Pediatr Surg Int (2014) 30:1121–1127
DOI 10.1007/s00383-014-3592-9

ORIGINAL ARTICLE

Predictors of mortality in children with typhoid ileal perforation in a Nigerian tertiary hospital

Ademola Olusegun Talabi · Amarachukwu Chiduziem Etonyeaku · Oludayo Adedapo Sowande · Samuel Anu Olowookere · Olusanya Adejuyigbe

Accepted: 1 September 2014 / Published online: 4 October 2014

Abstract

Purpose Childhood typhoid ileal perforation is associated with high morbidity and mortality. Our aim was to ascertain the predictors of survival in children.

Materials and methods This is a tertiary hospital-based retrospective review of patients aged ≤15 years managed for typhoid ileal perforations between January 2005 and December 2013. The details of their biodata, potential risk factors and outcome were evaluated.

Results Forty-five children out of a total of 97 with typhoid fever had typhoid ileal perforation. The age range was 2–15 years, mean (±SD) = 9.3 (±3.31) years, median = 10 years. There were more males than females (26:19). Thirty-nine (86.7 %) patients were >5 years old. There were nine deaths (20 % mortality). The mean (±SD) age of survivors was 9.8 (±2.9) years and 7.1 (±4.2) for non-survivors ($p = 0.026$). The duration of illness at presentation, gender, admission temperature, nutritional status and packed cell volume, perforation-operation interval, number of perforations, surgical procedure, and the duration of surgery did not statistically influence survival ($p > 0.05$). The age of the patients and burst abdomen attained statistical significance ($p < 0.05$).

Conclusion The patients' age and postoperative burst abdomen were significant determinants of survival in children with typhoid ileal perforation.

Keywords Childhood · Typhoid · Ileal · Perforation · Prognostic factors

A. O. Talabi (✉) · A. C. Etonyeaku · O. A. Sowande · S. A. Olowookere · O. Adejuyigbe
Obafemi Awolowo University, Teaching Hospitals Complex, Ile-Ife, Osun, Nigeria
e-mail: ademolatalabi1608@gmail.com

Introduction

Intestinal perforation is a serious complication of typhoid fever and remains a great challenge to patients and paediatric surgeons in developing nations where it is associated with high morbidity and mortality. The infection has been associated with lack of safe drinking water and poor sanitation. Morbidity and mortality patterns are influenced by the virulence of the organism (salmonella species), the immune status of the patient, grossly inadequate health facilities particularly in remote areas and delay in hospital attendance often occasioned by poverty [1–5]. Typhoid fever and its sequels have a devastating effect on resource-poor countries like Nigeria. It is estimated that more than 33 million cases occur annually causing about 500,000 deaths [5–7]. Though the disease may occur throughout the year in many tropical and resource-poor countries where social infrastructure is lacking [8–10], two peaks have been identified in Jos, Nigeria [9]. Despite advances in the medical management of typhoid fever, the frequency of perforation remains high in developing countries. In most parts of the world the incidence of perforation is between 0.8 and 18 %, but in West Africa, higher rates of 15–33 % have been reported [1, 3–5]. This is in sharp contrast to the much lower rates of 1–3 % reported from India and Iran [1]. The high incidence of typhoid intestinal perforation could be due to late diagnosis, the emergence of multi-drug resistant and virulent strain of the organism. The morbidity ranges from 9 to 43 % with survivors having surgical site infections and relatively longer hospital stay [5, 11, 12].

While mortality in developed countries has reduced to single digit albeit less than 5 %, that of developing nations has remained high ranging from 9 to 75 % [7, 8, 13]. Some authors had attributed this poor outcome to late presentation, delay in surgical intervention with associated severe peritoneal contamination causing septicaemia [1, 3]. Other established prognostic factors include malnutrition, age and gender of patients, duration of illness, time interval between onset of fever and perforation, infection by virulent strain of the causative organism, the number of perforations and surgical procedures required for treatment [8–11, 14].

Our center, Obafemi Awolowo University Teaching Hospital Complex (OAUTHC), is a tertiary hospital located in southwestern Nigeria. Like most tertiary facilities in Nigeria, the hospital also provides both primary and secondary healthcare services. The bulk of patients seen in our center are farmers, traders, artisans, and civil servants, and the referral system remains poor. There is no community-based health insurance scheme in the catchment area. Over 90 % of hospital attendees in Nigeria pay out of pocket for hospital services. There are shortages of manpower and infrastructure to meet the teeming demand of the populace.

The purpose for this study was to determine the predictors of survival among our patients. The identification of predictive factors will help in decision making, prioritizing management and improve quality of care.

Materials and methods

This was a retrospective analysis of children aged 15 years and below managed for typhoid intestinal perforation at the paediatric surgical unit of Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, southwest Nigeria, between January 2005 and December 2013.

The clinical information of the patients was retrieved from the hospital medical record department. Based on literature review, the following prognostic factors were analyzed: age, gender, duration of illness and abdominal pain, fever–pain interval, perforation–operation interval, admission temperature (≥38.5 °C) and severe anaemia (haematocrit <8 gm/dl). Other factors include, nutritional status, hypokalemia (potassium <3.0 mmol/l), plain abdominal X-ray finding of pneumoperitoneum, quantity of intra-peritoneal collections of pus or faecopurulent exudate, number and site of bowel perforations, estimated size of perforation, nature of surgical intervention and postoperative complications encountered with emphasis on burst abdomen, and enterocutaneous fistula. The treatment outcome with respect to mortality was also analyzed. The diagnosis of typhoid ileal perforation was made on clinical grounds in all patients, and reinforced by: radiological finding of pneumoperitoneum, intraoperative finding of an acutely inflamed ileum (often terminal ileum) with perforation at the antimesenteric border as earlier described by Uba et al. [9]. Preoperatively, all patients were resuscitated with intravenous fluid, and had parenteral broad spectrum antibiotics, nasogastric tube and Foley's urethral catheter. Anaemia was corrected with blood transfusion. Data for 36 surviving children were reviewed for morbidity patterns.

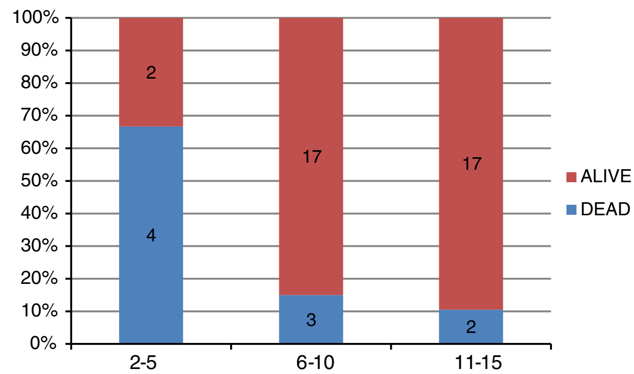

Fig. 1 Age stratification with distribution of deaths Fischer's Exact Test = 7.492, $p = 0.020$

Statistical analysis

Data collected were analyzed for frequencies and percentages using SPSS software version 17. The results were presented as tables and graphs. Continuous variables were compared with t test and categorical variables with Chi-square or Fischer's exact test. Nutritional status was assessed using Z-score (which ranges from −2 through 0 to +2) pattern for growth based on weight for age and sex of patients. Bivariate analysis using logistic regression model was performed to determine predictors of mortality. Variables in the bivariate test with p value of <0.1 were included in the regression model. A p value <0.05 was accepted as significant. Kaplan–Meier survival analysis was done to determine mean and median survival time after surgical intervention.

Ethical considerations: ethical approval to conduct this study was obtained from Ife Central Local Government Ethical Review Committee.

Results

A total of 87 typhoid ileal perforation cases including adult cases were seen during the period under review out of which 52 % were children <15 years. Of 97 children with typhoid fever admitted during this period, typhoid ileal perforation constituted 46.4 %. The ages of patients ranged 2–15 years with a mean (±SD) of 9.29 (±3.31) years and a median of 10 years. There were 26 males and 19 females giving a ratio of 1.4–1.0. Thirty-nine (86.7 %) patients were above the age of 5 years while 6 (13.3 %) patients were ≤5 years. The mean (±SD) age of survivors and non-survivors were 9.8 (±2.9) and 7.1 (±4.2) years,

Table 1 Characteristics of patients

Variables	Survivors	Non survivors	p value	95 % CI
Age in years (mean ± SD)	9.8 ± 2.9	7.1 ± 4.2	0.026	−5.09 to −0.35
Gender				
Male	22 (61.1 %)	4 (44.4 %)	0.461	
Female	14 (38.9 %)	5 (55.6 %)		
Duration of illness in days (mean ± SD)	10.5 (±4.01)	8.7 (±3.9)	0.225	−4.94 to 1.17
Duration of abdominal pain in days (mean ± SD)	4.7 (±2.9)	4.7 (±3.7)	1.000	−2.33 to 2.33
Fever–perforation interval in days (mean ± SD)	5.9 (±3.1)	4.0 (±1.2)	0.079	−4.06 to 0.23
Temperature in °C (mean ± SD)	38.3 (±1.0)	38.5 (±0.7)	0.514	−0.49 to 0.97
Preoperative pack cell volume (mean ± SD)	30.7 (±5.8)	29.3 (±7.6)	0.56	−5.96 to 3.30
Perforation–operation interval in days (mean ± SD)	5.7 (±3.3)	5.8 (±3.8)	0.948	−2.47 to 2.64
Duration of operation in days (mean ± SD)	108.3 (±44.8)	93.9 (±29.8)	0.369	−46.25 to 17.53
Extent of faecal soilage of peritoneum in mls (mean ± SD)	849.9 (±668.1)	1,433.3 (±1,152.1)	0.051	−3.66 to 1,171
Z-score for nutritional assessment (mean ± SD)	−1.167	−0.889	0.419	−0.41 to 0.96

respectively (t test = −2.31, $p = 0.026$). The age stratification in relation to mortality is shown in Fig. 1. There was a statistical significant difference with treatment outcome across age groups, Fischer's exact test = 7.49, $p = 0.020$.

There were 9 (20 %) deaths of which 5 (55.6 %) were attributed to overwhelming sepsis and multiple organ failure. Two (22.2 %) patients died from complete bowel evisceration (burst abdomen), one (11.1 %) from enterocutaneous fistula, and one (11.1 %) from intra-abdominal abscess. Mortality occurred between the first and the 44th postoperative day, mean (±SD) = 8.8 (±14.2) days; while six (66.7 %) patients died within 72 h of surgical intervention. The predictive factors for mortality in typhoid perforation are shown in Tables 1 and 2. Logistic regression analysis showed that age and burst abdomen were the significant predictors of mortality (Table 3).

Clinical features recorded were fever, abdominal pain, abdominal distention, vomiting, diarrhoea and constipation. The more dominant symptoms in ≤5 years were fever, abdominal pain and diarrhoea. Seventeen (37.8 %) patients presented within the 1st week of illness, while 28 (62.2 %) patients presented between the 2nd and 3rd week. The mortality rates for the two groups were 29.4 and 14.3 %, respectively. The mean (±SD) duration of illness for survivors and non-survivors was 10.5 (±4.0) and 8.7 (±3.9) days, respectively, with a range 4–21 days. This difference was not statistically significant ($p = 0.225$).

We assume that the onset of acute abdominal pain, most probably coincided with the period of perforation.

The mean (±SD) perforation-operation interval for survivors was 5.7 (±3.3) days whereas it was 5.8 (±3.8) days for non-survivors. The difference was not statistically significant ($p = 0.95$). Five (11.1 %) patients had surgical intervention within 24 h of onset of perforation with no mortality, 40 (88.9 %) were operated after 24 h of perforation with a mortality of 22.5 % ($p = 0.566$).

About 82.8 % of our patients had perforation within the 1st week of illness. The first presentation by all patients was fever. The average period from the onset of fever to perforation was shorter among non-survivors compared to survivors ($p = 0.079$. Eighteen patients (40 %) presented with body temperature ≥38.5 °C with 27.8 % mortality and 27 (60 %) presented with temperature <38.5 °C with a mortality of 14.8 % ($p = 0.449$). Thirty patients had malnutrition at admission with mortality of 16.7 % while 15 patients had good nutritional status with a mortality of 26.7 % ($p = 0.454$). The mean Z-score for assessment of nutritional status of patients did not influence mortality ($p = 0.419$). The mean Z score for children ≤5 years and for those >5 years were −0.75 and −1.17, respectively, with no statistical significance ($t = 1.045$, $p = 0.302$, 95 % CI = −0.387 to 1.22).

Twenty-eight (64.4 %) patients had plain abdominal X-ray films available for review. Out of the 28 patients, only 8 (28.6 %) had pneumoperitoneum. Main laboratory changes observed were hypokalemia (serum potassium <3.0 mmol/L) in 4 (11.1 %) and severe anaemia (haematocrit <8 gm/dl) in 5 (11.1 %). Serum potassium and severe anaemia had no influence on mortality ($p > 0.05$). The mean packed cell volume of survivors was 30.7 ± 5.8 % compared with 29.3 ± 7.6 % for non-survivors ($p = 0.56$).

The number of perforations ranged from one to six. Thirty-two (71.1 %) patients had solitary perforation with a mortality of 15.6 %, while 13 (28.9 %) had multiple perforations with a mortality of 30.8 %. The mean (±SD) number of perforations was slightly higher (1.78 ± 1.09) among non-survivors in comparison to (1.42 ± 0.99) among survivors and this had no significant influence on

Table 2 Univariate analysis of factors that influence mortality

Variables	Survivors	Non-survivors	*p* value
Age			
≤5 years	2 (5.6 %)	4 (44.4 %)	0.01
>5 years	34 (94.4 %)	5 (55.6 %)	
Temperature >38.5 °C			
Yes	13 (36.1 %)	5 (55.6 %)	0.449
No	23 (63.9 %)	4 (44.4 %)	
Preoperative Hb < 8 g/dl			
Yes	3 (8.3 %)	2 (22.2 %)	0.258
No	33 (91.7 %)	7 (77.8 %)	
Preoperative hypokalemia			
Yes	4 (11.1 %)	0 (0 %)	0.569
No	3,288.9 %	9 (100 %)	
Nutritional status			
Normal	11 (30.6 %)	4 (44.4 %)	0.454
Malnutrition	25 (69.4 %)	5 (55.6 %)	
Number of perforation			
1	27 (75 %)	5 (55.6 %)	0.411
2–6	9 (25 %)	4 (44.4 %)	
Burst abdomen			
Yes	4 (11.1 %)	2 (66.7 %)	0.056
No	32 (88.9 %)	1 (33.3 %)	
Enterocutaneous fistula			
Yes	3 (8.3 %)	1 (33.3 %)	0.284
No	33 (91.7 %)	2 (66.7 %)	
Perforation–operation interval			
≤24 h	5 (13.9 %)	0 (0 %)	0.566
>24 h	31 (86.1 %)	9 (100 %)	
Surgical procedure			
Simple two layered closure	30 (81.1 %)	7 (18.9 %)	0.598
Wedge resection	1 (100 %)	0 (0 %)	
Segmental resection	2 (66.7 %)	1 (33.3 %)	
Right hemicolectomy	2 (66.7 %)	1 (33.3 %)	
Ileostomy	1 (100 %)	0 (0 %)	

mortality ($p = 0.35$). The mean diameter of perforation was 0.838 cm. All perforations were situated in the last 108 cm of the ileum (range = 16–108 cm).

The quantity of faecal contamination of peritoneal cavity ranged from 20 to 4,000 ml with a mean of 849.9 (±668.1) for survivors and 1,433.3 (±1,152.1) ml for non-survivors. This was not statistically significant ($p = 0.051$).

The mean (±SD) duration of operation was 93.9 ± (29.8) min for non-survivors and 108.3 (±44.8) min for survivors. There was no significant difference with treatment outcome (t test = −513, $p = 0.611$).

In all, five operative modalities were adopted in the management of these patients. These were simple closure of perforation, wedge excision and anastomosis, segmental resection and anastomosis, right hemicolectomy and primary end-to-end anastomosis, and ileostomy. Simple two-layer closure (82.2 %) of perforations after debridement of the edges were the predominant operative procedures performed in 37 patients and solitary perforation of the ileum was the indication for the procedure in 29 (78.4 %) patients. There was no statistical significance with the treatment outcome, Fischer exact test = 2.49, $p = 0.598$. Surgical technique deployed was a function of the number and location of the perforations ($p = 0.015$).

Table 3 Bivariate logistic regression analysis of select variables predicting treatment outcome

Factors	Odd ratio	*p* value	95 % CI
Age (years)			
2–5 ref	1.0		
6–10	5.79	0.134	0.58–57.94
11–15	14.76	0.033	1.24–175.80
Fever–perforation interval	1.27	0.282	0.82–1.98
Extent of peritoneal contamination	0.999	0.185	0.998–1.00
Burst abdomen	0.063	0.038	0.005–0.855

Among survivors, 31 (86.1 %) patients developed various postoperative complications. The postoperative complications were surgical site infection in 29 (80.6 %), superficial abdominal wound dehiscence in 14 (38.9 %), burst abdomen in four (11.1 %), and enterocutaneous fistula in three (8.3 %) patients. Others included residual intra-abdominal collection in two (5.6 %), re-perforation in one (2.8 %), and adhesive bowel obstruction in one (2.8 %). There was spontaneous closure of fistula in one (2.8 %) patient.

Thirteen (36.1 %) patients underwent subsequent minor operating room procedures for closure of superficial wound dehiscence in seven (53.8 %), wound debridement in two (15.4 %) and tension closure of anterior abdominal wall in four (30.8 %) patients. Six (16.7 %) major re-laparotomies were performed of which two (33.3 %) were for repair of enterocutaneous fistula, two (33.3 %) for drainage of residual intra peritoneal abscess, one (16.7 %) for repair of re-perforation and one (16.7 %) for ileostomy closure. We observed that in one patient whose fistula was resected with bowel anastomosis had anastomotic failure which required a third laparotomy. The duration of hospital stay for survivors was 8–82 days with a mean (±SD) of 20.7 (±14.1) days.

The mean and median survival time was 20.6 and 17.0 days, respectively, (Table 4). Kaplan–Meier survival analysis showed that more than 50 % of patients were alive

Table 4 Mean and median postoperative survival time of patients with typhoid perforation

	Kaplan–Meier technique		
	Survival time	Standard error	95 % CI
Mean (days)	20.6	2.4	15.9–25.3
Median (days)	17.0	1.5	14.1–19.9

after 17 days of surgical intervention (Fig. 2). Among the 39 patients that initially survived beyond the third postoperative day, six patients developed burst abdomen with 33.3 % mortality, while one (3 %) patient died among those without burst abdomen. This significantly influence mortality ($p = 0.038$, 95 % CI = 0.005–0.855). However, enterocutaneous fistula did not influence mortality ($p = 0.284$).

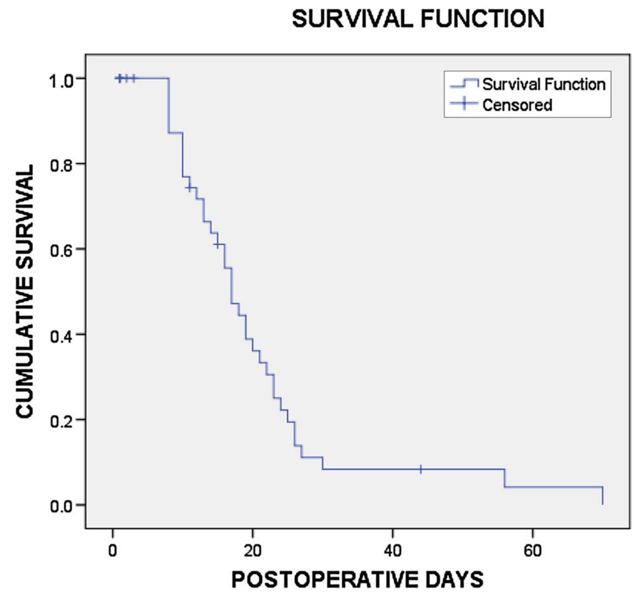

Fig. 2 Postoperative survival analysis of patients with typhoid perforation

Discussion

The incidence of typhoid intestinal perforation had previously been reported as an indication of endemic status of typhoid fever in any locality [5]. In this study the incidence of perforation was found to be 46.4 % in children; this observation is comparable with the previous study from this center [15]. Much lower incidence of 10.3 % was reported by Ameh [10] in Zaria and 11.0 % by Rahman et al. [16] in Ilorin, Nigeria. Abdul Azees et al. [17] in India reported a perforation rate of 24.4 %.

The mortality rate of 20 % in the present series is comparable to 23.7 % reported previously from this center [15] and to rates reported from other regions in Nigeria [3, 9, 13, 18]. One report from Ilorin, Nigeria, observed a relatively lower fatality rate of 10.4 % [19]. A much higher mortality rate of 39 % was reported by Ameh [10] in Zaria, while Osifo [8] in Benin, Nigeria, found a mortality of 70 %. These figures are much higher than the rates reported from other tropical countries such as 6.8 % from Nepal [20] and 10.5 % from India [21]. A much lower mortality rate 1.5–2.0 % has been reported from some parts of the developed world where socioeconomic infrastructures are well developed [22]. As in this study, overwhelming infection was the most common reported cause of death [3, 10]. Overwhelming sepsis may be a consequence of uncontrolled progression of the primary disease. In this series as in other studies, [3, 18] most deaths were recorded within the first 3 days of surgical intervention; with more than 50 % of our patients surviving well beyond 17 days of surgical therapy probably due to aggressive resuscitation and improved supportive care for these patients.

The outcome of typhoid perforation is influenced by multiple variable factors [13, 19]. In this series as in others, gender, preoperative anaemia, hypokalemia, nutritional status, and duration of operation had no statistical significant effect on mortality [10, 19]. Similarly, mortality was not affected by the degree of admission temperature and enterocutaneous fistula in this study contrary to the observation of Nasir et al. [19]. Among patients' factors that affect mortality, the most significant were the age of patients and development of burst abdomen. Earlier reports had recognized that mortality was higher in children <5 years [3, 16]. Our finding in this study had validated the association of mortality with younger age group. The adolescent age group (10–15 years) had the best chance of survival in this study. However, Adesunkanmi et al. [14] and Kella et al. [1] found that patient's age had no influence on mortality pattern. Postoperative burst abdomen was associated with significant poor prognosis in this study as 33.3 % of those who developed this complication died. This was in tandem with the report by Edino et al. [13]. Burst abdomen is often associated with surgical site infection, and fluid and electrolyte imbalance as was noted in this study. We also observed that perforation occurred in the 1st week of illness which may reflect the virulence of the organism or prevalence of the disease. Highly virulent strains of Salmonella typhi with reduced immune status on the one hand and hypersensitivity of the payers patches with an increased risk of necrosis and perforation, on the other hand are probable factors responsible for early perforation.

This review also revealed that patient whose typhoid ileal perforation occurred within the first 1–2 weeks of illness seem not have a different mortality pattern compared to those whose perforation occurred much later [23].

We believe that for this finding to be significant a large number of patients would need to be studied in prospective series. Late presentation and delayed surgical intervention had been associated with high mortality [3, 14, 18]. It is posited that overwhelming sepsis, fluid and electrolyte imbalance, severe peritoneal contamination and poor nutritional status could be responsible for the poor prognosis in these patients who have been sick for more than 2 weeks and then develop a perforation [9]. Majority of our patients did present late; however we could not establish that this conferred on them lesser likelihood of survival.

The diagnosis of typhoid ileal perforation can be made on the basis of a fever preceding the typical symptoms and signs of peritonitis and intraoperative finding of perforation of an inflamed ileum on its anti-mesenteric border [3, 6, 9]. Plain abdominal or chest X-ray with presence of air under the diaphragm should serve as an adjunct to the diagnosis. Findings from our study demonstrated free air under the diaphragm on plain abdominal X-ray in 28.6 % of cases. However, the absence of free gas under the diaphragm should not preclude the diagnosis of typhoid ileal perforation. Thus, the emphasis here is to have a high index of suspicion and to proceed with resuscitation and surgical intervention when the diagnosis is entertained.

In typhoid ileal perforation, early surgery after prompt and adequate resuscitation is lifesaving [24]. Unfortunately, late presentation appears to be the norm in our locality as 88.9 % presented after 24 h of intestinal perforation with 22.5 % mortality. The need for adequate resuscitation resulted in a delay before operation in some of our patients who had presented in a poor clinical condition, which probably contributed to high mortality in our patients. This finding has underscore the importance of reduction in perforation–operation interval as a panacea to better prognosis in typhoid ileal perforation [25]. Thus there is no reason at present for continued non operative management once the diagnosis of perforation is made and adequate resuscitation has been instituted.

The presence of single intestinal perforation in majority of our patients is consistent with other reports [3, 9, 19]. The number of perforation in a patient has been reported to have an influence on prognosis [5, 13, 14]. In the present review, we found out that patients with multiple perforations had no significantly high mortality rates compared to those with single perforation. This is in tandem with the observation of previous reports [16, 19, 26]. Beniwal et al. [21] and Kayabal et al. [27] reported better outcome in single perforation and worse prognosis in multiple perforations. Severe peritoneal contamination by purulent or faecopurulent exudate have been documented to play a role in the poor prognosis of patients with typhoid ileal perforation. Extensive contamination of the peritoneal cavity often leads to overwhelming septicemia, multiple organ failure and death of patients [4, 13]. As in a previous study [15] from this center the extent of faecal contamination of the peritoneal cavity had no influence on survival.

The most appropriate surgical procedure for the treatment of typhoid perforation remains controversial. Whereas better outcome have been reported with simple closure in many series, others [28, 29] favoured resection and anastomosis. The advocates of simple closure as opposed to segmental resection argued that in such very ill patients any prolonged and extensive procedure may lead to poorer outcome and that the ileum affected by typhoid fever, take sutures well without cutting through [7, 28, 29]. Our center protocol in managing these patients is a 2-layer closure for solitary perforation, segmental resection and end-to-end primary anastomosis in multiple adjacent perforations, right hemicolectomy and primary ileo-colic anastomosis where the caecum or distal part of the terminal ileum is involved and ileostomy or exteriorization for severe peritoneal contamination in moribund patients. Despite this, some authors have opined that treatment should be individualized as no operative procedure is likely to be applicable in all cases [30]. It is desirable therefore, to individualized operative procedure based of patients' clinical state and intra-operative findings as earlier suggested by Onen et al. [30].

The rate of complications following surgical intervention for typhoid perforation in children is high. The reported complication rate ranges from 47.6 to 100 % [1, 8]. In the present study, the incidence was 86.1 % among survivors. As in other studies, surgical site infection was the most common postoperative complication [2, 6, 9, 10, 14, 18, 19]. The high rate of surgical site infection is not un-expected as the surgical wound is assumed 'dirty' due to gross contamination of the laparotomy wound during the surgical procedure.

The mean hospital stay of 21 days for children who survived agrees with those of other studies [2, 5, 10]. However, much shorter stay was reported by Edino et al. [13]. The longer hospital stay in our study is believed to be due to the large number of patients with postoperative complications.

This study provided information on the determinants of survival of children that presented with typhoid ileal perforation in our center over 9 years. A major limitation is its retrospective nature however a prospective study could be conducted to determine the best management method of typhoid ileal perforation in our setting.

In conclusion, age $\leq$5 years and development of burst abdomen were significant determinants of poor prognostic outcome in this study. It is necessary to improve on public awareness in this condition and put in place preventive strategies to control typhoid fever. Also, early presentation and prompt treatment of typhoid ileal perforation especially in children $\leq$5 years should be encouraged.

Acknowledgement The authors wish to thank members of staff of hospital medical record department for painstakingly retrieving records of patients.

Conflict of interest The authors declare that there is no competing interest.

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