

Original Research Article

Spectrum of presentation and prognostic factors in non-traumatic small bowel perforations

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ABSTRACT

Background: The small bowel perforation peritonitis is one of the main causes of generalized acute peritonitis in developing countries. The aim is to find out the prognostic factors affecting the mortality and morbidity of non-traumatic small bowel perforations.

Methods: A total of 50 patients of any age and either gender of non-traumatic small bowel perforation peritonitis were included and studied prospectively. The prognostic evaluation was assessed by the impact of pre-operative prognostic factors and per operative findings on post-operative complications and mortality.

Results: One third of the patients were of 20-30 years of age followed by 18% who belonged to 10-20 years age group. Operative findings revealed mean duration of surgery was 2 hours. Majority of patients (33) had bilio-purulent peritonitis. Post-operative pulmonary complication revealed 56% (28 out of 50) patients were having pulmonary complications. Post-operative wound complication showed surgical site infection as the most common complication noted and managed by sending wound culture and changing antibiotics. Second most common was burst abdomen managed initially by dressing and thereafter secondary wound closure. Delay in intervention (DII) had significant correlation with world society of emergency surgery (WSES) score and amount of peritoneal fluid.

Conclusions: Most common cause of non-traumatic small bowel perforation was typhoid ileal perforation with most common presentation being pain abdomen. The significant factors defining the outcome of these patients were volume of intra-peritoneal fluid (purulent/fecal) >1000 ml, WSES score >6 and Mannheim's peritonitis index (MPI)>18.

Keywords: Perforation peritonitis, Enteric perforation, Sepsis severity score, DII, Prognostic factors

INTRODUCTION

Perforation peritonitis is the most common surgical emergency in India and presents as acute abdomen. The small bowel perforation peritonitis is one of the main causes of generalized acute peritonitis in developing countries, mainly due to tuberculosis and typhoid fever, while non-infectious pathology is more common in

western countries.¹⁻⁴ Peritonitis following perforation may lead to multi-organ failure and death unless it is treated promptly.⁵ Perforation of terminal ileum is a cause for obscure peritonitis, presented as exacerbation of abdominal pain along with tenderness, rigidity and guarding, most presented over right iliac fossa. The patients presented in non-traumatic perforation of small intestine is nonspecific.^{2,6} The patients diagnosed mainly

clinically with radiological finding of free air under diaphragm being supportive.^{3,6,7} The severity assessment done according to the score of WSES which has a range of 0-18 and is assessed at admission by clinical condition of the patient. It has been observed that the factors that significantly predict mortality in patients following surgery of perforation peritonitis are tachycardia, tachypnea, hypotension, anemia, renal failure and septicemia, amount of contamination, size and number of perforations.⁸ The other factors are extreme ages of life, delay in consultation, a long period of admission to the operating room, the amount of peritoneal fluid beyond 1000 ml; feculent multiple perforations and the surgical procedure for predicting mortality.⁹ The objective of this study is to study presenting features of these patients and to study factors influencing the outcome in these patients.

METHODS

The present prospective case control study was conducted in the department of general surgery at Pt. B. D. Sharma institute of medical sciences, Rohtak from may-2018 to april 2019. Fifty patients were enrolled in study who qualified inclusion criteria. An informed consent was taken from all patients for inclusion in the study.

Inclusion criteria

Cases of non-traumatic small bowel perforation were included in the study.

Exclusion criteria

Cases of traumatic small bowel perforation and cases of gut perforation other than small bowel (e.g., appendicular, gastric, duodenal, large bowel perforation) were excluded from the study. Detailed history with special reference to presence of fever, pain, vomiting, abdominal distension, constipation and treatment prior to admission was taken. On examination, vital signs, hydration, abdominal distension, tenderness, guarding and presence of free fluid was noted. All patients were resuscitated preoperatively with intravenous fluids and broad-spectrum antibiotics were given. Patients unfit for surgery were initially treated with closed peritoneal drainage under local anesthesia as a temporary measure prior to definitive laparotomy. Most cases received cefotaxime or ciprofloxacin with metronidazole. In case of gross peritoneal contamination aminoglycosides were added. All patients underwent laparotomy through midline incision under general anesthesia. The amount and type of peritoneal contamination, number, site and size of perforations and procedure employed was noted. The choice of procedure was based on surgeon's preference or unit policy. The following procedures were employed: 1. Simple two-layer closure and 2. Resection and anastomosis. The biopsy specimen was sent for histopathological examination. Post-operative complications were noted. The factors influencing mortality and morbidity and outcome were assessed. The study was

approved by the institutional ethics committee. At the end of the study, the data was collected and analyzed by using appropriate statistical methods. A p value of less than 0.05 was considered significant. The data was analyzed by using SPSS software (version 21.0 for Microsoft windows; SPSS Inc.).

RESULTS

One third of the patients who came with perforation peritonitis were of 20-30 years of age followed by 18% who belonged to 10-20 years age group. Mean age of the patients who presented with perforation peritonitis was 36.6 years with $p=0.56$ that shows age is not a confounding factor (Table 1). Among patients who presented with perforation peritonitis, majority (84%) of the patients were males. Only 8 out of 50 patients were females with $p=0.21$ suggesting gender is not a confounding factor (Table 2). 88% of the patients were having BMI of 18.5-24.9. Mean BMI of the patients was 22.42. 47 out of 50 patients were having ASA status II. Majority of the patients (88%) had CCI score of zero. Pulse rate with mean of 102.86 and SD of 15.23, respiratory rate with mean of 23.38 and SD of 1.92, temperature with mean of 99.52 F and SD of 0.55, systolic BP with mean of 107.44 mm of mercury and SD of 24.54 and diastolic BP with mean of 71.72 mm of mercury and SD of 71.72 were observed.

Table 1: Age distribution (n=50).

Age (years)	Frequency (%)
10-20	9 (18)
20-30	17 (34)
30-40	7 (14)
40-50	7 (14)
50-60	3 (6)
>60	7 (14)
Mean \pm SD	36.6 \pm 18.1

Table 2: Gender distribution, (n=50).

Gender	Frequency (%)
Female	8 (16)
Male	42 (84)

X-ray findings revealed 98% (49 out of 50) of the patients presented with pneumo- peritoneum (Table 3).

USG abdomen revealed around 54% of patients presented with free fluid in pelvis, 16% presented with free fluid in pelvis and Morrison's space and 14% presented with moderate ascites (Table 4).

Table 3: CXR/XR-abdomen, (n=50).

X-ray findings	Frequency (%)
NAD	1 (2)
Pneumoperitoneum	49 (98)

Table 4: USG abdomen, (n=50).

USG findings	Frequency (%)
Abdomen full of gases	3 (6)
Free fluid in pelvis	27 (54)
Free fluid in pelvis and Morrison's pouch	8 (16)
Inter-gut free fluid	1 (2)
Minimal inter-gut fluid	2 (4)
Moderate ascites	7 (14)
NAD	2 (4)

WSES sepsis severity score is a new practical clinical severity score for patients with complicated intra-abdominal infections and is specific for intra-abdominal infections. When the total score is under or 3, the severity is low; score 4-6: moderate severity; score upper or equal 7, the severity is high associated with poor prognosis. Total score is 18 with higher the score higher is the morbidity and mortality. The study showed that 70 % of patients presented with score of 3, 12% presented with score of 6 and 10% presented with score of 5 (Table 5).

Table 5: WSES score and mortality.

Mortality	N	Mean	Std. Deviation
No	45	3.71	1.375
Yes	5	6.60	2.510
Total	50	4.00	1.726

Operative findings revealed mean duration of surgery was 2 hours. and 16 min and SD of 59 min. Mean width of perforation was 0.9 cm and SD of 0.56 cm. Mean length of perforation was 0.84 cm and SD of 0.40 cm. Duration of surgery, width and length of perforation were not significant factors for mortality ($p>0.05$). Mean amount of peritoneal fluid was 699 ml and SD of 626.3 ml. Calculation of fluid was done by calculating fluid collected in the jar for mortality. Mean MPI was 18.44 and SD of 3.34. Both MPI and amount of peritoneal fluid were significant factors for mortality ($p<0.05$) (Table 6).

Table 6: Descriptive data of operative findings.

Variables	Min	Max	Mean	SD	P
Duration of surgery (hours)	1.15	4.00	2.16	0.59	0.83
Width of perforation (cm)	0.50	3.00	0.9	0.56	0.61
Length of perforation (cm)	0.50	2.00	0.84	0.409	0.26
Amount of fluid (ml)	100	4000	699	626.3	0.01
MPI	16.00	28.00	18.44	3.34	0.01

Majority of patients (33) had bilio-purulent peritonitis out

of which 4 expired. Least number of patients (3) had feco-purulent peritonitis out of which 1 expired. Type of fluid had no significant correlation with post-op mortality ($p>0.05$).

About 82% patients had E. coli in their culture and 18% were having sterile peritoneal fluid culture. Post-operative pulmonary complication revealed 56% (28 out of 50) patients were having pulmonary complications out of which 17 were having pneumonitis, 9 with effusion, 2 with ARDS and 44% (22 out of 50 patients) were not having any pulmonary complications.

Post-operative wound complication showed surgical site infection was the most common complication noted which was managed by sending wound culture and changing antibiotics. Second most common was burst abdomen managed initially by dressing and thereafter secondary wound closure. One case had developed septicemia who got expired.

Five out of fifty patients expired during hospital stay. About 78% (39 out of 50) cases were diagnosed as enteric perforation and 16% (8 out of 50) were diagnosed as tubercular perforation (Table 7).

Table 7: Spectrum of peritonitis and its causes, (n=50).

Final diagnosis	Frequency (%)
Enteric perforation	39 (78)
Tubercular perforation	8 (16)
Non-specific jejunal perforation	1 (2)
Non-specific ileal perforation	1 (2)
Carcinomatous perforation	1 (2)

Around 52% of the patients stayed in hospital for 5-10 days whereas 28% patients stayed for 10-15 days, 10% patients stayed for more than 20 days. Seven out of 50 cases were operated after 24 hours. of admission whereas 43 cases underwent laparotomy within 24 hours. Two of these seven patients with delayed intervention had post-operative mortality. However, it was not statistically significant. About 88% (44/50) patients had CCI of 0 at the time of admission. The 37 of these 44 patients were operated within 24 hours. Whereas remaining 7 could be operated after 24 hours. The 62% (31 out of 50) patients developed surgical site infection out of which 5 had DII for >24 hours. The 38 % (19 out of 50) patients did not develop any surgical site infection out of which 2 had DII for >24 hours. There was no significant correlation of DII with CCI and surgical site infection.

A total of 14% (7 out of 50) patients had DII out of which 2 had WSES score of 9 and 2 had WSES score of 6. DII had significant correlation with WSES score and amount of peritoneal fluid (Table 8 and 9).

MPI and DII had $p>0.05$ suggesting no significant correlation.

Table 8: DII and WSES score.

Variables			WSES score					Total
			3.00	5.00	6.00	8.00	9.00	
DII>24 hours	No	N	33	5	4	1	0	43
		%	76.7	11.6	9.3	2.3	0	100
	Yes	N	2	0	2	1	2	7
		%	28.6	0	28.6	14.3	28.6	100
Total	N	35	5	6	2	2	50	
	%	70	10	12	4	4	100	

Table 9: DII>24 hours and amount of peritoneal fluid.

DII >24 hours		Amount of peritoneal fluid
No	Mean	615.12
	SD	337.804
Yes	Mean	1214.29
	SD	1429.952
Total	Mean	699.00
	SD	626.334
P value		0.01

DISCUSSION

Perforation peritonitis remains one of the most common surgical emergencies worldwide. The etiology and site of perforation shows wide geographical variation and the spectrum of perforation peritonitis in India differs from that of the western world. Although many studies have been carried out on prognostic factors in non-traumatic small bowel perforation in past and they found that DII, amount of peritoneal fluid, type of peritonitis, WSES score and MPI were significant factors which affect morbidity and mortality of patients.

In the study conducted by Mabewa et al in which mean time for operation was 2 hours and the mean of perforation size was 1 cm. The results were comparable to the present study.¹⁹

The study showed that MPI was significant prognostic factor for morbidity and mortality in the patients of perforation peritonitis. Similar results were found in studies conducted by Kamble et al, Murlidhar et al and Irpatgire et al.¹⁴⁻¹⁶

The study suggests that there is significant association between amount of peritoneal fluid and mortality which is similar to studies conducted by Hodonou et al and Wani et al.^{7,13} Whereas in study conducted by Ahmad et al there was no significant association between amount of peritoneal fluid and mortality as majority of patients (78%) in present study had less than 1000 ml of peritoneal fluid.¹¹

Majority of the patients (78%) had enteric perforation in our study followed by tubercular perforation (16%). Similarly, in studies conducted by Ahmad et al, Wani et

al and Hodonou et al, majority of the patients had enteric perforation whereas in study conducted by Verma et al majority of patients had non-specific inflammation.^{7,11-13}

Most common post-operative complication in our study is surgical site infection (62%). Similar results were found in studies conducted by Verma et al, Ahmad et al and Hodonou et al but rate of infection was quite higher in our study which was probably due to late presentation of patients and poor nutritional status.¹¹⁻¹³

The study revealed that 56 % patients were having pulmonary complications. Yadav et al in his study showed that 7.8% patients were having pulmonary complications.¹⁰ In study conducted by Verma et al showed that the incidence of post-operative pulmonary complication in emergency abdominal surgeries was found to be 2.9%.¹²

In the study conducted by Ahmad et al, mortality remained nil in all those cases who had early presentation, admission-operation interval shorter than 12 hours, size of perforation less than 1 cm, amount of pus/fecal fluid less than 1000 ml and had primary simple closure.¹¹ Three mortalities (5.4%) occurred among the cases with primary loop ileostomy due to a significant impact of pre-operative and per operative prognostic factors on post-operative complications and had a significant association with late presentation, admission-operation interval longer than 12 hours, perforation with size more than 1 cm, amount of pus/fecal fluid greater than 1000 ml. Mortality rate in relation to different post-operative complications was 23% in burst abdomen, 33% in residual intra-abdominal abscess, 50% in fecal fistula.

Hodonou et al observed in his study that the predictive factors were: delay in consultation time, surgical time, amount of peritoneal fluid, perforation number, surgical technique and postoperative complications such as digestive fistula and postoperative peritonitis.¹³ The mortality increased with the elevation of the WSES score. Thus, prognostic factors deciding outcome in cases of non-traumatic small bowel perforations in the present study were similar to previous such studies.

DII has significant association with mortality in study conducted by Hodonou et al with mean delay of 72 hours.¹³ In study of Wani et al mean delay was 46 hours.⁷ In study conducted by Verma et al mean delay was quite

less (14.7 hours).¹² In study conducted by Cruz et al there was significant association between DII and mortality and similar results were found in study conducted by Adesunkanmi et al.^{17,18} In previous studies there was significant correlation between DII and mortality but in present study there was no significant association between DII and mortality and total seven patients had DII. The study was limited by small sample size of only 50 patients and most of the patients are from a single surgical unit of an institute.

CONCLUSION

The study concluded that the most common cause of non-traumatic small bowel perforation was typhoid ileal perforation with most common presentation being pain abdomen. The statistically significant factors defining the outcome of these patients were volume of intra-peritoneal fluid (purulent/fecal) >1000 ml, WSES score >6 and MPI>18. The delay in surgical intervention (>24 hours) and post-operative fecal fistula were other factors associated with high morbidity and mortality but these were not statistically significant, possibly due to small number of cases included in the study.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Diarra MS, Kanté MN, Koné CS, Dembélé K, Dolo M. Peritonitis by intestinal perforation in the region of Sikasso. Final report of the National Institute for Public Health Research Mali. Mali Med. 2013;28(3):21-24.
2. Kimchi NA, Broide E, Shapiro M, Scapa E. Non-traumatic perforation of the small intestine. Report of 13 cases and review of the literature. Hepatogastroenterol. 2002;49(46):1017-22.
3. Kapoor VK, Mishra MC, Ardhani R, Chattopadhyay TK, Sharma LK. Typhoid enteric perforations. Jap J Surg. 1985;15:205-8.
4. Sharma MP, Bhatia V. Abdominal tuberculosis. Indian J Med Res. 2004;120:305-15.
5. United Arab Emirates (UAE). Ministry of Health. The Statistical Report. 2004.
6. Noorani MA, Sial I, Mal V. Typhoid perforation of small bowel: a study of 72 cases. J R Coll Surg Edinb. 1997;42:274-6.
7. Wani RA, Parray FQ, Bhat NA, Wani MA, Bhat TH, Farzana F. Non traumatic terminal ileal perforation. World J Emerg Surg. 2006;1(1):1-4
8. Ray P, Gupta HN, Roy M. Sushruta Samhita. Indian Science Academy. N.K. Gossain and Co. (Pvt.) Ltd. 1980;338.
9. Zachary Cope. A History of Acute Abdomen. 2nd Edition, Oxford University Press. 1965;12.
10. Yadav D, Garg PK. Spectrum of perforation peritonitis in Delhi: 77 cases experience. Indian J Surg 2013;75(2):133-7.
11. Rahman K, Krishnaswamy J, Muthukumar G, Prakash S. A comparative study on outcome of ileal perforation after primary perforation closure and resection and ileostomy. Int Surg J. 2018;5(2):445-51.
12. Verma H, Pandey S, Sheoran KD, Marwah S. Surgical audit of patients with ileal perforations requiring ileostomy in a Tertiary Care Hospital in India. Surg Res Pract. 2015;2015:1-4.
13. Hodonou MA, Allode SA, Tamou-Sambo B, Seto DM, Houegnanou MH, Dossou FM. Prognostic Factors of Non-Traumatic Small Bowel Perforation Peritonitis: A Multicenter Study in North Benin. J Surg. 2018;6(1):29-32.
14. Kamble RS, Singh M, Jaiswal Y. Prognostic factors in perforative peritonitis: an observational study. Int Surg J. 2016;3(3):1082-92.
15. Muralidhar VA, Madhu CP, Sudhir S. Efficacy of Mannheim peritonitis index (MPI) score in patients with secondary peritonitis. J Clin Diagn Res. 2014;8(12):NC01.
16. Irpatgire RN, Badane A. Efficacy of Mannheim peritonitis index (Mpi) score in patients with perforation peritonitis. Int J Surg. 2019;3(4):457-9.
17. Adesunkanmi AR, Ajao OG. The prognostic factors in typhoid ileal perforation: a prospective study of 50 patients. J R Coll Surg Edinb. 1997;42(6):395-9.
18. Paredes C, Cruz J, Diaz-Plasencia J, Prevost M. Prognostic factors in typhoid perforation. J Gastroenterol Peru. 1993;13(1):13-9.
19. Mabewa A, Seni J, Chalya PL, Mshana SE, Gilyoma JM. Etiology, treatment outcome and prognostic factors among patients with secondary peritonitis at Bugando Medical Centre, Mwanza, Tanzania. World J Emerg Surg. 2015;10(1):1-7.

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