# Paediatric surgical abdominal emergencies in a north central Nigerian centre

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***Background/objective*** **Paediatric surgical abdominal emergencies (PSAEs) account for 2.4–3.1% of all paediatric admissions. The causes of PSAEs vary worldwide, and the management is challenging, often with unimaginably poor outcome if not carefully handled. The aim of this study was to determine the patterns and factors influencing the outcome of PSAE at a tertiary healthcare centre in Nigeria.**

***Patients and methods*** **The biodata, clinical features, perioperative findings and outcome of management of 100 consecutive children aged up to 12 years with confirmed PSAE were prospectively collected and analysed using SPSS 15.0 software, taking *P*-value to be $<0.05$. Five children who had undergone an initial surgical intervention and those who were discharged against medical advice during care were excluded.**

***Results*** **The 100 children included in this study constituted 38.3% and 3.4% of the total paediatric surgical operations and paediatric admissions that took place during the study period, respectively. Their mean age was $4.6 \pm 0.469$ years, and the male-to-female ratio was 2.5 : 1. About 64% of patients presented within the first 5 days of onset of symptoms with abdominal pain/distension and/or vomiting as chief complaint. Fourteen (63.7%) of patients with perforated typhoid ileitis presented after a week, whereas 10% presented with the same symptoms after 2 weeks. Mechanical intestinal obstruction was the most common cause of PSAE among neonates and infants, whereas peritonitis was the main presenting cause in late childhood (7–12 years). Only 54 patients underwent surgical intervention within 24 h of presentation. Twenty-four (24%) patients underwent surgical intervention after 48 h. The main causes of delay for surgical intervention were hospital logistics in 58 patients and lack of funds to procure drugs and consumables in nine patients. The overall median hospital stay was 10 days. Eighty-nine (89%) patients were discharged, whereas 11 (11%) died. Mortality was significantly higher in neonates and infants ($P=0.016$) and in those with peritonitis ($P=0.008$).**

***Conclusion*** **PSAE constitutes a large percentage of the paediatric surgical workload at our centre. Mechanical intestinal obstruction in neonates and infants is the leading cause. Aggressive resuscitation, accurate diagnosis, and prompt surgical intervention, in addition to provision of paediatric intensive care facilities, will assist in reducing morbidity and mortality among these children. *Ann Pediatr Surg* 8:25–28 © 2012 Annals of Pediatric Surgery.**

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## Introduction

Acute abdominal emergencies in children pose a diagnostic challenge to all healthcare practitioners, and this is compounded by the inability of children to explain the nature of their symptoms and/or cooperate during physical examination [1]. Paediatric surgical abdominal emergencies (PSAEs) were previously reported to account for 2.4–3.1% of all general paediatric admissions [2]. These constituted a set of patients who go through unbelievable agony and unimaginably poor outcome if not carefully handled. There are several retrospective reports about isolated or categorized causes of acute abdomen in children [2–4]. However, few reports about PSAE combining several causes were seen in the literature from the sub-Saharan African region and from some other parts of the world [5,6].

Delayed presentation due to several reasons have been identified as the cause of poor outcome. Grossly inadequate or nonexistent critical care facilities in vast areas of sub-Saharan Africa and lack of policy for the management of children have also been cited [5–8]. Certainly, children who constitute more than 50% of the population of most developing countries deserve a fair share of robust surgical care by planning surgical services to reduce the high morbidity and mortality [8].

The aim of this study was to document the patterns and factors influencing the outcome of PSAE at a tertiary healthcare centre in the north central geopolitical zone of Nigeria.

## Patients and methods

This prospective study was carried out at a tertiary public healthcare centre with a catchment population of about 10 million, about 40% of them being children below 13 years of age. The total sample size required was based on turnover in the hospital and comprised 95 children; an additional 10 children were added to cater for attrition. An approval from the Hospital Research and Ethical Review Committee was obtained, and a similar consent

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for surgical intervention and enrolment in the study was obtained from the parents or caregivers.

This study included 100 consecutive children who had undergone a surgical abdominal emergency during the period from October 2006 to December 2007. Their ages ranged from birth to 12 years. Five patients who were discharged against medical advice during the course of treatment and those who had undergone an initial surgical intervention before referral were excluded from this study. The biodata, clinical features, perioperative findings and outcome were recorded on a proforma. All patients were followed up from admission up to a minimum of 3 months in the surgical outpatient clinic.

Statistical analysis was conducted using SPSS 15.0 software (SPSS, Chicago, IL, USA). A *P*-value of less than or equal to 0.05 was considered significant.

## Results

There were 6359 general paediatric admissions, of which 261 (4.1%) underwent surgery at the hands of paediatric general surgeons and 105 (1.7%) cases were PSAE. One hundred cases constituting 38.3 and 3.4% of the total number of surgical cases and paediatric admissions, respectively, met the inclusion criteria for the study.

Of these children, 78% were admitted to the emergency paediatric unit, 7% to the neonatal intensive care unit, 5% to the inpatient ward, 7% to the accident and emergency room (A & E) and 3% of children were outpatients. The mean age was $4.6 \pm 0.47$ years, and the male-to-female ratio was 2.5 : 1 (Table 1). Mechanical intestinal obstruction (MIOB) was the most common cause of PSAE and was the most presented cause in early infancy, whereas peritonitis was the second overall cause of PSAE, which occurred mainly in late childhood (7–12 years).

Acute appendicitis occurred in 15% of cases at a mean age of $10.6 \pm 1.03$ years, with a male-to-female ratio of 1.1 : 1. Seven patients underwent exploratory laparotomy and appendectomy for a complicated appendix, whereas others underwent simple appendectomy through a Lanz incision. Typhoid ileal perforation (TIP) accounted for 22% of the cases, which occurred within the age range of 2–12 years and a mean age of $7.7 \pm 1.19$ years. The male-to-female ratio was 1.6 : 1. Multiple perforations occurred in 22.7% (5/22) of patients with an associated gallbladder empyema and gangrene in one case. Laparotomy and two-layer closure was used in single perforations, whereas segmental resection and/or limited right hemicolectomy was used in multiple perforations.

Anorectal malformation (ARM) was the most common cause of MIOB in neonates, accounting for 11% of cases, with a male-to-female ratio of 10.1. The mean age at presentation was 5.23 days (range from 12 h to 1 month). There were four cases each of high and intermediate anomalies, whereas three cases were low anomalies that covered the anus with an anocutaneous fistula.

Intussusception, which occurred in 15% of cases, was the most common cause of MIOB in infants. It occurred at a median age of 5 months (range from 2 months to 12 years) with a male-to-female ratio of 1.5 : 1. Laparotomy and manual reduction was achieved in 66.6% of patients. Four patients underwent right hemicolectomy because of bowel gangrene. One patient underwent a colostomy after resection of a lead point in the transverse colon. Other causes of MIOB were obstructed inguinal hernia ($n = 4$), ileal atresia ($n = 3$), postoperative adhesion ($n = 3$), obstructing mesenteric cyst ($n = 2$), Hirschsprung's disease ($n = 2$) and a case each of obstructed umbilical hernia, jejuna atresia, midgut volvulus and malrotation.

Traumatic blunt abdominal injury occurred in seven patients whose mean age was $8.86 \pm 0.53$ years. There were two cases of fall and five cases of motor vehicle injury (MVI); four of them occurred in pedestrians. There were eight abdominal visceral injuries: four were spleen injuries, one was a concomitant hepatic laceration, one was a duodenal perforation (in addition to rib and femoral fracture), one was an ileal perforation and one was a right polycystic kidney haemorrhage. All but one patient underwent exploratory laparotomy, with two cases of splenorrhaphy, one splenectomy, one hepatorrhaphy, one nephrectomy, one duodenal repair and gastrojejunostomy and one closure of ileal perforation.

The majority of the patients (64%) with PSAE presented within the first 5 days of onset of symptoms, whereas 10% presented after 2 weeks. Fourteen patients (63.7%) with TIP presented after a week from onset of fever (Table 2).

Only 54 patients underwent surgical intervention within 24 h of presentation. Twenty-four patients underwent surgical intervention after 48 h. Seventy-eight patients experienced a delay of more than 12 h before surgical intervention because of hospital logistics; 43 patients (55.1%) experienced a delay because of a lack of theatre space and delayed laboratory results, 15 patients (19.2%)

**Table 1 Age group and sex**

| Age groups | Males | Females | Total |
|---|---|---|---|
| <1 month | 19 | 2 | 21 |
| 1–12 month | 13 | 7 | 20 |
| 13 month–6 years | 16 | 3 | 19 |
| 7–12 years | 23 | 17 | 40 |
| Total | 71 | 29 | 100 |

**Table 2 Duration of symptoms among paediatric surgical abdominal emergencies**

| Duration of symptoms | Acute appendicitis | Mesenteric adenitis | Typhoid perforation | Mechanical intestinal obstruction | Trauma | Others | Total |
|---|---|---|---|---|---|---|---|
| <24 h | 4 | – | – | 5 | 4 | 1 | 14 |
| 24–48 h | 5 | – | 2 | 11 | 1 | – | 19 |
| 3–5 days | 2 | 1 | 5 | 19 | 2 | 2 | 31 |
| 6–14 days | 2 | – | 15 | 8 | – | 1 | 26 |
| >14 days | 2 | 1 | – | 4 | – | 3 | 10 |
| Total | 15 | 2 | 22 | 47 | 7 | 7 | 100 |

**Table 3 Complications in paediatric surgical abdominal emergencies**

| Complications | Number of patients (%) | Primary pathology |
|---|---|---|
| Wound infection | 14 | TIP 8, App 2, IT 1, ARM 1 others 2 |
| Septicaemia | 4 | TIP 2, IT 1, Tr 1 |
| Enterocutaneous fistula/ electrolytes derangement | 4 | TIP 1, IT 1, Tr 1, atresia 1 |
| Burst abdomen | 3 | TIP 2, atresia 1 |
| Prolonged ileus | 3 | IT 1, atresia 2 |
| Anastomotic leak | 1 | Jejuna atresia 1 |
| Respiratory failure | 1 | Ileal atresia 1 |
| Severe haemorrhage | 1 | Tr 1 |
| Hyperthermia + seizure | 1 | IT 1 |
| Wound dehiscence | 4 | TIP 2, ARM 2 |

App, appendicitis; ARM, anorectal malformation; IT, intussusception; TIP, typhoid ileal perforation; Tr, trauma.

**Table 4 Morbidity and mortality pattern among the causal factors of paediatric surgical abdominal emergencies**

| Causal factors | Number of patients | Morbidity rate | Duration of hospital stay (days) | Median duration of hospital stay (days) | Case fatality (%) |
|---|---|---|---|---|---|
| Simple appendicitis | 8 | 0 (0%) | 3–8 | 4 | 0 |
| Complicated appendicitis | 7 | 2 (28.6%) | 5–14 | 9 | 0 |
| Typhoid perforation | 22 | 10 (42%) | 5–35 | 12 | 2 (9.1) |
| Intussusception | 15 | 5 (33.3%) | 1–22 | 11 | 3 (20) |
| Abdominal trauma | 7 | 2 (28.6%) | 2–17 | 9.5 | 2 (28.6) |
| Anorectal malformation | 11 | 4 (36.4%) | 1–23 | 10 | 2 (18.2) |
| Intestinal atresia | 4 | 3 (75%) | 2–25 | 16.5 | 1 (25) |
| Midgut volvulus | 1 | – | | 13 | 1 (100) |
| Postoperative adhesion | 3 | 0 | 8–14 | 12 | 0 |

because of the need for resuscitation and stabilization and nine patients (11.5%) because of lack of funds to procure drugs and consumables. Seven patients (8.9%) experienced a delay because of an initial adoption of a conservative approach and two patients each because of refusal of parents to consent to surgery and because of the bureaucracy of interdepartmental transfer of patients.

The median hospital stay was 10 days, which was affected by the presence of complications in patients (Table 3). The postoperative complication rate in TIP was 63.6%; the most common complication in PSAE was wound infection (71%), which was responsible for prolonged hospitalization. The follow-up period ranged from 11 h to 7 months (mean = 3.8 ± 0.52 months).

Eighty-nine (89%) patients were discharged, whereas 11 (11%) died. Mortality was significantly higher in neonates and infants ($P = 0.016$) and in those with peritonitis ($P = 0.008$). The two (28.6%) trauma-related deaths were in patients with multiple injuries and it followed electrolytes and fluid derangement in the duodenal fistula and haemobilia in hepatic injury (Table 4).

## Discussion

PSAE constituted a large bulk (38.3%) of the total number of surgical cases in the paediatric surgical unit and about 3.4% of total paediatric admissions during the study period. A similar incidence of PSAE was reported to be between 2.4 and 3.1% of all paediatric admissions in some retrospective studies in Nigeria [2–4]. A male preponderance is in agreement with most series of PSAEs involving only children in whom the ratio ranged between 1.1 and 1.7 : 1 [4–6].

In this study, PSAEs occurred most commonly during late childhood (7–12 years) in 40% of cases, followed by the neonatal period in 21% and infancy in 20% of cases. Congenital intestinal atresia was the largest cause of MIOB in neonates, whereas intussusceptions remained the leading cause of acquired MIOB in infancy, as attested to in previous series [5,9–11]. Of the neonatal MIOB cases, ARM and jejunoileal intestinal atresia were the most common, which is higher than the rates detected in the series by Adejuyigbe [9] and Ameh and Chirdan [10]. The cost of rectal biopsy and lack of frozen sections in cases of suspected Hirschsprung's disease led to many cases being excluded from the study, as mothers who were impatient and anxious withdrew their children from the study following relief of abdominal distension by digital rectal examination or use of enema wash-out. One-stage posterior sagittal anorectoplasty for correction of ARM adopted at our centre for male and female intermediate ARM cases has been found to be simple and safe in neonates and it reduced waiting time [12]. This was confirmed to have reduced the risk of repeated anaesthesia exposure, high cost of three-stage operation, parental stress in caring for their wards, and complications of colostomy [13–15].

TIP with its grievous effect was a leading cause of peritonitis in this study; current reports have shown that it is being controlled with special measures. Mortality from TIP has reduced from more than 20% to less than 10% at our centre [4,16–18]. The high rate of TIP in this study may not be unconnected with our local referral system, in which critical cases were sent to the tertiary centre by private primary caregivers who often conduct 'minor' surgeries and refer the difficult ones to the public tertiary centre. This might have affected the incidence of appendicitis in this study unlike in reports from other centres [5,6].

Multiple intestinal perforations resulting from typhoid enteritis in this study confirmed its endemicity as seen in many developing communities, which also witnessed an increased incidence of multiple perforations and occurrence at unusual sites [19,20]. Poor environmental sanitation, inadequate safe water supply and poor potency and underdosing of antibiotics constituted a large menace in the eradication of enteric fever and its complications in our environment.

MVI, a major cause of trauma in this study, was confirmed as the leading cause of morbidity and mortality in children in middle-income and low-income countries. MVI affected most children when they were pedestrians and the spleen was the most common abdominal visceral organ affected [21,22].

The time lapse between onset of illness and presentation at the hospital depended on the causes of PSAE, the

symptoms at onset and the ages of the patients. Children with abdominal pains and vomiting or progressive abdominal distension presented early and many others presented late following failure of response to local herbs, over-the-counter drugs and onset of super-imposed fever. Delay in seeking medical treatment and deterioration of patients' condition were reported to be generally responsible for the high morbidity and mortality at many centres [4,5,21,22].

The time lapse from surgical consultation to surgical intervention depended on the patients' clinical status, hospital logistics and availability of funds. Although the hospital allowed deferment of payment for surgical materials like sutures and anaesthestic drugs, antibiotics and intravenous fluids needed for resuscitation and stabilization of patients were not covered. Lack of funds on arrival can be surmounted if the National Health Insurance Scheme was guaranteed as a social package for all citizens to cover these types of emergencies. There is also a great need to overhaul human factors in the delivery of services to avoid all sorts of bottlenecks at our centre. Ensuring the availability of personnel at all times, including after hours (call period), at the designated duty post will reduce the time lost in attending to emergencies.

The high wound infection and dehiscence rate might not be unconnected with bacterial contamination of the wound accruing from the faecal peritonitis and associated malnutrition in many patients. This can be reduced by delayed primary closure of the skin and parental support of nutrition. Lack of a well-equipped intensive care unit for children at our centre contributed to the high mortality recorded in this study as many of the neonates and infants would have benefitted from ventilator support, intensive monitoring and maintenance facilities.

## Conclusion

PSAEs constituted a large percentage of surgeries conducted on children at our centre, with MIOB being the lead cause. The majority of these patients appeared in a debilitated state at presentation after having been delayed at home or at referring centres. Public education is needed for parents and guardians to present their wards early to designated children's hospitals. Healthcare providers should know their limitations so that they can promptly refer cases beyond their competence to the nearest referral centre. There is a need to provide well-equipped neonatal and paediatric intensive care units for the management of these children who require aggressive resuscitation, diagnosis and prompt surgical intervention.

## Acknowledgements

### Conflicts of interest

There are no conflicts of interest.

## References

1 Kenny SE. Acute abdominal emergencies in childhood. *Surgery* 2008; **26**:310–313.
2 Adejuyigbe O, Fashakin EO. Acute intestinal obstruction in Nigerian children. *Trop Gastroenterol* 1989; **10**:33–40.
3 Uba AF, Edino ST, Yakubu AA, Sheshe AA. Childhood intestinal obstruction in Northwestern Nigeria. *West Afr J Med* 2004; **23**:314–318.
4 Abubakari AM, Ofoegbu CP. Factors affecting outcome of emergency paediatric abdominal surgery. *Niger J Surg Res* 2003; **5**:85–91.
5 Pujari AA, Methi RN, Khare N. Acute gastrointestinal emergencies requiring surgery in children. *Afr J Paediatr Surg* 2008; **5**:61–64.
6 Mabiala Babela JR, Pandzou N, Koutaba E, Ganga Zandzou S, Senga P. Retrospective study of visceral surgical emergencies in children at the University Hospital Center of Brazzaville (Congo). *Med Trop* 2006; **66**:172–176.
7 UNICEF. State of the world children. 2005; Available at: http://www.unicef.org/sowc05/english/index.html. [Accessed 23 April 2011].
8 Bickler SW, Rode H. Surgical services for children in developing countries. *Bull World Health Organ* 2002; **80**:829–835.
9 Adejuyigbe O, Jeje EA, Owa J, Adeoba EA. Neonatal intestinal obstruction in Ile Ife, Nigeria. *Niger Med J* 1992; **22**:24–28.
10 Ameh EA, Chirdan LB. Neonatal intestinal obstruction in Zaria, Nigeria. *East Afr Med J* 2000; **77**:510–513.
11 Abdur Rahman LO, Yusuf AS, Adeniran JO, Taiwo JO. Childhood intussusception in ilorin: a revisit. *Afr J Paediatr Surg* 2005; **2**:4–7.
12 Adeniran JO, Abdur Rahman L. One-stage correction of intermediate imperforate anus in males. *Pediatr Surg Int* 2005; **21**:88–90.
13 Osifo OD, Evbuomwan I. Primary perineal surgeries for the low and intermediate anorectal anomalies: 5-year results in a developing country. *Surg Pract* 2009; **13**:64–68.
14 Uba AF, Chirdan LB. Colostomy complications in children. *Ann Afr Med* 2003; **2**:9–12.
15 Chirdan LB, Uba FA, Ameh EA, Mshelbwala PM. Colostomy for high anorectal malformation: an evaluation of morbidity and mortality in a developing country. *Pediatr Surg Int* 2008; **24**:407–410.
16 Adeniran JO, Taiwo JO. Typhoid intestinal perforation in children in Ilorin: Salmonella versus the surgeon: who is winning the race? *Trop J Health Sci* 2008; **15**:61–65.
17 Sümer A, Kemik O, Dülger AC, Olmez A, Hasirci I, Kişli E, *et al*. Outcome of surgical treatment of intestinal perforation in typhoid fever. *World J Gastroenterol* 2010; **16**:4164–4168.
18 Uba AF, Chirdan LB, Ituen AM, Mohammed AM. Typhoid intestinal perforation in children: a continuing scourge in a developing country. *Pediatr Surg Int* 2007; **23**:33–39.
19 Adeniran JO, Taiwo JO, Abdur Rahman LO. Salmonella intestinal perforation: (27 perforations in one patient, 14 perforations in another) are the goal posts changing? *J Indian Assoc Pediatr Surg* 2005; **10**:248–251.
20 Abdur Rahman LO, Adeniran JO, Nasir AA. Outcome of typhoid acalculus gallbladder disease in Nigerian children. *J Natl Med Assoc* 2009; **101**:717–719.
21 WHO and UNICEF. *World report on child injury prevention*. Geneva: WHO and UNICEF; 2008.
22 Abdur Rahman LO, Babalola OM, Taiwo JO, Abubakar AM, Adeniran JO, Kuranga SA. Pattern of childhood abdominal injuries in Ilorin Nigeria. *Trop J Health Sci* 2007; **14**:32–36.