

Intestinal obstruction in older children in Komfo Anokye Teaching Hospital: a tertiary referral centre in Kumasi, Ghana

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Background Childhood intestinal obstruction can either be congenital or acquired and both types result in high morbidity and mortality in developing countries, mainly as a result of late presentation and diagnosis.

Patients and methods From January 2007 to December 2010, a retrospective analysis of all older children with intestinal obstruction admitted to Komfo Anokye Teaching Hospital (Kumasi, Ghana) was carried out. This was to establish the causes of intestinal obstruction and to determine its morbidity and mortality among the children studied.

Results There were 98 children who were treated with a diagnosis of intestinal obstruction during the period. The mean age of the children, in months, was 34.7 ± 5.0 SEM (range 3–180, median age 10 months), with a male : female ratio of 1.5 : 1. About 70.6% of the children were admitted with acquired causes of intestinal obstruction and 29.4% with congenital causes of intestinal obstruction. In all, 21.2% of the children, treated for intestinal obstruction, underwent bowel resection as a result of nonviability of a segment of the intestine; the majority of the bowel resections were performed in the intussusception group.

The mean length of hospital stay, in days, was 8.2 ± 5.7 . There were 15 children (15.3%) with various postoperative complications, mainly surgical site infections; the mortality rate was 11.2%. Here again, most of the deaths occurred in the intussusception group of children.

Conclusion Intestinal obstruction is a serious emergency in children and must be diagnosed early and treated promptly to avoid high morbidity and unnecessary deaths among children in our subregion. *Ann Pediatr Surg* 11:7–12 © 2015 Annals of Pediatric Surgery.

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Introduction

Intestinal obstruction is a major cause of morbidity and mortality in children in the developing countries. Surgical complication rates are quoted to be as high as 61.0% in some instances and as low as 15.0% in others in the developing world [1–4]. Mortality is high in our subregion with respect to childhood intestinal obstruction. This is mainly because parents, as a result of ignorance and poverty [5,6], spend time seeking alternative therapies and as a consequence delay sending their children to a hospital for medical attention when they develop abdominal pain with inability to pass stool for more than 48 h. Besides this, there are also instances when the parents report early to hospital with their children, but medical personnel in the peripheral district/regional hospitals are unable to make the correct diagnosis on time and thus end up mismanaging the patient, with a resultant delay in referring the child for diagnosis and expert management in a higher and better equipped referral centre. The aim of this study was to determine the aetiologies of intestinal obstruction in older children in our hospital, examine the outcome of intestinal obstruction in these children and note whether it is representative of the trend prevalent in the subregion in general.

Patients and methods

A retrospective descriptive study of children, with a diagnosis of intestinal obstruction, admitted through the Accident and Emergency Department of the Komfo Anokye Teaching Hospital from January, 2007 to December, 2010, was carried out. The case files of the children were analysed for age, sex, common presenting symptoms, intraoperative findings/postoperative diagnosis, complications of the surgery and outcome. The data were analysed using the statistical package for social sciences version 16.0 for Windows (SPSS Inc. Released 2007; Chicago, Illinois, USA). Continuous data were expressed as mean \pm SEM or mean \pm SD and also as the median value in months. *P*-value was considered significant if it was less than or equal to 0.05 ($P \leq 0.05$). The study did not need the approval of the institutional review board of the institution as it was a retrospective study based on analysis of retrieved archived folders/files of patients.

Results

In all, 98 folders with complete records were retrieved for the 4-year period, beginning from January, 2007 to December, 2010, and the relevant information was

extracted and subjected to analysis. The mean age of the patients in months was 34.7 ± 5.0 months (range: 3–180 months, with a mode of 5 months and median age of 10 months). There were 59 males and 39 females – a male:female ratio of 1.5:1 (Table 1). The most common presenting symptom was abdominal pain (99.0%), followed by vomiting (93.9%) and abdominal distension (90.9%). Constipation was observed in only 32.3% and diarrhoea in 12.2% of children. The intraoperative findings/postoperative diagnosis included intussusception (68.4%), adhesions (11.2%), congenital aganglionosis (9.2%) and anorectal malformations (ARM) (8.2%) (Table 2). All the children with adhesion intestinal obstruction, except one, had undergone a previous abdominal surgery (a laparotomy) before the occurrence of bowel obstruction.

Of the 67 children with various types of intussusception (41 boys and 26 girls, median age of 7 months, male:female ratio 1.6:1), 26 (13 males and 13 females) were subjected to nonoperative management (NOM) in the form of pneumatic reduction of the intussusception after resuscitation. In 17 children (seven males and 10 females), had pneumatic reduction of the intussusception was successful and in six males and three females, the nonoperative reduction of the intussusception failed, and therefore they had to undergo open reduction through laparotomy. The intussusception in these nine children was reduced successfully during laparotomy without the need for bowel resection. Of the remaining 41 children with intussusception who were resuscitated and subjected to a celiotomy without first undergoing trial pneumatic reduction, 15 had various lengths of bowel resected as a result of either gangrene or irreducibility of the involved segment of intestine; of these, two children died. The average length of bowel resected (in cm) was 12.6 ± 8.5 (range 4–30 cm) in the children with intussusception. Both morbidity and mortality were high in the intussusception group of patients, being 10.2% each. It should be noted that none of the children who underwent pneumatic reduction of their intussusceptions had postprocedure complications or died. The average length of hospital stay (LOHS) was 6.7 ± 4.3 days (range: 1–23 days; mode of 4 days).

Intestinal obstruction secondary to adhesions was diagnosed in 11 children (11.2%). The mean age of this group of children was 108.7 ± 56.5 months (median age 121 months). From the histories it was found that the average period of illness before reporting to hospital was 3.5 ± 1.2 days (range: 3–6 days; mode 3 days). Resuscitation of these children (intravenous fluids, nasogastric decom-

pression of the stomach, antibiotics and analgesics) was for an average of 39.9 ± 35.8 h. Of the 11 children with intestinal obstruction because of an adhesive band or adhesions, nine had undergone a previous laparotomy, one had undergone a previous groin surgery for an inguinal hernia and the last, a 4-year-old boy, had not undergone any previous abdominal operation, but during surgery for the present condition, an adhesive band was found to have caused necrosis of the terminal ileum requiring a right hemicolectomy. Three children were managed nonoperatively for an average of 72 h; this failed in all children and two were operated because their general condition did not improve. The third child died 72 h after NOM. In the history, this child had undergone a laparotomy for typhoid ileal perforation. At first, he seemed to be responding to the NOM, with an improvement in his condition, but suddenly his condition deteriorated and he died on the third day of NOM. Post-mortem examination showed the cause of the obstruction to be adhesive bands obstructing the small intestine, resulting in it becoming gangrenous. Of the remaining 10 children (including the two who failed NOM), five were subjected to laparotomy with adhesiolysis performed; the other five were subjected to laparotomy with segmental resection of the small bowel with anastomosis (four) and a right hemicolectomy was carried out in one child (the one already presented above). Hence, bowel resection was performed in 50% of children with adhesive intestinal obstruction. The average length of bowel resected was 24.8 ± 23.8 cm (range: 4–65 cm). The average LOHS was 7.3 ± 3.2 days (range: 3–13 days). Morbidity was low in this group, with one child having surgical site infection postoperatively. There was one death in this group of patients.

The nine children (eight boys, one girl) with Hirschsprung's disease (HD) had a mean age of 50.4 ± 56.8 months (range: 5–180 months; median age: 24 months). All the children were resuscitated and hypertonic saline enemas were administered to relieve the intestinal obstruction. Five boys, in who histopathological confirmation of HD was made later, underwent transanal endorectal pull-through; the remaining three boys and one girl underwent full-thickness rectal biopsies and were discharged home. The biopsies confirmed the diagnosis of HD in these children and they were also eventually operated using the transanal endorectal pull-through procedure. One child in this group had surgical site infection. The average LOHS for this group was 11.4 ± 7.5 days (range: 3–25 days). There were no deaths in this group of patients.

ARM were the cause of intestinal obstruction in one boy and seven girls. The average age of the children with ARM was 21.6 ± 13.7 months (range: 9–48 months; median age: 14.5 months). All the girls had ARM with rectovestibular fistulae and the boy had an ectopic anus. All eight children were subjected to divided sigmoid colostomies after resuscitation and have since undergone successful definitive surgery – posterior sagittal anorectoplasty – at various periods after the creation of the colostomies. The postoperative complication in this

Table 1 Distribution of children by age groups (N=98)

Age group of children (months)	Males	Females	Total [n (%)]
3–12	36	22	58 (59.2)
13–60	10	12	22 (22.5)
61–120	4	3	7 (7.1)
121–180	9	2	11 (11.2)
Total	59	39	98 (100.0)

Table 2 Final diagnosis, postoperative complications and morbidity observed in older children with intestinal obstruction presenting to hospital for management (*N*=98)

Diagnosis	Male	Female	Total [<i>n</i> (%)]	Number of children with postoperative complications [<i>n</i> (%)]	Deaths [<i>n</i> (%)]
Adhesive intestinal obstruction	8	3	11 (11.2)	1 (1.0)	1 (1.0)
Volvulus	1	0	1 (1.0)	–	0 (0.0)
Intussusception	41	26	67 (68.4)	10 (10.2)	10 (10.2)
Ileoileal	5	4	9 (9.2)	–	–
Ileocolic	20	12	32 (32.7)	6 (6.1)	7 (7.1)
Caecocolic	5	2	7 (7.1)	2 (2.1)	1 (1.0)
Colocolic	6	1	7 (7.1)	2 (2.1)	2 (2.1)
Type not stated	5	7	12 (12.2)	–	–
Anorectal malformation	1	7	8 (8.2)	2 (2.1)	0 (0.0)
Hirschsprung's disease	8	1	9 (9.2)	1 (1.0)	0 (0.0)
Gastric duplication	0	1	1 (1.0)	1 (1.0)	0 (0.0)
Small bowel duplication cyst	0	1	1 (1.0)	–	0 (0.0)
Total	59	39	98 (100.0)	15 (15.3)	11 (11.2)

group of children was superficial surgical site infection in two; the average LOHS was 17.2 ± 5.2 days.

Rare conditions in our study included midgut malrotation with small bowel volvulus, gastric and small bowel duplications. These presented with signs of intestinal obstruction, but the actual diagnoses were made intraoperatively.

A total of 21 children (21.2%) in this study underwent a resection of one segment of intestine or the other as a result of nonviability/gangrene or irreducibility of the segment of bowel involved in the obstruction. This occurred in 15 children (15.2%) with intussusception, five (5.1%) with adhesive intestinal obstruction and one (1.0%) with small bowel volvulus. The mean length of bowel resected in this group of patients was 16.8 ± 14.7 cm (range of 4–65 cm).

The average LOHS, in days, for this study group of children, admitted and treated with intestinal obstruction, was 8.2 ± 5.7 (range 1–28 days). The mean number of days spent in hospital before discharge was longer for ARM (17.7 ± 5.0 days) and shorter for intussusception (6.7 ± 4.3 days) ($P < 0.05$). Morbidity was as high as 15.3% and consisted mainly of superficial (6.1%) and deep (3.1%) surgical site infections, bleeding in the wound (2.0%) and others, not specifically stated in the notes (3.1%). The children with the most morbidity were those with various kinds of intussusception. Thus, surgical site infection was the main cause of morbidity in over 64.3% of the cases that developed postoperative complications. Mortality was 11.2% among the children with intestinal obstruction (eight males and three females). Over 90.9% of the deaths occurred in the intussusception group (Table 2).

Discussion

Intestinal obstruction in children is a common cause of emergency surgical procedures in our subregion. The causes of intestinal obstruction in older children can either be acquired or congenital. These causes of bowel obstruction in older children are often different from those causing intestinal obstruction in the newborn child [1,7,8]. The acquired conditions that cause intestinal obstruction in older children include adhesive intestinal obstruction, intussusception, inflammatory

conditions such as acute appendicitis that result in intestinal obstruction, worm impaction, hypertrophic pyloric stenosis and ingested foreign bodies [1,2,8–13]. Congenital causes of intestinal obstruction in older children include malrotation of the bowel that may eventually result in a volvulus, ARM, HD, bowel duplication, Meckel's diverticulum, congenital hernias and abdominal bands [1,2,9,14]. In neonates, ARM is the most common cause of intestinal obstruction in our subregion and the developing world [3,7,15–17], unlike in the older children in whom intussusception is considered the most common cause of intestinal obstruction [1,4,6,9,18,19], with significant morbidity [14,20]. In the present study, the aetiological pattern of intestinal obstruction in older children is in agreement with that of other studies of its nature [1,2,10,13,14,21,22], with intussusception being the most common cause of intestinal obstruction in our children as in other studies [14,22–24]. The treatment of intussusception after meticulous resuscitation is either nonoperative (hydrostatic/barium enema reduction, or pneumatic reduction, which is recommended by many paediatric surgeons and radiologists) [18,20,25–31] or open surgery, with manual reduction and resection of various lengths of gangrenous or irreducible segments of bowel if present [14,18,20,26,27,29,32–36], or laparoscopic reduction (also with resection of the bowel if required) [35–38]. In our children, pneumatic or air enema reduction was carried out successfully in 65.4% of the patients with intussusception who underwent NOM. This success rate has also been reported by others in our subregion [29], but this is lower than what most centres achieve [30,31,39,40]. This was mainly because the children with intussusception reported late to our hospital, a finding noted by others [6,19,22,32]. Such children are sometimes treated for dysentery, diarrhoea and vomiting before being referred to the surgeon for expert advice when everything else has failed. As a result, a high percentage (22.4%) of the children in our study with this condition were subjected to bowel resection as a consequence of irreducibility of the intussusceptum or frank gangrenous intestine. This compares favourably with the 39.3% resection rate reported in the article by Carneiro *et al.* [32]. The resection rate in other studies in our subregion and other developing countries varies from 41.4 to 79.0% [6,19,26,41]. Morbidity was the highest in

this group of patients, confirmed to be the case in children with intussusception in work carried out by others [6,25]. Also in this group of patients, mortality was high compared with the other conditions studied. Mortality was as high as 10.2%, which is comparable with work carried out by others on patients with intussusception. The mortality rate for children with intussusception ranges from 8.1 to 25.0% as found in the literature [6,19,26,32].

Adhesions were the second most common aetiological cause of intestinal obstruction in our children. This is in agreement with the findings of Shiekh *et al.* [2], who found adhesions to be the second most common cause of intestinal obstruction in their children. However, in contrast to our study, ascariasis was the leading cause of intestinal obstruction in their children [2]. Ten of our children had undergone a previous surgery for an abdominal condition, mainly acute peritonitis of various origins (e.g. typhoid ileal perforations) in nine children and a groin hernia repair in one child. NOM was unsuccessful in three of our patients, but we still believe that NOM should be attempted first in children with postoperative adhesive intestinal obstruction who are haemodynamically stable (and with no signs of bowel strangulation) on admission for at least 24–48 h and, if there is no improvement in their general condition, then they should undergo surgery. This position is also ascribed to by Lautz *et al.* [42], who add that a delay beyond 48 h increases the risk of small bowel resection by about two-fold. Although we were unsuccessful in managing any of our children in this series nonoperatively, we still advocate NOM for children reporting early to hospital with intestinal obstruction because of adhesions as the world literature includes many examples of successful NOM of children with this condition [43–46]. As already stated above, this was carried out in three of our patients; unfortunately one of them, who we believed was improving, died suddenly. Post-mortem indicated massive adhesions of the small bowel, resulting in intestinal obstruction. NOM of intestinal obstruction secondary to adhesions (which involves the passage of a nasogastric tube to decompress the gastrointestinal tract, use of intravenous fluids, antibiotics and analgesics and finally, correction of electrolyte imbalances) [43,44] was also carried out by other workers in the subregion and other developing countries, also without any or much success [7,47]. According to Eeson *et al.* [44], more than 85% of patients with adhesive intestinal obstruction do not respond to NOM and eventually would require a surgical intervention. Where features of strangulation are ascertained on admission, the child should be well resuscitated and relaparotomy should be performed immediately to relieve the strangulation [45,47]. The resection rate for our children who underwent laparotomy for adhesions was 50% (five out of 10). Compared with other series with resection rates ranging from 13.0 to 44.0% [42–44,48,49], the resection rate in our patients with adhesive intestinal obstruction was rather high. A similar high resection rate was also noted by Abdelkader *et al.* [45], five children undergoing resection of the bowel out of eight patients. We believe that the very high resection rate in our

children was mainly because of late reporting to the hospital by parents with their children (an average of 3.5 days after the occurrence of symptoms) and delay in making the right diagnosis in the hospital and performing the required emergency surgery on time, a finding similar to other reports [44,47,49]. We, therefore, advocate early surgery after resuscitation for older children whose symptoms of intestinal obstruction secondary to adhesions have been present for 3 days or more. Those children who come early, 48 h or less, and are haemodynamically stable can undergo trial NOM of their adhesive intestinal obstruction, and if there is no improvement after 24–48 h (which involves an increase in the quality and quantity of nasogastric tube drainage, tachycardia, fever, intensification of localizing abdominal signs and increase in the number of air-fluid levels on a repeat plain abdominal radiograph) [43], then, considering the possibility of the bowel becoming nonviable, a laparotomy should be performed without further delay to relieve the obstruction to avoid increasing the potential risk of bowel loss. This method of management is supported by others in the literature [42,44].

HD is most often a neonatal condition and all attempts should be made to diagnose it early. Unfortunately, most women in our subregion still deliver at home and hence attempt all sorts of therapies when the child does not pass meconium within the first 24–72 h; only when these therapies fail do they go to the nearest health centre for advice. Unfortunately, late presentation of HD with signs of acute intestinal obstruction is a common occurrence in developing countries as reported by others [13,50]; sadly, many of the workers in our health centres are not familiar with this condition and will usually advise mothers to use all kinds of fluids/herbs to perform enemas and that the condition will ‘disappear’ as the children grow. This, unfortunately, never happens and that is when the parents/guardians finally bring the children to hospital for expert help. From our results, none of these children were seen at the neonatal age with their conditions. The youngest was 5 months old. In our hospital, the diagnosis is usually confirmed by full-thickness rectal biopsy; we do not have facilities for suction rectal biopsy.

ARM were the next major cause of intestinal obstruction in older children in our hospital. This is rather unexpected because this condition should actually be diagnosed in the neonatal period; it is, however, not surprising that all the patients were girls (except for one boy, in whom the diagnosis was made at 36 months of age) in whom rectovestibular fistulae could easily be mistaken for a normal anus by the unwary and uninitiated traditional birth attendant or the health worker in the rural clinic/health centre. The youngest in this group to be diagnosed with ARM was 9 months old, an age at which an adult diet is routinely provided to children in our subregion, resulting in hardening of the stools, intractable constipation, straining and crying at defaecation, thus forcing the parents to seek medical help in a specialist hospital.

Other rare causes of intestinal obstruction in older children in our study included midgut malrotation with

volvulus of the small intestines, gastric and terminal ileum duplications. The number of these conditions treated in our study is not sufficient enough for us to meaningfully discuss their clinical presentation and management, except to state that preoperative diagnosis in all these instances was difficult and was only made intraoperatively. One needs to have a high index of suspicion [51,52] to make a preoperative diagnosis of such rare conditions in older children.

This study has added to our knowledge of the range of causes of intestinal obstruction in older children from Ghana in particular and the subregion in general; we know that such childhood conditions are usually hidden in adult manuscripts [5,49,53,54] and hence the true picture of such childhood diseases is not readily available. This paper also provides evidence that the conditions that cause intestinal obstruction in children in Ghana are no different from those in other parts of the world. The only major differences are that morbidity and mortality are still high in our subregion and the developing world as confirmed by others [1,2,4,55] because of late reporting or presentation to hospital, ignorance and poverty [2,4,5,33,41,56].

The limitation of the study is our inability to include children younger than 3 months of age in our analysis. Folders of the under 3-month-old children are archived in the Child Health Department, a separate entity from the Surgery Department; these babies are also not admitted through the Accident and Emergency Department as the others are, hence our inability in retrieving and analysing the folders.

Conclusion

The causes of intestinal obstruction in children in our hospital are no different from those in the subregion and need to be diagnosed as early as possible once admitted to hospital. Early diagnosis and management will improve morbidity and mortality, which are still high in our subregion. Specifically, early diagnosis is required in intussusception and adhesive intestinal obstruction as these are usually strangulation-obstruction type of intestinal obstruction that quickly results in decompensation of the normal physiological processes in these children and can lead to high mortality, as evidenced in our cases of intussusceptions.

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Conflicts of interest

There are no conflicts of interest.

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