the peak age group while (11.1%) were aged 1to 3 months as the least group.The diagnoses were Hirschsprung's disease in 37% of patients (n=20), anorectal malformations 22.2% (n=12), Intussusception18.5% (n=10), malrotation 11.1% (n=6), obstructed herniae 5.6% (n=3), mixed 3.7% (n=2), and bowel atresia 1 patient (1.9%)Concomitant disease was present in 13% (n=7) of the patients. Family history of intestinal obstruction in the first year was positive in one patient but no data about the diagnosis. The diagnosis was achieved only clinically in 51.9% of cases, radiological diagnosis was done in 25.9% of cases, while rectal biopsy confirmed Hirschsprung's disease in 12.9% of cases, and intra-operative diagnosis was done in 9.3%. The duration of symptoms before admission was 1-2 days in 38.9%, 3-5 days in 37%, and more than 5 days in 24.1% of cases.Regarding the number of admissions, 40.7% of the patients were admitted once, 46.3% were admitted two to four times, and 13% more than four times.Operations were colostomy (with done or planned pull-through) 50%, Ladd procedure 13%, resection-anastomosis 11.1%, reduction of intussusceptions 7.4%, reduction of obstructed hernia 5.6%, combined surgeries11.1% and anal transposition1.9%.Complications (excluding mortality) occurred in 29.6% (n=16) of our patients. These were stoma complications11.1% (n=6), wound infection 5.6% (n=3), intestinal obstruction 3.7% (n=3), hernia formation 1.9% (n=1) and multiple complications 7.4% (n=4.(Regarding the sum of duration of hospital stay(sum of days of different admissions); 50% stayed for 5 to 15 days, 24.1% stayed for 16 to 30 days, 16.7% stayed for 1 to 4 days and 9.3% stayed for more than 30 days.Death was the outcome in six patients (11.1%). 83.3% of this mortality happened in neonates. 50% of this mortality is associated with the diagnosis of anorectal malformation. Intestinal obstruction in the first year is associated with considerable morbidity- measured by number of admissions and days of hospital stay- and mortality.

Keywords: Colostomy, Hirschsprung's disease, Intestinal obstruction, Infant, Intussusception

INTRODUCTION

Intestinal obstruction is one of the most common emergencies in the practice of paediatric surgery [1].It is the result of various causes depending on age, with the peak incidence in children noted below one year of age [1]. It is a common cause of paediatric surgical emergency with a high morbidity and mortality in Africa [2]. The causes of paediatric intestinal obstruction show variations that are influenced by age, racial, social and environmental factors [1, 3].

Patient and methods:

This is a prospective, descriptive, cross sectional study, conducted at Bahri (Khartoum north) teaching hospital, a governmental hospital, located in Khartoum north, Khartoum state, Sudan. Study

population are children aged below one year presenting with features of intestinal obstruction. 54 patients fulfilled the inclusion criteria of the study.

Exclusion criteria are patients above one year of age, patients treated conservatively (a dynamic obstruction) and patients with chronic constipation, post-diarrheal distension and abdominal trauma. Data collection was done through a questionnaire (semi-structured)

SPSS was used in data analysis. P value is considered significant if < 0.05.ethical considerations were done.

RESULTS

The study included 54 patients who satisfied the inclusion criteria.

Demographic data of the patients:

Most of our patients were male, they were 42 (77.8%) while 12 (22.2%) patients were females. With a male: female ratio of 3.5 : 1. The mean age was 3.1± 3.5 months. 48.1% were neonates,**(Figure 1)**. No statistically significant difference between gender and age group, p value 0.267, **(Table 1).**

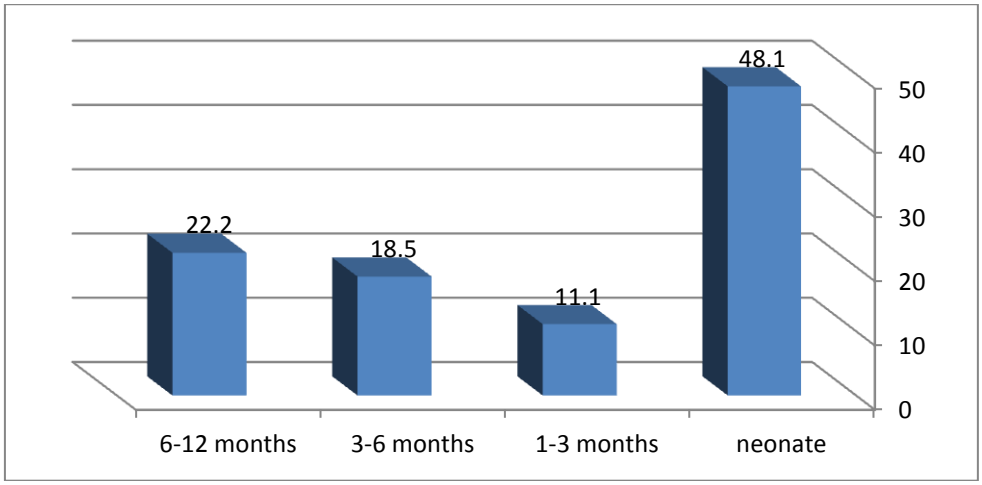

Fig-1:Age in groups

The mean age was 3.1±3.5 in months

Table 1: Age and gender of the study population:

Age in groups	Male	Female	Total	Percentage
Neonate	22	4	26	48.1
1-3 months	3	3	6	11.1
3-6 months	7	3	10	18.5
6-12 months	10	2	12	22.3
	42	12	54	100

Clinical features:

The presenting features are absent anal orifice, delayed passage of meconium, abdominal distension, irritability, abdominal mass, blood with stools and constipation. Some patients presented by one feature e.g. absent anal orifice while others presented by more than four. The three features that some patients presented by only one of them are absent anal orifice, vomiting and delayed passage of meconium. Other features are presented in combination, **(Table 2)**.

Table 2: Clinical features of the study population (n=54):

Clinical feature	Number	Percentage
Absent anal orifice	8	14.8%
Delayed passage of meconium	21	38.9%
Irritability	29	53.7%
Vomiting	22	40.7%
Constipation	40	74.1%
Abdominal distension	34	63.0%
Abdominal mass	3	5.6%
Blood with stools	3	5.6%

Duration of symptoms before admission:

The duration of symptoms before admission was 1-2 days in 38.9%, 3-5 days in 37%, and more than 5 days in 24.1%.

How the diagnosis was reached?

The diagnosis was achieved clinicaly, radiologicaly and rectal biopsy for Hirschsprung's disease in percentages of 51.9%, 25.9% and 12.9%, respectively. and intra-operative diagnosis was done in a small (9.3%) of cases, **(Table 3).**

Table 3: Imaging modalities used:

Imaging modality	Frequency	Percent
Plain abdominal x-ray	01	1.9
Contrast abdominal x-ray	04	7.4
Ultrasound abdomen	07	13.0
No	40	74.1
Two modalities	02	3.7
Total	**54**	**100.0**

Pattern of intestinal obstruction:

The three commonest diagnoses were Hirschsprung's disease (37%), anorectal malformations (22.2%) and Intussusception (18.5%). malrotation, obstructed herniae , bowel atresia and others, **(Table 4)**.

The vast majority of these diagnoses showed male predominance, **(Table 5)** and association with age groups, **(Table 6)**.

Table 4: Pattern of intestinal obstruction in the study group:

Diagnosis	Frequency	Percent
Hirschsprung's disease	20	37.0
Anorectal malformation	12	22.2
Intussusception	10	18.5
Malrotation	06	11.1
Obstructed hernia	03	05.6
Multiple	02	03.7
Bowel atresia	01	01.9
Total	**54**	**100.0**

Table 5: Pattern of intestinal obstruction and gender in the study group:

Final diagnosis	Male	Female	Total
HSD[a]	15	5	20
ARM[b]	11	1	12
Intussusception	8	2	10
Malrotation	4	2	6
Bowel atresia	0	1	1
Obstructed hernia	3	0	3
Others	1	1	2
Total	**42**	**12**	**54**

P value 0.000

[a]: Hirschsprung's disease, [b]: Anorectal malformation.

Table 6: Pattern of intestinal obstruction and age groups in study population:

Final diagnosis	Neonate	1-3 months	3-6 months	6-12 months	Total
HSD[a]	9	5	4	2	20
ARM[b]	10	0	1	1	12
Intussusception	0	1	3	6	10
Malrotation	5	0	0	1	6
Bowel atresia	0	0	1	0	1
Obstructed hernia	0	0	1	2	3
Others	2	0	0	0	2
Total	**26**	**6**	**10**	**12**	**54**

P value 0.143

[a]: Hirschsprung's disease, [b]: Anorectal malformation.

Types of operations:

Operations were colostomy (with done or planned pull-through) 50%, Ladd procedure 13%, resection-anastomosis 11.1%, reduction of intussusceptions 7.4%, reduction of obstruction 5.6%, others11.1% and anal transposition1.9% **(Table 7)**.

Table 7: Surgical procedures done for the study population:

Surgical procedure	Frequency	Percent
Colostomy	27	50.0
Ladd's procedure	7	13.0
Resection and anastomosis	6	11.1
Combined surgeries	5	9.3
Reduction of intussusception	4	7.4
Reduction of obstruction	3	5.6
Anal transposition	1	1.9
Other	1	1.9
Total	**54**	**100.0**

Outcome of surgery in the study group:

There was uneventful post-operative outcome in 32 patients (59%), complications occurred for 16 patients (29.6%) while 6 patients (11.1%) died.

Post-operative complications:

Complications occurred in 16 (29.6%) of our patients. The complications were stoma complications in six patients (11.1%), wound infection in three patients (5.6%), intestinal obstruction in three patients (3.7%), hernia formation in one (1.9%) and multiple complications in four patients (7.4%).

Mortality:

Six patients (11.1%) died. 83.3%of this mortality happened in neonates, **(Table 8).**

Table 8: Mortality in the study population

No	Age	Gender	Diagnosis	Type of surgery	Cause of death
1	2 months	Male	Malrotation	Ladd procedure	Enterocolitis
2	Neonate	Female	Malrotation	Ladd procedure	Enterocolitis
3	Neonate	Male	Malrotation	Ladd procedure	Sepsis
4	Neonate	Male	ARM[a]	Colostomy	Hypothermia
5	Neonate	Female	HD[b]	Colostomy	Pneumonia
6	Neonate	Male	HD	Colostomy	Sepsis

[a]: Anorectal malformation, [b]: Hirschsprung's disease.

Table 8: Mortality in the study population

No	Age	Gender	Diagnosis	Type of surgery	Cause of death
1	2 months	Male	Malrotation	Ladd procedure	Enterocolitis
2	Neonate	Female	Malrotation	Ladd procedure	Enterocolitis
3	Neonate	Male	Malrotation	Ladd procedure	Sepsis
4	Neonate	Male	ARM[a]	Colostomy	Hypothermia
5	Neonate	Female	HD[b]	Colostomy	Pneumonia
6	Neonate	Male	HD	Colostomy	Sepsis

[a]: Anorectal malformation, [b]: Hirschsprung's disease.

Number of admissions:

Regarding the number of admissions, 40.7% of the patients were admitted once, 46.3% were admitted two to four times, and 13% more than four times.

Length of hospital stay:

Regarding the sum of duration of hospital stay(sum of days of different admissions), 9.2% of the patients stayed in the hospital for 1 to 4, 50% stayed for 5 to 15 days, 24.1% stayed for 16 to 30 days, 16.7% stayed for 1 to 4 days and 9.3% stayed for more than 30

days. In relation to the diagnosis, 80% of patients who stayed more than 30 days had HSD, 80% of cases of intussuscuption stayed less than 2 weeks, 2/3 of cases of obstructed hernias discharged in not more than 4 days, 3/4 of cases of anorectal malformation stayed less than 2 weeks and 2/3 of cases of malrotation stayed also for 2 weeks **(Figure 9)**.

Table 9: Final diagnosis and Duration of hospital stay:

Final diagnosis	1-4 days	5-15 days	16-30 days	more than 30 days	total
HSD[a]	1	8	7	4	20
ARM[b]	1	8	2	1	12
Intussusception	3	6	1	0	10
Malrotation	1	3	2	0	6
Bowel atresia	0	1	0	0	1
Obstructed hernia	2	1	0	0	3
multiple	1	0	1	0	2
Total	**9**	**27**	**13**	**5**	**54**

P value 0.296

[a]: Hirschsprung's disease, [b]: Anorectal malformation.

DISCUSSION

Intestinal obstruction is a common pediatric surgical emergency. In Sudan, in a study about the load of intestinal obstruction in pediatric surgery unit, Mahmoud T.N *et al*[4] showed that 31.5% of patients admitted to the pediatric emergency unit in Khartoum teaching hospital were admitted by a diagnosis of intestinal obstruction. Ogundoyin O.O *et al*[2] reported that about 60% of admissions in emergency pediatric surgical unit in a tertiary hospital in Nigeria were aged less than one year. Uba AF *et al*[5]also reported similar results. That is why it is reasonable to conduct studies in this age group.In this study, 54 patients were fulfilled the inclusion criteria for this study.

Age groups of the study population:

When divided the study population into four age groups, the neonates were the most common age group as they comprised 48.1% of patients, this percentage is more than what we found in studies conducted in Africa, Ogundoyin O.O *et al* [2] reported that 30% of cases of infancy intestinal obstruction were neonates. the next age group in terms of frequency is group aged 6-12 months which scored 22.2%, followed by the group aged 3-6 months 18.5%, and finally the group aged 1-3 months 11.1% **(Figure 1)**.

Clinical features:

The presenting features are absent anal orifice, delayed passage of meconium, abdominal distension, irritability, abdominal mass, blood with stools and constipation, either as single or combined. These features are identical to those found in most reviews [1, 2, 3, 5].

Methods of diagnosis:

Diagnosis was achieved in only clinically in 51.9% of cases (n=28), radiological modalities helped in the diagnosis in 25.9 % of cases (n=14), Rectal biopsy confirmed the diagnosis of HD in 24% of cases (n=13), while the diagnosis was reached after laparotomy in % of cases.

Frequency of different diagnoses:

The most frequent cases are those of HD followed by ARM, 37% and 22.3%, respectively. Abdel-wahab N *et al* [6] reported in their study that the majority of neonatal intestinal obstruction is due to ARM followed by HD, this difference in our study is probably that only about one third of cases of HD present after the neonatal period El-Tayeb SA *etal* [7], while the majority of cases of ARM present in the first weekAli A.J *et al* [8].Intussusception was the cause in 18.5% of cases (n=10), this percentage is less than what we found in other studies, Soomro BA *et al*[3] reported that intussusception is the leading cause of infancy obstruction in a university hospital in Pakistan with a percentage of 26.9%. malrotation in 11.1%% (n=6), obstructed hernia 5.6% (n=3), and bowel atresia1.9 % (n=1).

Surgical procedures:

Fifty percent of the patients underwent temporary colostomy with done or planned pull-through (staged procedure), and these are all the cases of HSD and some of the cases of ARM, the procedure of choice for HSD is pull-through [10, 12].

The surgical management offered to the study population was according to the standard international operations, except that patients of intussusceptions didn't receive the management by pneumatic or hydrostatic reduction methods[(12)] because of lack of facilities in the hospital, if these facilities were available, they might decrease the rate of open surgical reduction, **(Table 5)**.

Past medical and family history:

Concomitant disease was present in 13% (n=7) of the patients. these diseases are tuberculosis, congenital rubella, congenital heart disease, talipesequinovarus and pyloric stenosis. Family history of intestinal obstruction in the first year was positive in one patient, but no data about the diagnosis and this number is not significant in this study.

These associations are not found to be significant in this study or other similar ones [1, 3 ,5].

Association between gender and diagnoses:

Of these 54 patients, 77.8% (n=42) were males while 22.2% (n=12) were females, this male predominance was present in all diseases, except that the only one patient that was diagnosed as bowel atresia was female, but the (one) number cannot be used for comparison. Male predominance was mostly obvious in cases of ARM where 91.7% of them were males, this percentage is higher than what was found in the literature [34]. Regarding patients of HSD, 75% of them were males and this is comparable with a study conducted by Mohammed Y.Agab *et al*[9], where they found that in a sample size of 71 patients underwent pull-through for HSD, 75% (n=53) of them were males.

The same applies for patients of intussusception [10] where the male percentage was 80%,this figure is identical to that written by Saifeddin M.A *et al* [10], and they found that 77.8% of pediatric patients underwent surgery for intussusceptions were males, but some studies showed no sex predominance like Soomro BA *et al* [3]. For malrotation, the percentage was 67%, this is keeping with the literature but higher percentages are reported by Nasir A *et al*[11]. All of cases (n=3) of obstructed herniae were males but this can be justified by the fact that inguinal and umbilical herniae are much more common in males**(Table 5)**.

Association between age and specific types of intestinal obstruction:

The highest association between age group and diagnosis was noted in patients of ARM where 83.3% (n=10) of them were neonates, this is going with most of our literature reviews [2, 33, 34].the second most frequent diagnosis in neonates was HSD, where 45% of them (n=9) were neonates and the percentage is decreasing as the age group increases, this also is the case with local and regional studies [2, 34, 35]. The third association is noted in patients of intussusceptions as 90% of them presented after age of three months, 60% being aged 6-12 months. it is the most common cause of intestinal obstruction in infants above one month and this is comparable with Sirajudduh S*et al*[1]which reported that intussusceptions is the most frequent cause for intestinal obstructoin above one month, Soomro BA *et al* [3] showed that the peak age of intussusceptions is in the infancy period and it is the most common non-congenital cause in this period. Fine out of six patients of malrotation (83.3%) were neonates, also it is compatible with the reviews [11]. The only one case of bowel atresia was presented at age of two months , this contrasts to the usual presentation of such patients in the first week of age [12].(**Table 6)**.

Outcome of management:

Uneventful post-operative course occurred in 59.3% (n=32), 11.1% (n=6) patients died and 29.6% (n=16) developed post-operative complications.

Post-operative complications:

These occurred in 29.6% (n=16) of our patients. These were stoma complications11.1% (n=6), wound infection 5.6% (n=3), intestinal obstruction 3.7% (n=3), hernia formation 1.9% (n=1) and multiple complications 7.4% (n=4). Colostomy complications were the most frequent because half of our patients underwent colostomy.

Number of admissions:

Regarding the number of admissions, 40.7% of the patients were admitted once, 46.3% were admitted two to four times, and 13% more than four times**,** this means that 59.3% of cases were re-admitted and reflects morbidity of infancy intestinal obstruction.

Duration of hospital stay:

Sum of the days of hospital stay was in the peak of 5_15 days 50% (n=27), while 24% (n=13) of patients stayed for 16_30 days, 16.7% (n=9) stayed for 1_4 days and 9.3% (n=5) of them stayed more than 30 days. Of the five patients that stayed for more than 30 days, four cases were HSD while one was ARM, this reflects the considerable mobidity associated in part with the neonates and in part with these two diagnoses [1, 2, 3].**(Table 9)**.

Mortality:

Six patients died, 83.3% were neonates and 50% of them were diagnosed as cases of malrotation, this high mortality in malrotation cases is keeping with Abdel-wahab N et al [6] study about neonatal IO, in which malrotation was number one association between diagnosis and mortality,**(Table 8)**.

CONLUSION

The pattern of presentation and outcome of management in our study group is comparable with most of the local and regional studies, but the small sample size may not be sufficient to reflect the entire problem.

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