

Post-operative Complications following Laparotomy for Typhoid Intestinal Perforation in Children: Experience in a Tertiary Hospital in Enugu, Nigeria

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ABSTRACT

Background: Typhoid fever, also known as enteric fever, is a public health problem and one of the most dreaded complications of typhoid fever is typhoid intestinal perforation (TIP). Surgical treatment of TIP is fraught with complications. The aim of this study was to evaluate our experience with regards to post-operative complications that occurred following laparotomy for TIP.

Materials and Methods: This was a retrospective analysis of children aged 15 years and younger who had laparotomy for TIP at the pediatric surgery unit of a teaching hospital in Enugu, Nigeria. The study covered a 5-year period. The diagnosis of TIP was made based on clinical, investigative, intra-operative findings and histopathological confirmation.

Results: A total of 118 patients aged between 7 years and 15 years with a median age of 8 years were operated upon for TIP. There were 71 (60.2%) males and 47 (39.8%) females with a male female ratio of 1.5:1. Fever and abdominal pain were present in all the patients. Single ileal perforation was the predominant intra-operative finding and primary closure of the ileal perforation was mostly performed. The overall complication rate was 66.9%. The most common post-operative complication was wound infection. The 16 (13.6%) patients expired secondary to overwhelming infections.

Conclusion: Amongst all the surgical complications of typhoid fever, TIP is the most feared. More males were affected. Fever and abdominal pain were consistent symptoms in the patients. Single ileal perforation occurs commonly and wound infection was frequent post-operatively.

KEYWORDS: Complications, ileal, salmonella, typhoid intestinal perforation, wound infection.

1. INTRODUCTION

Typhoid fever, also known as enteric fever, is a public health problem that is seen mostly in developing countries due to lack of potable drinking water, poor hygiene and poor sanitation [1]. Enteric fever is multi system infection caused by the gram negative bacteria, *Salmonella enterica* serovar typhi and *Salmonella enterica* serovar paratyphi A and B. Transmission of enteric fever is through feco-oral route by ingestion of contaminated food and/or water [2]. There are several complications of typhoid fever of surgical importance. Typhoid intestinal perforation (TIP) is the most dreaded and most common [3]. There are differences in the incidence of TIP in developing and developed countries of the world. Some researchers have suggested that the higher virulence of *Salmonella* organisms seen in Sub-Saharan Africa may account for the higher propensity to perforation in Africans [4]. Inadequate waste disposal seen in developing countries is also contributory. Mogašale et al reported that Nigeria has one of the highest rates of typhoid intestinal perforation in developing countries [5]. TIP is a surgical emergency due to the leakage of the intestinal contents into the peritoneal cavity and attendant peritonitis. This may lead to multiple organ dysfunction syndrome and organ failure. Surgery is required for the closure of the intestinal perforation and cleaning of the peritoneal cavity. The surgery for TIP entails a laparotomy and is fraught with complications. Late presentation of the patients in low income country like Nigeria makes the complications more severe and a common occurrence. There is paucity of data on the complications that may result from the surgery required for the treatment of TIP in children. Hence, there is need to carry out this study. The aim of this study was to evaluate our experience with regards to post-operative complications that occurred following laparotomy for TIP.

MATERIALS AND METHODS

This was a retrospective analysis of children aged 15 years and younger who had laparotomy for TIP between January 2016 and August 2020 at the pediatric surgery unit of Enugu State University Teaching Hospital (ESUTH) Enugu, Nigeria. The diagnosis of TIP was made based on clinical, investigative, intra-operative findings and histopathological confirmation. All the complications that occurred during the course of treatment of the patients were noted and recorded. Patients who have had laparotomy for TIP at

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a peripheral hospital before referral to ESUTH for reoperation were included in the study. Patients who are older than 15 years of age and those with incomplete medical records were excluded from this study. ESUTH is a tertiary hospital located in south east Nigeria. The hospital serves the whole of Enugu State, which according to the 2016 estimates of the National Population Commission and Nigerian National Bureau of Statistics, has a population of about 4 million people and a population density of 616.0/km². The hospital also receives referrals from its neighboring states. Information was extracted from the case notes, operation notes, operation register, and admission-discharge records. The information extracted included the patients' age, gender, duration of symptoms before presentation, time interval between presentation and surgery, presenting symptoms, intra-operative findings, operative procedure performed and post-operative complications, duration of hospital stay and outcome of treatment. The period of follow up was for 12 months. Ethical approval was obtained from the ethics and research committee of ESUTH. Statistical Package for Social Science (SPSS) version 21, manufactured by IBM Cooperation Chicago, Illinois, was used for data entry and analysis. Data were expressed as percentages, median, mean, and range.

3. RESULTS

3.1. Patients demographics

A total of 118 laparotomies were performed for TIP during the study period. There were 71 (60.2%) males and 47 (39.8%) females. The median age of the patients was 8 years with a range of 7 to 15 years. The mean duration of symptoms prior to presentation was 6 days (range: 4 – 12) and the mean duration from presentation to surgery was 2 days (range: 1 - 4). The mean duration of hospital stay was 13 days (range; 9 - 23).

3.2. Presenting symptoms (n=118)

The predominant presenting symptoms are depicted in Table 1.

Table 1: Presenting symptoms

Presenting symptoms	Number of patients (%)
Fever	118 (100)
Abdominal pain	118 (100)
Vomiting	93 (78.8)
Constipation	62 (52.5)
Abdominal distension	51 (43.2)
Diarrhea	39 (33.1)

3.3. Intra-operative findings

All the typhoid perforations were in the ileum. All the perforations were within 50 centimeters of the ileocecal valve. Ninety-three (78.8%) patients had a single ileal perforation whereas there were multiple perforations in 25 (21.2%) patients. Each of the ileal perforation was round/ovoid in shape measuring 1-3 centimeters and was located at the antimesenteric border of the ileum. There was no perforation was noticed in the colon.

3.4. Operative procedure performed

One hundred and one (85.6%) patients had primary repair of the ileal perforation and 17 (14.4%) patients had a temporary ileostomy. None of the patients had segmental bowel resection and anastomosis.

3.5. Post-operative complications

The post-operative complications are shown in Table 2.

Table 2: Post-operative complications

Post-operative complications	Number of patients (%)
Wound infection	47 (39.8)
Intra-abdominal abscess	13 (11)
Enterocutaneous fistula	9 (7.6)
Chest infection	6 (5.1)
Wound dehiscence/Burst abdomen	2 (1.7)
Incisional hernia	1 (0.8)
Adhesive intestinal obstruction	1 (0.8)

3.6. Outcome of treatment

The outcome was good in 102 (86.4%) patients. These patients recovered fully and were discharged home. However, 16 (13.6%) patients could not make. The 16 patients expired secondary to overwhelming infections.

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4. DISCUSSION

The organism, gram negative bacillus, 'salmonella' that causes typhoid fever is named after Daniel Elmer Salmon, an American veterinary pathologist [6]. Typhoid intestinal perforation (TIP) is a serious complication of typhoid fever and is a significant surgical problem in developing countries [7]. TIP is associated with significant morbidity and mortality and its management can be challenging [7]. The rate of TIP has been reported to reflect the endemicity of salmonellosis in any setting [8]. However, the development of intestinal perforation is unpredictable [7]. Intestinal perforation could be the first sign of typhoid fever [9].

In the present study, more males were affected. This male predominance is consistent with the report of other series on typhoid intestinal perforation [7, 10]. However, a study from north eastern Nigeria reported an almost equal number of males and females affected. Other authors documented female dominance [11, 12]. The exact reason for the gender difference is not known. A researcher from Malawi attempted to explain the gender difference in typhoid intestinal perforation. In his paper, the researcher postulated that the cytokine response to an intestinal salmonella infection in males is predominantly proinflammatory due to the effect of testosterone [13]. The median age of our patients was 8 years. This finding is within the range of published age ranges for TIP [14, 15]. There are wide variations in the median ages of patients who have typhoid intestinal perforation. TIP can also occur in children who are less than 5 years of age. Ameh et al and Ekenze et al reported typhoid intestinal perforation in children who are less than 5 years of age [16, 17]. It is worthy to note that the presentation of typhoid intestinal perforation in children younger than 5 years are atypical and is associated with high mortality [24]. In developing country like Nigeria, there is late presentation of the patients. This delayed presentation is evident in the mean lag period before the patients presented to the hospital. Improper awareness and paucity of funds may account for the lack of early presentation of the patients to the hospital. The resorting of the patients' caregivers to alternative health practitioners and intake of native herbal concoctions may also be contributory. The mean 2 days interval between presentation and surgical intervention was the period required to resuscitate, stabilize and optimize the patient. Delayed patients' presentation makes the optimization more challenging.

The predominant presenting symptoms in the patients were fever and abdominal pain. The symptomatology of typhoid fever may explain these symptoms. Fever and abdominal pain were also the consistent symptoms in most studies on typhoid intestinal perforation [16, 17]. Fever usually comes before the abdominal pain. The onset of abdominal pain heralds the time of intestinal perforation, usually at the third week of salmonella infection. This sequence of symptoms is in contrast to ruptured vermiform appendix, a strong differential diagnosis of TIP, where abdominal pain usually comes before the fever. Other symptoms such as vomiting, abdominal distension, diarrhea and constipation may be present, relative to the time of presentation of the patients.

Single ileal perforation was found in most of the patients. Other researches from different climes also reported single perforation as the most common form of typhoid intestinal perforation [7, 11]. There were no colonic perforation in the current series, howbeit; some authors have published colonic perforations in TIP [3, 19]. Differences in the pathogenesis of colonic and ileal perforations have been postulated: Colonic involvement in typhoid perforation is due to direct bacterial invasion whereas ileal perforation is due to enterotoxin produced from parasitized macrophages that caused hyperplasia, necrosis and ulceration of the Peyer's patches [7, 20].

Repair of ileal perforation was the predominant modality of treatment of our patients. This repair entails freshening of the edge and closure of the perforation in a transverse manner. However, there are other options of treatment of TIP. An author from northern Nigeria reported segmental bowel resection and anastomosis as predominant option of treatment of TIP [16]. But in a setting of gross peritoneal contamination, formation of ileostomy may be advised [3]. The best option of treatment should be individualized and is at the discretion of the surgeon.

Surgery for TIP is fraught with several complications. Typhoid fever is a multi-system infection with lots of sequela. Wound infection is quite common in children who had laparotomy for TIP and is the most common complication recorded in the index study. Abantanga et al also reported wound infection as a frequent complication of TIP [21]. The leakage of intestinal contents, including microbes, into the peritoneal cavity causes superinfection with peritonitis. This may explain the high wound infection rates seen in TIP. About one-tenth of the patients had some residual intra-abdominal abscess in the early post-operative period. Improper cleaning of the peritoneal cavity and gross peritoneal contamination may be responsible. The poor pre-morbid state, low nutritional status and compromised immunity of the patients may also be contributory. Enterocutaneous fistula is a serious complication of laparotomy for TIP. It is challenging to the surgeon and devastating to the patient. Enterocutaneous fistula results from breakdown of the repaired intestinal perforation site or a new typhoid perforation. Gross presence of fecal matter and pus in the peritoneal cavity impairs healing and encourages fistula formation. In fact, spontaneous enterocutaneous fistula has been reported as a rare presentation of typhoid fever [22]. Other complications such as wound dehiscence, chest infection and incisional hernia were also reported by similar papers on TIP [7, 23].

The outcome of treatment of TIP in children in our centre is fair. However, about one-tenth of the patients expired. A meta-analysis from New Zealand reported a mortality of 20% among patients that were treated for TIP [24]. Sepsis is a significant cause of mortality in TIP. Even in adults, sepsis is a prominent cause of death [25].

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5. CONCLUSION

Amongst all the surgical complications of typhoid fever, TIP is the most feared. More males were affected. Fever and abdominal pain were consistent symptoms in the patients. Single ileal perforation occurs commonly and wound infection was frequent post-operatively. Future studies will examine the predictive factors that may have an effect on mortality in children treated for TIP.

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