

## Surgical Abdomen in School Age Children: A Prospective Review From Two Centers In South-Western Nigeria.

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**Background:** *Surgical abdomen traverses all age groups. We sought to define the aetiology, patients' characteristics, and outcome of management amongst children*

**Methods:** *Two years prospective review of patients aged 5-15 years managed for surgical abdomen at the Wesley Guilds Hospital Ilesa and Mishmael Medical Centre Akure*

**Results:** *Fifty two patients were treated. The male: female ratio was 1:1. The age range was 5years to 15years (mean=11.25 ±2.24years). Mean duration of illness was 29.5hours (range 2-72hours). Gut perforation was the most common aetiology (n=39; 75%); with perforations due to infections most prevalent (n= 34; 87.2%). Ten cases (19.2%) were trauma related and showed male predominance. Obstructed gut accounted for 15.4% (n=8) of cases; and showed female predominance. Five out of the eight small bowel obstructions (62.5%) were due to post operation adhesions. Pre-operative and post-operative diagnoses were congruent in 90.4% (n=47) of cases. Major post-operative complications were surgical site infection (20; 38.5%), and pneumonia (5; 9.6%). The average hospital stay was 9days (range 4-21days). Mortality rate was 1.9% (n=1).*

**Conclusion:** *Acute abdomen requiring surgical intervention is mainly infective origin. The male child is more at risk of abdominal trauma while gut obstruction was more common in females.*

**Keywords:** Surgical, Abdomen, Children, Emergency.

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### Introduction

Acute abdomen is a clinical condition characterized by abdominal pain of short duration, with rapid onset or progression, requiring prompt attention. Pain is the predominant symptom in patients with acute abdomen. The aetiology of this acute abdominal emergency is numerous and includes traumatic, infectious and inflammatory conditions<sup>1</sup>. Of importance is the need for a quick decision on whether it is a surgical abdomen (i.e. requiring an operation) or whether it can be managed by non-surgical means.

Surgical abdomen has a worldwide distribution and transverses all age groups. They make up a considerable number of emergency surgeries and account for a significant part of paediatric surgery admission<sup>2, 3</sup> and a surgeon's practice. It is therefore very important for the surgeon to have an understanding and be familiar with the presentations of common diseases that cause abdominal pain<sup>4, 5</sup>. The morbidity and mortality associated with surgical abdominal conditions can be enormous<sup>6,7</sup>. This is particularly true in children who may have atypical modes of presentation. Moreover, there may be a delay in presentation causing most patients to present with complications. These often make surgical intervention challenging with varying outcomes of management. Differing patterns of presentation and outcome of management have been reported in parts of the country especially in children in the neonatal and preschool ages, and these have highlighted some of the challenges in the management of these patients<sup>2, 3, 7, 8</sup>. This study aims to evaluate the pattern of surgical abdomen and outcome of intervention among children aged 5-15 years managed in our centers. We sought to determine if there is any variation in disease pattern amongst the age groups and gender studied and to ascertain the most common cause of surgical abdomen in our clients.

### Patients and Methods

This was a descriptive prospective study conducted at the Wesley Guild Hospital Unit of the Obafemi Awolowo University Teaching Hospitals Complex Ile Ife Osun State and Mishmael Medical Centre: a private hospital in Akure, Ondo State; all in South-West Nigeria. Both hospitals are about 65 kilometers apart. The period of study was between September 1, 2011 and August 31, 2013. The surgeries were

carried out by the General Surgery service of the hospitals, and the surgeon was not below the rank of a specialist senior registrar.

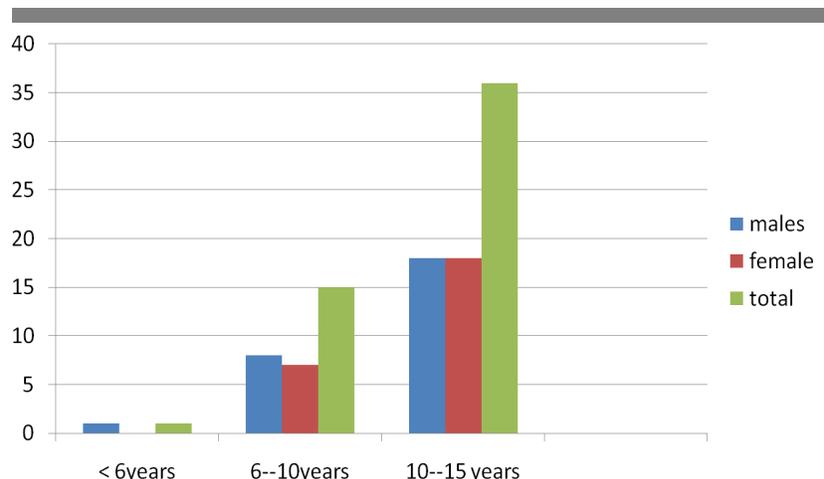
Consecutive patients whose ages were between 5years and 15years with acute abdomen that required surgical intervention (surgical abdomen) were recruited into the study. All patients had clinical evaluation with ancillary laboratory and radiological investigations to obtain a pre-operative diagnosis. Patients with acute abdomen who have clinical features of intestinal obstruction, peritonitis, and those who had trauma with abdominal distension associated with progressive tachycardia, hypotension and fall in haematocrit were classified as having a surgical abdomen and were recruited. Patients below five years and those who may require intensive care services were excluded from the study. Intra-operative findings were used to determine the final diagnosis which was then compared with the pre-operative diagnosis for congruency. During the study period, both centres did not have facilities for routine evaluation of C-reactive protein, serum amylase values and/ or abdominal computerized tomography in patients with surgical abdomen. Hence these investigations were not done.

All patients were adequately resuscitated with correction of fluid and electrolyte deficit where necessary. All the patients, where necessary, had nasogastric tube to decompress the stomach, urethral catheterization to monitor adequacy of fluid management, antibiotics (cefuroxime/ceftriaxone plus metronidazole and gentamycin) and analgesics (paracetamol and/or pentazocine). Surgical wounds, where indicated, were irrigated with copious saline, especially in those following surgical sepsis, before primary wound closure was done. Superficial surgical site infections were managed with removal of stitches, daily wound dressing with honey and antibiotics in those with systemic features of infection. Data on age, gender, duration of illness at presentation, pre-operative and post-operative diagnosis, post-operative complications and survival were entered into a spreadsheet. Data analysis was done using SPSS version 20 for averages, frequencies and simple percentages.

**Results**

A total of 52 patients had surgical intervention for acute abdomen during the study period. The age range was 5-15 years with a mean age of 11.25 ( $\pm$  2.24) years. There were 27 males and 25 females with a male female ratio of 1:1 (Figure 1). Eighteen (34.6%) patients presented within 24 hours of onset of symptoms, while 19 (36.5%) and 15 (28.8%) presented between 25-48 hours and beyond 48hours respectively.

When the cause of the surgical abdomen was matched with age group and gender, we observed that: intra-abdominal sepsis was more common in children between 10 and 15years (Table 2). Furthermore, trauma occurred more in males (males=8; females=2), while intestinal obstruction was more common in females (females= 6; males=2).



**Figure 1.** Sex and Age distribution

**Table 1.** Congruency of pre-operative and post-operative diagnoses

S/N	Pre-operative diagnosis	Post-operative diagnosis	*Congruency
1	Appendicitis	Perforated typhoid ileitis	Incongruent
2-6	Acute appendicitis (5)	Acute appendicitis (5)	Congruent
7	Perforated appendicitis	Perforated typhoid ileitis	Incongruent
8-15	Perforated appendicitis (8)	Perforated appendicitis (8)	Congruent
16-33	Perforated typhoid (18)	Perforated typhoid ileitis (19)	Congruent
34	Perforated typhoid	Perforated appendix	Incongruent
35-39	Adhesive intestinal obstruction (5)	Adhesive intestinal obstruction (5)	Congruent
40-44	Post-traumatic gut perforation (5)	Traumatic Ileal perforation (5)	Congruent
45	Post-traumatic mesenteric injury	Post-traumatic splenic laceration grade II	Incongruent
46-47	Post-traumatic splenic injury (2)	Ruptured spleen grade IV (2)	Congruent
48	Obstructed right inguinal hernia	Obstructed right inguinal hernia	Congruent
49	Obstructed left inguinal hernia	Strangulated left inguinal hernia	Congruent
50	Post-traumatic mesenteric injury	Liver laceration	Incongruent
51	Small bowel obstruction ?cause	Incomplete midgut volvulus	Congruent
52	Post-traumatic viscera injury	Laceration of the spleen grade III	Congruent

\*congruency rate = 90.4

**Table 2.** Distribution of Post-operative diagnosis amongst divers age group and gender

Patient's characteristics		Post-operative diagnosis									Total (%)
		Sepsis			Trauma			Bowel obstruction			
Sex	Age (yrs)	Ac Ap	Pf Ap	Ty Pf	Sp Lac	Gut pf	L Lac	Gr H	MGV	Ad Io	
Male (27)	<6	0	1	0	0	0	0	0	0	0	1
	6-10	0	1	4	1	1	0	0	0	1	8
	10-15	2	2	7	2	3	1		0	1	18
	Total	2	4	11	3	4	1	0	0	2	27
Female (25)	<6	0	0	0	0	0	0	0	0	0	0
	6-10	0	0	3	0	1	0	0	0	3	7
	10-15	3	5	6	1	0	0	2	1	0	18
	Total	3	5	9	1	1	0	2	1	3	25
Total for Age	<6	0	1	0	0	0	0	0	0	0	1
	6-10	0	1	7	1	2	0	0	0	4	15
	10-15	5	7	13	3	3	1	2	1	1	36
Grand total		5	9	20	4	5	1	2	1	5	52

**KEY:** Ac Ap = Acute appendicitis. Pf Ap = Perforated appendicitis. Ty Pf = Typhoid ileal perforation

Sp lac = Splenic laceration. L Lac = Liver laceration. Gut pf = Gut perforation.

Gr H = Groin Hernia. MGV = Mid-gut volvulus. Ad Io = Adhesive intestinal obstruction

**Table 3.** Post-operative Complications

Aetiology (Frequency )	Post-operative complication					Total
	Atelectasis	Pneumonia	SSI	Abnormal / hypertrophic scar	Incisional hernia	
Perforated appendix (9)	0	0	3	2	0	5
Typhoid ileal perforation (20)	2	4	13	2	2	22
Traumatic gut perforation (5)	1	1	1	1	0	4
Traumatic viscera injury (5)	1	0	0	0	0	1
Intestinal obstruction (8)	0	0	3	1	0	4
<b>Total</b>	4	5	20	6	2	

**Key:** SSI = Surgical site infection

Patients with gut perforation had either simple closure of the perforation, or resection of involved bowel segment and primary end-to-end anastomosis if the perforations were multiple and contiguous. Two of the patients with splenic injury had splenorrhaphy while the remaining two had splenectomy. The patient with hepatic laceration on the right lobe was observed to have stopped bleeding at laparotomy and only drainage of the haemoperitoneum was necessary. The patients with adhesive bowel obstruction had release of the adhesive bands if the bowels were viable, or resection with primary end-to end anastomosis if the bowel segment involved were gangrenous.

The overall post-operative complications rate was 71.2% [n=37]. Surgical site infection (SSI) was the most common complication: occurring in 20 patients (38.2 %) with 13 (65%) of these patients having ileal perforation from typhoid fever. Five patients had pneumonia (9.6%). Other post-operative complications encountered are as shown in Table 3. We recorded one death, giving a mortality rate of 1.9%; this occurred in a patient who presented in shock with blunt abdominal trauma following road traffic accident; and whom intra-operatively was found to have had a shattered spleen and a huge retroperitoneal haematoma. Patients with post-operative complications stayed longer on admission ( $p \leq 0.05$ ) compared to those that did not. Similarly patients with typhoid ileal perforation also had a longer hospital stay. However, duration of illness at presentation, interval between admission and surgery, and admission vital signs did not statistically influence the occurrence of complications ( $p > 0.05$ ).

### Discussion

The seemingly low number of cases managed within the study period could be explained by the presence of other health facilities in the region that could cater for patients with similar condition. In Akure, there is a state-owned specialist hospital, several private hospitals (some manned by specialist surgeons). Furthermore, about 50 km away is a federal medical centre (tertiary hospital) which could cater for children with surgical abdomen. Similarly, Ilesa is about 40km from Ile-Ife where the main hospital unit of out teaching hospital is domicile, and about same distance to Osogbo which also has a university teaching hospital and numerous private hospitals. The lead author is an attending surgeon to the two facilities involved in the study, hence choice of the two centres: howbeit tertiary and private.

Surgical abdomen transverses all paediatric age groups, and the aetiology usually maintain a close relationship with the age group of the patients. Our findings showed that when the aetiology of surgical abdomen was matched with age groups and gender of our patients, the relative frequency of the various causes was consistent with earlier reports was obtained<sup>1-3, 7-11</sup>. Patients below five years were excluded from the study as most of them were referred directly to the specialist paediatrics surgery unit

where better ancillary support [intensive care unit and paediatrics anaesthetists] services were available. This explains the absence of such conditions as intussusceptions, and intestinal atresia and other aetiologies found within this age group<sup>9, 12, 13</sup>. Similarly, patients who may require intensive care services were also referred if they are stable enough to undertake the journey (40-50 km ride).

Majority of our patients were in the second decade of life, a period characterized by increased immune, endocrine and psycho-social activities. In Nigeria, children in this age group are expected to be in primary and secondary schools. Commuting to and from school in places where motorcycles are major means of transport, with poor road infrastructure and impatient drivers/ riders put these children at risk of road traffic injuries. Similarly, the absence of school feeding program encourages the pupils/ students to patronize food vendors which may increase the risk of contracting food and water borne diseases like enteric fever; which was a major cause of surgical abdomen in them<sup>14</sup>.

There was delayed presentation in more than a third of the patients studied. Similar late presentation by patients had been noted by researchers across diverse specialties for different disease states<sup>8- 15</sup>. This delay had been attributed to poverty<sup>16</sup> and the poor health seeking behaviour of the populace<sup>9</sup> which may manifest as self-medication, patronage of unorthodox medical practitioners and quacks before coming to the hospital. The poor drug control policies within the country also encourage procurement of proprietary drugs (like antibiotics and antispasmodics) over the counter. This could alter the temporal profile and mask clinical features of diseases; thus promoting delayed presentation and diagnosis with attendant propensity towards disease complication at presentation. Moreover, patients with surgical abdomen who present late do so in poor physiologic states: with fluid, electrolyte and acid-base imbalance<sup>8- 14</sup>. Similarly, patients with surgical abdomen from trauma could have haemoperitoneum sufficient enough to cause hypovolaemic shock requiring correction. Judicious and expeditious correction of these deficits greatly improves surgical outcome<sup>10, 15-18</sup>.

Good clinical judgment in the preoperative diagnosis of acute abdomen is crucial in the management of surgical abdomen. This helps to minimize the morbidity and mortality especially where the diagnostic facilities are limited<sup>19</sup>. In our study, the pre-operative and post-operative diagnoses were congruent in forty seven patients (90.4%) and we did not record any negative laparotomy. This further underscores the importance of adequate and effective clinical evaluation of patients with acute (surgical) abdomen in order to mitigate negative laparotomy rates<sup>20</sup>.

Typhoid ileal perforation was the singular most common cause of intra-abdominal sepsis among the patients in this study: 51% of patients with intra-abdominal sepsis, and 38.5% of all patients managed for surgical abdomen. It was also more common in the males and in patients within the second decade of life, and still remains a leading cause of acute abdomen in children and young adults in Nigeria<sup>21, 22</sup>.

From this study, small bowel obstruction (SBO) was the least common cause of surgical abdomen. Furthermore the SBO in this study had the girl child preponderance; and in them, adhesive intestinal obstruction was the most common cause. This is in contrast to earlier works which reported obstructed hernias as the most common cause of intestinal obstruction in patients within the age group studied<sup>3, 23</sup>. This paucity of bowel obstruction from groin hernias could be an incidental finding, but most probably a reflection of increasing elective repair of patent processus vaginalis and groin hernia as day case procedures in both institutions. Our study suggests that there may be a changing pattern of intestinal obstruction with increasing incidence of adhesive intestinal obstruction in teenagers and adolescents. There may not be unconnected with sub-acute peritoneal inflammations causing adhesive intestinal obstruction<sup>24</sup>. This is especially true in females who are prone to pelvic inflammatory conditions; and also in individuals in the second decade of life who have higher prevalence of appendicitis<sup>11</sup>. However there is need for further studies involving a larger population to affirm this assertion.

Surgical abdomen arising from trauma was more common in patients older than 10yrs. It also occurred more in males which is in tandem with patterns documented in literature<sup>25, 26</sup>. Although the liver and spleen were the most injured intra-abdominal organs in blunt abdominal trauma<sup>25-27</sup>, there was a slightly higher incidence of traumatic gut perforation in our study. The reason(s) for this is not clear, further studies, preferably multi-centre involving a larger population, may elucidate this. The current trend in management of blunt abdominal injuries advocates non-operative care in those: with suspected intact gastrointestinal tract (no clinical or radiological evidence of gut perforation), and those with stable, non-deteriorating cardiopulmonary status following initial resuscitation. Earlier reports from northern

Nigeria by Ameh et al and Chirdan et al<sup>18, 25, 26</sup> had shown that a sizeable proportion of children with blunt abdominal injuries can be managed non-operatively. There is also a growing trend towards splenic conservation (splenorrhaphy) even in those with splenic laceration (grade I-III). Computerized tomography scan of the abdomen is believed to be the gold standard imaging modality in classification of visceral injuries following blunt abdominal trauma as pre-operative grading of splenic and hepatic can be done. This facility was not available at the facilities during the period of study. We had to rely on ultrasonography (which is operator dependent) and clinical judgment to determine those patients that would require emergent surgical intervention<sup>28</sup>. Retrospectively we have found that sound clinical judgment with at least an abdomino-pelvic ultrasonography (in suspected gut perforation or abdominal trauma) and/or plain abdominal x-ray (in suspected intestinal obstruction) gave a diagnostic accuracy of 90.4% and negative laparotomy rate was zero percent. In resource poor settings we advocate thorough clinical evaluation with abdominal ultrasonography with or without plain abdominal x-ray for all children with suspected acute (surgical) abdomen.

The high overall post-operative complication rate in our study could be due to the fact that complicated intra-abdominal infections (especially gut perforations due to appendicitis, typhoid enteritis) were the major aetiology; and the surgical wounds in these conditions were considered dirty at surgery. Thus surgical site infection occurring as the most common post-operative complication was not surprising in patients with intra-abdominal sepsis when compared with other causes of surgical abdomen in this study. The high rate of surgical site infection amongst patients with complicated intra-abdominal sepsis, like typhoid ileal perforation, corroborates earlier reports<sup>8, 10, 11, 13, 15</sup>. Furthermore patients with typhoid ileal perforation constituted the bulk of patients with post-operative complications; this may be due to the pan-systemic nature of the disease with septicaemia. The latter could cause post-operative atelectasis and pneumonia, defective wound healing with or without wound dehiscence, hypertrophic scars and incisional hernias.

All patients in our study had primary wound closure even though some of the wounds (perforated typhoid ileitis and perforated appendicitis) were considered dirty wounds at surgery. Given the high rate SSI amongst patients with typhoid ileal perforation, we opine that delayed primary closure would have been a better option compared to primary closure of the wounds even after diligent irrigation. Furthermore over a quarter of patients with SSI also had hypertrophic scar which is not unexpected, and also patients with pot traumatic visceral injury neither had SSI nor abnormal scars.

Though we recorded 100% morbidity amongst the patients managed for typhoid perforation, there was no mortality. This is in contrast to reports by Ekenze *et al*<sup>16</sup> and Uba *et al*<sup>29</sup> who reported 19.1% and 22.8% mortality rates respectively for typhoid intestinal perforation. The small proportion of patients with typhoid intestinal perforation in our study may account for this variation, and perhaps adequate preoperative resuscitation and optimization of patients before surgery may have contributed to their favorable outcome in our study.

## Conclusion

Surgical infections still remains a major cause of surgical abdomen with perforated typhoid ileitis and appendicitis (including perforated appendicitis) predominating. Bowel obstruction appeared to be more common in girls while trauma related conditions were noted more in boys. Sound clinical acumen supported by ultrasonography and plain abdominal X-ray were invaluable in diagnosis. Surgical site infection remain a major cause of morbidity especially in patient with perforated typhoid ileitis.

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