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## Determinants of postoperative morbidity and mortality in children managed for typhoid intestinal perforation in Kano Nigeria <sup>☆,☆☆,★</sup>

Lofty-John Anyanwu <sup>a,\*</sup>, Aminu Mohammad <sup>a</sup>, Lawal Abdullahi <sup>a</sup>, Aliyu Farinyaro <sup>a</sup>, Stephen Obaro <sup>b</sup>

<sup>a</sup> Paediatric Surgery Unit, Department Of Surgery, Aminu Kano Teaching Hospital and Bayero University Kano, Nigeria

<sup>b</sup> Division Of Pediatrics Infectious Disease University of Nebraska Medical Center, Omaha, USA

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## ABSTRACT

**Background:** Intestinal perforation is a serious but poorly understood complication of typhoid fever. This study aims to determine the patient factors associated with postoperative morbidity and mortality.

**Methods:** We retrospectively reviewed the records of all children presenting to our unit with typhoid intestinal perforation (TIP) between March 2009 and December 2013. The patients were grouped based on postoperative outcome status and were compared with respect to patient related variables, using chi square test. Multivariate analysis was performed using a binary logistic regression model. Significance was assigned to a p-value <0.05.

**Results:** The records of 129 children were analyzed. There were 78 (60.5%) boys and 51 (39.5%) girls. The male/female ratio was 1.53:1. Their ages ranged from 3 years to 13 years (mean 8.14 years; SD 2.61 years). A single intestinal perforation was seen in 73.4% (94/128) of them, while 26.6% (34/128) had two or more. Mortality rate was 10.9%. Multivariate analysis showed that multiple intestinal perforations significantly predicted postoperative mortality ( $p = 0.005$ ) and development of postoperative fecal fistula ( $p = 0.013$ ), while serum albumin <32 g/L was a predictor of postoperative surgical site infection ( $p = 0.002$ ).

**Conclusion:** Multiple intestinal perforations, a postoperative fecal fistula and hypoalbuminemia adversely affected outcome in our patients.

**Level of evidence:** III (Retrospective study). Type of study—Prognosis study.

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Typhoid fever is a septicemic illness caused predominantly by the bacterium *Salmonella enterica* serovar Typhi, a gram negative facultative anaerobe. A similar but often less severe disease is caused by *Salmonella enterica* serovar Paratyphi A and less commonly by serovar Paratyphi B [1–3].

The common mode of infection is by the fecooral route. It is estimated that there are about 17million cases of typhoid fever worldwide every year, with an annual mortality of between 500,000 to 600,000 [4,5]. Case fatality rate is approximately 1% with prompt and appropriate antimicrobial therapy, but can vary between 28% and 80% after intestinal perforation which occurs in about 2%–4% of all cases of typhoid fever [2,6,7].

Intestinal perforation is a serious but poorly understood complication of typhoid fever [8–10]. Perforation is heralded by exacerbation of

abdominal pain associated with tenderness, rigidity and guarding; however for many patients in a severe toxic state, these signs may be obscured with resultant delays in diagnosis and adequate surgical intervention [11–14]. The mortality and morbidity rates of typhoid intestinal perforation have remained in double digits in developing countries in the last quarter of a century [15].

Many factors, such as late presentation, age, virulence of the organism, inadequate preoperative resuscitation, sepsis, delayed operation, inadequate antibiotic therapy, the number of perforations, and the extent of fecal peritonitis, have been found to adversely affect the prognosis of those presenting with typhoid intestinal perforation (TIP) [16–18]. The significant differences in reported mortality rates have revealed the need to investigate the underlying reasons [19]. The purpose of this study was to determine patient variables affecting the clinical outcome of children presenting to our hospital with TIP.

### 1. Methods

A total of 129 consecutive children with typhoid intestinal perforation (TIP) managed between March 2009 and December 2013, at the Aminu Kano Teaching Hospital, Kano, North Western Nigeria were retrospectively enrolled into the study.

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★ Data from this study were earlier presented at the 9th International Conference on Typhoid and Invasive NTS Disease. April 30th–May 3rd 2015, Bali Indonesia.

\* Corresponding author at: Department Of Surgery, Aminu Kano Teaching Hospital, Kano, Nigeria. Tel.: +234 8037052659.

E-mail address: [loftyjohn@yahoo.com](mailto:loftyjohn@yahoo.com) (L.-J. Anyanwu).

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The study was approved by the Aminu Kano Teaching Hospital's ethics committee.

Diagnosis was primarily based on clinical features. Preoperatively, all patients had fluid and electrolytes deficit corrected by intravenous infusions, nasogastric tubes were passed for gastric decompression, and urethral catheters placed to monitor urinary output. Broad spectrum antibiotics which included ceftriaxone and metronidazole were commenced, and anemic patients had blood transfused.

Following adequate fluid resuscitation as evidenced by the production of at least 2 ml/kg/h of clear urine, all patients had an exploratory laparotomy via a midline incision under general anesthesia with endotracheal intubation. All intraperitoneal collections were characterized, aspirated and quantified. The peritoneal cavity was surveyed, and operative findings noted. In those with a single perforation, excision of the perforation edge was done and 2/0 Vicryl sutures used to close the perforation in double layers. Bowel resection and anastomosis were done for those with multiple perforations (which are close together) in which the most distal was at least 10 cm from the ileocecal junction, while for those with multiple terminal ileum perforations (which are close together) in which the most distal was less than 10 cm from the ileocecal junction, a limited right hemicolectomy was done, with an ileoascending colon anastomosis sited near the right colic artery. A copious amount of warm normal saline solution was used to lavage the peritoneal cavity, and mass closure of the abdomen done using nylon-1 sutures. Interrupted stitches with nylon-2/0 were used to close the skin. Intraperitoneal drains were not placed in any of the patients.

In the postoperative period, IV antibiotics were continued for about 10 days. 'Nothing by mouth' was maintained for all patients until bowel sounds returned. The abdominal wound dressing was opened on the second postoperative day for wound inspection. If a localized swelling, erythema or purulent drainage was noted on any site on the wound, alternate skin stitches were removal from the region, and that site of the skin wound was deliberately prized open for drainage and daily dressing. The patients were closely observed for major complications e.g. surgical site infection.

Data from each patient were entered into a proforma prepared for the study. Data were analyzed using SPSS version 15.0 for windows (SPSS Inc., Chicago, IL). Descriptive statistics were computed for continuous variables, while proportions were used for categorical characteristics of the study subjects. Chi-square and Pearson's correlation statistics were used to test for associations. Fisher's exact test (two-tailed) was employed where appropriate. Multivariate logistic regression was used to determine the influence of the study variables on the outcome factors (postoperative mortality, surgical site infection and postoperative fecal fistula). Level of significance was set at  $p < 0.05$  for all analyses.

## 2. Results

### 2.1. Demographic characteristics

There were 129 children included into the study in all. Of these, 78 (60.5%) were males, and 51 (39.5%) were females. The male/female ratio was 1.5:1. Their ages ranged from 3 years to 13 years, with a mean of 8.14 years (SD 2.61 years). Majority of the patients (52.7%; 68/129) presented during the rainy season (May–October), while 47.3% (61/129) presented during the dry season (November–April). The monthly incidence is as depicted in Fig. 1. The peak incidence occurred in the month of October, which corresponds to the ending of the raining season and the beginning of the dry season. The incidence declined as the dry season progressed. The mean duration of hospitalization was 21 days (SD = 14 days).

### 2.2. Investigations

The median Body Mass Index (BMI) of the study subjects was 13 kg/m<sup>2</sup>. BMI-for-age z-score for 12.1% (15/124) of the patients was  $>+1$  SD

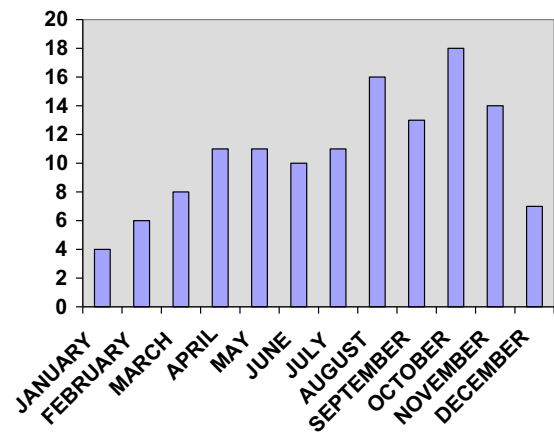


Fig. 1. Seasonal variation of Typhoid perforation.

(overweight/obese),  $+1$  SD to  $-2$  SD (normal range) for 25.8% (32/124), and  $<-2$  SD (underweight) for 62.1% (77/124). Widal's test and HIV screening were not done for any of the patients. Preoperative diagnosis was primarily based on clinical features of a history of fever followed by abdominal pain, distension and tenderness. It was supplemented by radiological findings of pneumoperitoneum (where radiographs were available) and intraoperative findings of an oval perforation disposed longitudinally on the antimesenteric border of the jejunum or ileum or between the tenia coli in the colon, as well as an acutely inflamed and edematous intestine with intraperitoneal soiling [3]. In an early subset of the patients who had chest and abdominal radiographs (54), pneumoperitoneum was detected in 87%. Analyses of the radiographic features in this subset of patients have been submitted elsewhere for consideration for publication.

### 2.3. Intraoperative findings

Exploratory laparotomy was done for all patients. A total of 194 perforations were seen in all, 193 (99.5%) of them in the small intestine, while 1 (0.5%) was located in the cecum. In all the patients, the omentum was seen retracted to the upper abdomen — away from the perforation site which was usually in the terminal ileum (Figs. 2 and 3). The



Fig. 2. Intraoperative picture of abdomen of child with typhoid intestinal perforation, showing omentum 'A' retracted to the upper abdomen.

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