

Typhoid intestinal perforation in North Central Nigeria

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Summary

Background: Typhoid intestinal perforation is a surgical problem with severe morbidity and high mortality in North Central Nigeria.

Patients and Methods: In order to determine the pattern and the prognostic indices, we studied 101 patients with typhoid intestinal perforation managed over a ten-year period

Results: Children constituted 49% of the cases and majority (78%) of the patients were in the low socio-economic strata. The incidence peaked to 67% between November and March – the dry season in Nigeria. The male/female ratio was 1.9:1 with a mean age of 19 years and a mean hospitalization period of 18 days. There were 167 perforations; four involved the large bowel and appendix, and in 72.2% cases, the perforation was single. The mortality rate was 13.9%, affected mostly children and significantly worsened by prolonged perforation-surgery interval > 72 hours, jaundice, convulsion, ASA V, faecal peritonitis and re-exploration for early intra-peritoneal complications. Morbidity rate was 65.3% and significantly affected more children than adults and associated with perforation-surgery interval of between 24 and 72 hours, haematochezia and multiple perforations. Moribund patients fared better when operated upon under local anaesthesia with adequate analgesia. The least traumatic but effective surgical procedure that could seal the perforations and keep the peritoneum clean gave the best results. Children who survived up to 5 days and adults who survived up to 10 days after surgery had better chances of survival.

Conclusion: The most significant prognostic factor is late presentation which prolongs perforation-surgery interval and the other complication and mortality indices are directly influenced by it.

Key words: Typhoid intestinal perforation, Prognostic factors, Dry season, Low socio-economic strata

Résumé

Introduction: La perforation typhoïde intestinale est un problème chirurgical avec une morbidité et une mortalité élevée grave au Nord central du Nigeria.

Patients et Méthodes: Afin de décider la tendance et les indices pronostiques, nous avons étudié 101 patients atteints de la perforation typhoïde intestinale soignée au cours d'une période de dix ans.

Résultats: Des enfants constituaient 49% des cas et le plus grand nombre (78%) des patients étaient dans le groupe socio-économique bas. L'incidence était élevée en 67% entre novembre et mars - pendant la saison sèche au Nigeria. Le rapport homme/femme était 1,9:1 avec un âge moyen de 19 ans et la période d'hospitalisation moyenne de 18 jours. Nous avons eu 167 perforations; quatre concernent l'intestin supérieur et appendice, et dans 72,2% des cas, il y avait une

seule perforation. Le taux de la mortalité était 13,9% impliquant principalement des enfants et remarquablement rendu mauvais par un intervalle prolongé d'une perforation chirurgicale. >72 heures. Jaunisse, convulsion, ASA V, péritonite fécale et une ré exploration pour des complications intrapéritonite précoce. Le taux de la mortalité était 65,3% et a remarquablement impliqué plus des enfants que des adultes et lié à l'intervalle de la perforation chirurgicale entre 24 et 72 heures, hématochezie et des perforations multiples. Des patients moribonds se portent mieux lorsqu'on lui a opéré sous l'anesthésie locale avec l'analgésie nécessaire. Le moindre traumatique mais un protocole chirurgical efficace qui pourrait boucher les perforations et rend le péritoine propre a donné des meilleurs résultats. Des enfants qui ont survie jusqu'au cinquième journée et des adultes qui ont survie jusqu'au dixième journée après l'intervention chirurgicale avaient eu des meilleurs chances de survie.

Conclusion: Le trait pronostique le plus important est la présentation retardé ce qui est responsable pour la longue durée d'intervalle de perforation chirurgicale et d'autre complication et indice de la mortalité sont directement influencés par ce phénomène.

Introduction

Typhoid intestinal perforation is the most serious surgical complication of typhoid enteritis and it is common in most developing countries^{1,2,3,4}. The mortality and morbidity rates of typhoid intestinal perforation have remained in double digits in developing countries in the last quarter of a century^{5,6,7}. This disease affects mostly young adults who contribute enormously to the economy of their countries. This impacts negatively on the economy of third world countries. It also affects children^{8,9} but it is most common in people in the low socio-economic strata². With high index of suspicion, the diagnosis of typhoid intestinal perforation could be made with a high level of accuracy based on clinical features and basic laboratory investigations⁹. Prompt and effective surgery is the best option after adequate resuscitation and appropriate antibiotic cover. The results are better if the simplest but effective procedures capable of sealing the perforations are employed with gentle tissue handling. The purpose of this study was to establish the pattern of this disease and to determine the prognostic indices that impacted on the outcome in the management of typhoid intestinal perforation.

Material and methods

A total of 101 consecutive patients with typhoid intestinal perforations managed between January 1994 and December 2003 at Jos University Teaching Hospital, Jos, North Central Nigeria form the basis of this study.

They were all operated upon by surgical trainees and consultant staff in our service by adopting similar protocol

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of adequate resuscitation and prompt surgical intervention under appropriate antibiotic cover. Their demographic data, clinical features, the subjective time of perforation, investigations, surgical options employed and management outcome were entered into a proforma and analysed.

The investigations that were done included the packed cell volume (PCV), white cell count, Widal's agglutination test, serum urea and electrolytes, plain erect abdominal x-rays, grouping and cross-matching of blood, culture of blood, stool and peritoneal fluid as well as histology of the edge of perforation and mesenteric nodes when they were enlarged. Electrocardiogram (ECG) and liver function tests were obtained when indicated. HIV serology, which became available at this centre at the middle of this study, was obtained in patients who gave informed consent in adults, or by parents in the case of children.

Inclusion criteria: All the patients in this study were diagnosed as typhoid intestinal perforation based on their clinical, laboratory and operative findings of longitudinal perforations in the jejunum and ileum as well as between the taenia coli in the colon. Three groups of antibiotics were administered depending on the choice of the surgeon as well as the ability of the patient to afford the cost. Each patient received either a combination of clavulanated amoxicillin and metronidazole, a third generation cephalosporin, or a combination of gentamicin, ampicillin and metronidazole. The ASA grading of each patient was determined pre-operatively; moribund patients were managed at the intensive care unit (ICU) after surgery. Oral feeds were started at about the fifth post-operative day for patients who had passed flatus by the fifth day; the others on a later day when flatus and bowel motion commenced.

These patients were followed up for 6–36 months. The data obtained were analyzed using the EPI-INFO version 2000.

Results

Epidemiology: Out of a total of 101 patients with typhoid intestinal perforation 49.5% were children under 15 years while 50.5% were adult; 85% of the children were between 4 and 10 years old. There were 66 males and 35 females with a male/female ratio of 1.9:1. Their ages ranged from 4 to 85 years with a mean of 19.9 years. Majority, 79(78.2%) patients were in the low socio-economic strata, 17(16.8%) were in the middle class while 5(4.8%) were in the upper class; the class distribution of the patients were as shown in Table 1. While 68(67.3%) patients presented during the dry season, 33(32.7%) patients presented during the rainy season and the monthly incidence is as shown in Fig. 1.

Clinical features: Fever and abdominal pain were common to all the patients and the other clinical features were as shown in Table 2. The fever-perforation interval was less than 7 days in 40(39.6%), 7 to 14 days in 43(42.6%) and more than 14 days in 18(17.8%). The fever-perforation interval when related to morbidity and mortality did not show predilections for any of the three groups as the complication rate of 65% in this study was distributed as follows: 19.8% in the first group, 24.7% in the second group and 20.8% in the third group. The mortality rate of 13.9% in this study was distributed as follows: 3.9% in the first group, and 5% each for the second and third

Table 1 Registrar general British social classification

Class	Description	No. of patients	Percentage (%)
I	Professionals and business men	2	1.9
II	Lesser professional, traders and teacher	3	2.9
III N	Skilled non-manual e.g. clerical staff	6	5.9
III M	Skilled manual e.g. electricians, lorry drivers	11	10.9
IV	Semi-skilled manual e.g. machine operators, farm workers	33	32.7
V	Unskilled manual to the unemployed e.g. labourers	46	45.5

Upper class = Classes I & II; Middle Class = Classes III N & III M; Lower class = Classes IV

Table 2 Clinical features

Parameter	No. of patients	Percentage (%)
Fever	101	100
Abdominal pain	101	100
Vomiting	89	88
Abdominal distension	93	92
Haematochezia	26	25.7
Pallor	11	10.8
Dehydration	73	72
Feculent gastric aspirates	15	14.9
Jaundice	10	9.9
Convulsion	6	5.9

Table 3 Site of perforation

Site of perforation	No. of patients	Percentage (%)
Jejunum	7	4.2
Ileum	156	93.4
Caecum	2	1.2
Appendix	1	0.6
Ascending colon	1	0.6
Total	167	100

groups. The time of typhoid intestinal perforation was subjectively determined as the time the patient felt an excruciating sharp pain with worsening of symptoms. In small children it was taken as the time the mother noticed abdominal distension, constipation and vomiting. In this study, the perforation-surgery interval in 20(19.8%) patients was within 24 hours, it was 24–72 hours in 30(29.7%) patients and more than 72 hours in 51(50.5%). In relating this finding to morbidity and mortality, out of the twenty patients with perforation-surgery interval of less than 24 hours, none died and only one of them had a complication (superficial wound infection); among the thirty patients with perforation-surgery interval of 24–72 hours, twenty nine (96.7%) had post-operative complications and one(3.3%) patient die while out of the fifty one patients with perforation-surgery interval of more than 72 hours, thirteen(25.5%) died while thirty eight(74.5%) patients had complications.

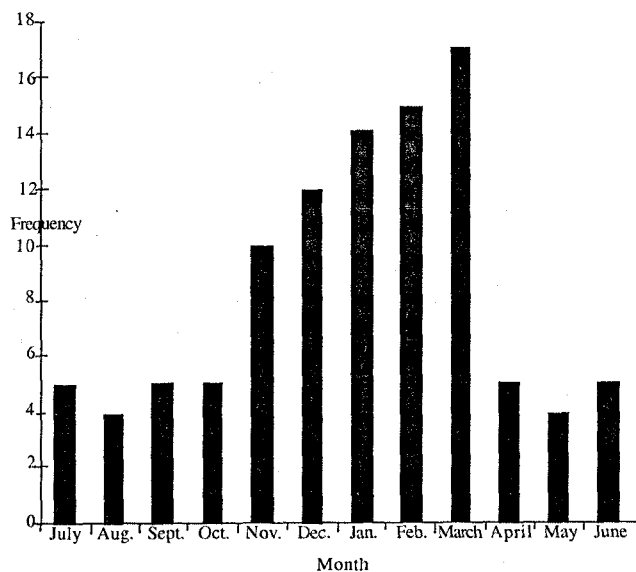
Investigations: Pneumo-peritoneum was present in the plain abdominal x-rays of 33 (32.7%) patients. Widal's Test was significant (i.e. titre = or > 1 in 160 dilutions) in 78(77.2%) patients. The HIV status of 61(60.3%) patients was recorded

Table 4 Type of surgery and relationship to morbidity and mortality

Site of perforation	No. of patients	Percentage (%)	No of patients with complications
Single layer closure	17	16.8	3
Double layer closure	35	34.7	6
Resection and anastomosis within 15cm of the terminal ileum	17	16.8	15
Resection and anastomosis at more than 15cm from ileocaecal junction	14	13.9	3
Right hemicolectomy	16	15.8	3
Exact procedure not specified	2	1.9	1

Table 5 Complications

Early complications	No. of patients	Percentage (%)
Chest infection	37	36.6
Surgical wound infection	31	30.7
Superficial wound dehiscence	19	18.8
Peritoneal abscess	8	7.9
Entero-cutaneous fistula	5	4.9
Burst abdomen	4	3.9
Typhoid Psychosis	3	2.9
Cardiac failure	1	0.9
Multiple organ failure	1	0.9
Late complications		
Adhesive intestinal obstruction	13	12.9
Incisional hernia	7	6.9
Gallbladder disease	5	4.9

**Fig. 1** Monthly incidence of typhoid intestinal perforation

and seven of them were positive; these seven patients had post-operative wound infection in three, chest infection in three and burst abdomen in one patient. Sixty three (62.4%) patients were transfused and they received an average of 1.8 units of blood. Twenty five (24.8%) patients needed correction of their electrolytes (bicarbonate and potassium) derangement and were duly corrected pre-operatively while 12(11.8%) other patients had the same electrolyte derangements post-operatively. Only one of these patients had an early complication of intra-abdominal abscess.

Anaesthetic assessment. All the patients were assessed pre-operatively using the American Society of Anaesthetists (ASA) pre-operative grading. Moribund patients made up 16(15.8%) of the cases. Out of the 14 deaths in this report, ten were pre-operatively graded as ASA V, three as ASA IV and one as ASA III. Sixty(59.4%) patients in ASA III & IV had complications and all the surviving 6(5.9%) patients in ASA V also had complications. There was no death or complication in the 19(18.8%) patients in ASA I & II. Ninety two (91.1%) patients were operated upon under general anaesthesia while 9(8.9%) patients – all moribund – were operated upon under local 1% lignocain infiltration of the anterior

abdominal wall under adequate non-narcotic analgesia - slow intravenous Dipyrone 5-7mg/kg to a maximum of 500mg. Among the nine patients operated upon under local anaesthesia, six were jaundiced and three others had convulsed pre-operatively; no death was recorded among these patients operated under local anaesthesia.

Surgical findings: A total of 167 perforations were recorded, 163(97.6%) of them in the jejunum and ileum and disposed longitudinally on the antimesenteric border while 4(2.4%) were located in the large bowel and the appendix as shown in Table 3. The perforations in the colon and caecum were between the taenia coli. All the four cases with perforations located in the appendix, caecum and the colon had, in addition, multiple perforations in the terminal ileum. Beside their significant Widal's titre, no evidence of concomitant chronic inflammatory lesions were recorded in the histology of the resected specimens in these four patients and their stool microscopy did not show evidence of helminthic lesions like amoebiasis or schistosomiasis. The perforations were single in 78(77.2%) patients and multiple in 23(22.8%) patients. The maximum number of perforations in a single patient was 25 perforations. Twenty patients with multiple perforations had complications and they made up 86.9% of patients with multiple perforations; the other three patients had no complications.

Among the sixteen(15.8%) patients with faecal peritonitis, fourteen(13.9%) died and one(0.9%) had burst abdomen but survived.

Surgical procedure: Three surgical procedures were employed in this study: simple closure; right hemicolectomy; segmental resection and anastomosis. Simple closure was employed in 52(51.5%), resection and anastomosis in 31(30.7%) and right hemicolectomy in 16(15.8%) patients as shown in Table 4. Out of the 51 patients who had simple closure, 9 of them had complications compared to 18 out of 31 patients who had resection and anastomosis and 3 out of 16 who had right hemicolectomy. The patients who had segmental resection/anastomosis were grouped into two: one group of 17(16.8%) patients who had resection/anastomosis within 15cm of the terminal ileum and another group of 14(13.9%) patients who had resection/anastomosis at a point more proximal than 15 from the ileo-caecal junction. Though the distribution of patients in these two groups was similar, the complication rate in the group with anastomosis within 15cm of the terminal ileum was five times when compared to

the other group.

Fourteen (13.9) patients had re-exploration between the third and seventh day post-operatively as follows: 8 (7.9%) for intra-peritoneal abscess, 4 (3.9%) for burst abdomen and 2 (1.9%) for enterocutaneous fistula. Post-operative paralytic ileus of more than 5 days was noticed in 29 (28.7%) patients and 25 (86.2%) of them had complications; none died.

Mortality & Morbidity: Sixty six (65.3%) patients had complications as shown in Table 5. The most common complications were: chest infection in 37 (36.6%) patients, wound infection in 31 (30.7%) patients and wound dehiscence in 19 (18.8%) patients.

There were 14 (13.9%) deaths in this study and 10 of them were children while 4 were adults. Among the paediatric patients, four died as a result of intra-operative cardiac arrest on the operating table, one died on the first post-operative day of multiple organ failure and five died of sepsis following re-exploration for early complications on the 3rd and 4th day post-operative days. The four adult patients died of sepsis between the 4th and 9th post-operative days.

Discussion

Since Archampong⁵ reported a mortality rate of 25% from typhoid intestinal perforation in 1976, more than a quarter of a century thereafter the scourges of this disease continue till date with double digit mortality in the West African Sub-region,^{1,6,7,10} as well as in other developing regions of the world^{2,3,11,12,13}. About 33% of the patients were in Social Class IV while 45% were in Social Class V using the Registrar-General of Great Britain Social Classification¹⁴ as shown in Table 1. Social Classes I & II – the professional and business classes – constituted only 5% of the cases in this study. This goes to show that typhoid intestinal perforation wears the face of the poor in developing countries. The influence of social class on this disease had earlier been reported by Amin and co-workers². Typhoid intestinal perforation affected the male gender twice as much as the female gender. The mean age was 19 years though the age ranged between 4 and 85 years. About 85% of the children clustered between 4 and 10 years. This disease therefore affects mainly the young and this impacts negatively not only on the economy of the developing world but also has a far-reaching impact on the future of the developing countries as the disease affects children adversely^{7,8,9,10,15}. The incidence of typhoid intestinal perforation peaked sharply between the months of November and March – the dry season in North Central Nigeria – when safe drinking water is scarce; 67% of the patients in this study presented in the dry season as shown in Fig. 1. The incidence dropped sharply in April when the heavy rains typical of the tropical environment arrived and provided abundant supply of water in the rural areas as well as replenish the water dams and reservoirs in the cities. The seasonal incidence of this disease had been observed by another worker⁸ in Northern Nigeria who observed that though the disease occurred all through the year it peaked in the dry season. The diagnosis of typhoid intestinal perforation could be made with a high degree of accuracy based on detailed history, physical examination and basic laboratory and radiological investigations⁹. The clinical features in this study are as shown

in Table 2. Fever-perforation interval did not show predilection for morbidity or mortality in this report.

The mortality of typhoid intestinal perforation in Australia¹⁶ as far back as 1993 had dropped from 25% to as low as 1%. Even among the recently emerging economies of some Asian nations from their previous third world economy to the industrialized type, the incidence of typhoid intestinal perforation has dropped to negligible levels, often with no mortality. In the work of Chiu and co-workers in Taiwan¹⁷ in a period of fourteen years, 71 children had typhoid fever and only 2 (3%) of them had intestinal perforations and the mortality rate was nil for all the typhoid complications. The common feature of these countries with very low incidence of typhoid intestinal perforation and zero mortality rates is the regular provision of safe drinking water and high standard of sanitary environment for every body, at all times, in these countries. The most significant finding of this study is that delay in surgical repair of the intestinal perforation was the singular factor which influenced morbidity and mortality of typhoid intestinal perforation. The pre-operative American Society of Anaesthetists (ASA) grading impacted on the morbidity and mortality of the patients in this review. Kolawole¹⁸ in his work on typhoid intestinal perforation in a developing country, had earlier shown that the majority of the patients operated upon for typhoid intestinal perforation were in ASA III & IV – the high risk group. This is in keeping with our experience as 65% of the patients in this study were in ASA III & IV and 16% in ASA V while 19% were in ASA I & II. Out of the 14 deaths in this study, patients in ASA V constituted 71% of the deaths while 91% of the patients in ASA III & IV had complications.

The four jaundiced patients who were operated upon under general anaesthesia died but those operated upon under local anaesthesia and non-narcotic analgesia (Dipyrone) survived. It is our view that patients who are unfit for general anaesthesia should be offered this option as intraoperative cardiac arrest is more likely to occur in these moribund patients when operated upon under general anaesthesia¹⁹.

Out of the one hundred and sixty seven perforations recorded in this report, 93% affected the ileum, 4% affected the jejunum and 3% affected the colon and appendix as shown in Table 6. Though rare, simultaneous perforation of the appendix in a patient with typhoid perforation of the ileum had been reported by other workers²⁰. The four patients with perforations in the appendix, caecum and ascending colon also had multiple perforations of the terminal ileum in the anti-mesenteric border. Their Widal's titres were high and their stools did not show helminthes like *E. histolytica* or schistosomes and the histology of the resected specimens did not show evidence of chronic inflammatory bowel lesion that would otherwise account for these uncommon sites of perforation. The implication of this is the need to conduct thorough and systemic exploratory laparotomy searching for perforations in both the small intestine, colon and the appendix in every patient with typhoid intestinal perforation. The association of fecal peritonitis with mortality had been reported by another worker¹¹. Simple closure of the perforations in the small intestine gave the best results in this report while

resection and anastomosis within 15 cm of the terminal ileum gave the worst outcome as shown in Table 4. Right hemicolectomy is a major procedure for these patients who present late and therefore less traumatic, quick and safe procedures give better outcome. Noorani and co-workers³ as well as Connolly and colleagues²¹ had reported good results with simple closure which is easy to perform but Ameh and colleagues²² reported that segmental resection and anastomosis gave the best result in their series though they did not differentiate the result of resections within the terminal 15 cm as opposed to resection of the ileum at a more proximal site. This demonstrates that what is required is a simple less traumatic procedure that could seal the perforation along with thorough peritoneal lavage. The mortality rate in this report is 14% and affected more children than adults. Re-exploration for early intra-operative complications was responsible for more than a third of the death. Minimal invasive procedures like ultrasound-guided aspiration techniques for intra-abdominal abscess and conservative management of entero-cutaneous fistulae with oral or intravenous hyperalimentation are better alternatives than early re-exploration. Surgical correction of late complications was not associated with further mortality. All the death among the children in this study, died by the fourth postoperative day while the adults died by ninth postoperative day. Therefore children who survived up to the fifth post-operative day as well as adults who survived up to tenth post-operative day had better chances of survival. The factors directly related to morbidity and mortality are multifactorial and these include age, social class, perforation-surgery interval, ASA preoperative grading, choice of anaesthesia, faecal peritonitis, multiple perforation, surgical procedure employed and the ability of the patient to survive for up to the fifth postoperative day in children and tenth postoperative day in adults. The mean hospitalization period was 18 days and the patients were followed up for periods ranging between 6 and 36 months; patients without complications dropped out of follow up early while those with complication continued with follow up until recovery.

The main limitation of this study is in its retrospective nature.

In all, the most significant prognostic factor in this study is late presentation which prolongs perforation-surgery interval and the other morbidity and mortality indices are directly influenced by it.

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