

Original Research Article

PREOPERATIVE PREDICTORS OF MORTALITY IN ADULT PATIENTS WITH GASTRIC AND SMALL BOWEL PERFORATION

Parth Dhamija, Tejinder Paul Singh,¹ Ashwani Kumar², Jaswinder Singh, Dinesh Kumar Pasi³

S.R.¹, Professor & Head², Assoc. Professor³,

Deptt of General & Minimal Access Surgery, GMC & Rajindra Hospital, Patiala

Corresponding Author : Dr. Parth Dhamija

S.R., Deptt of General & Minimal Access Surgery, GMC & Rajindra Hospital, Patiala

E-mail: parthdhamija04@gmail.com

ABSTRACT

Background: Perforation peritonitis is one of the most serious conditions encountered by a surgeon in the emergency. As a result, it becomes important to diagnose this condition early and intervene at the earliest. Higher mortality rates have been implicated with this disease as a result of which understanding of preoperative predictors of mortality becomes necessary to lower down these rates. **Methods:** A prospective study of 60 cases diagnosed with perforation peritonitis who underwent laparotomy was undertaken at Government Medical College and Rajindra Hospital, Patiala and data was collected in terms of age, gender, signs and symptoms, presentation to hospital, surgery timing and hematological investigations and was evaluated. **Results:** Distribution of cases showed a bimodal pattern where both younger and middle age group patients were present, majority of which were males (53/60). Ileal perforation was the most common intraoperative finding in the younger population whereas 50% (7/14) of cases in the middle age group had gastric perforation. 41/60 patients presented within 72 hrs from the onset of symptoms out of which only 3 patients died. 53/60 patients underwent exploratory laparotomy within 24hrs of admission. Higher mortality was observed in patients having raised total leucocyte count(TLC), deranged renal function tests (RFT) and dyselectrolytemia. **Conclusion:** Through our study we aimed to evaluate the importance of certain preoperative factors that can play a role in predicting mortality in patients of gastric and small bowel perforation.

Keywords : Peritonitis, Perforation, Predictors, Mortality

INTRODUCTION

Peritonitis is the inflammation of the peritoneum which may be primary where the source of infection is outside the peritoneal cavity, or secondary which occurs due to a perforated hollow viscus, or tertiary which develops following treatment of secondary peritonitis.^[1] Peritonitis is mainly a clinical diagnosis with tenderness, rigidity, guarding and vomiting being the important presenting features. A plain chest X-ray showing presence of free air under the domes of diaphragm confirms the diagnosis for further surgical intervention.^[2] Occurrence of gastroduodenal or ileal perforations is relatively common in our country due to

excessive smoking, alcohol or coffee consumption, increased use of NSAIDS like aspirin, ibuprofen etc., and prevalence of infections such as H. pylori and typhoid fever.^[3] Majority of the patients present to the emergency in late stages (septicemia, shock) where despite advancements in surgical techniques, antimicrobial therapy and intensive care, morbidity and mortality rates are very high. In addition, various risk factors such as old age, co-morbid conditions, deranged liver and renal function, coagulopathies etc. affect the treatment outcome.^[4-8] Interaction of patient related factors, disease-specific factors and diagnostic and therapeutic interventions determine the prognosis and

outcome of peritonitis. Thus categorizing the patients based on preoperative risk factors would help predict the outcome, select patients for intensive care and determine operative risk ultimately deciding on final therapeutic intervention.^[9]

A delay in presentation with subsequent septic shock was considered as the most important determinant of mortality in study done by Desa et al^[10] which is corroborated by studies done by Simmen et al^[11], Singh R et al^[4], Jhobta RS et al^[5], Moller MH et al^[6] and Afridi SP et al^[11] where further delay results in setting of dyselektrolytemia, acute respiratory distress syndrome (ARDS) and toxemia. This is relevant in our region as most of the population lives in semi-urban and rural areas where proper hospital services are not available and presence of quacks further causes delay in provision of authentic treatment. Poor physiologic reserves along with presence of co-morbid conditions in old age leads to inability of the frail body to counter stressful measures such as setting of peritonitis.^[4,11-13]

Studies done by Gupta SK et al^[3], Testini M et al^[14], Sunil K et al^[15] and Tanveer A et al^[16] have recommended to stabilize the patients of perforation peritonitis with intravenous(IV) fluids and antibiotics at least two hours prior to surgery as it has to shown to have a better outcome as compared to patients going for immediate surgery. Correction of dyselektrolytemia and deranged RFT's is advisable as they are associated with poor operative outcomes.^[4,15,17-18]

This study was done with the aim to highlight the preoperative factors resulting in mortality in 60 patients admitted with provisional diagnosis of perforation peritonitis of small bowel in Government Medical College and Rajindra Hospital, Patiala.

MATERIALS AND METHODS

A prospective study of 60 patients of perforation peritonitis who underwent exploratory laparotomy was done at GMC and Rajindra Hospital, Patiala where a detailed symptomatic history along with history of comorbid conditions and treatment history was taken. Monitoring of vitals was done and recorded. Abdominal examination was done in a detailed manner and patients were checked for signs and symptoms of perforation peritonitis. Following radiological

investigations in the form of chest X-ray and ultrasound abdomen and resuscitation with intravenous fluids and administration of IV antibiotics, patients were taken up for exploratory laparotomy and intraoperative findings were noted.

RESULTS

Table 1 : Age and Sex Distribution

Age Group (Years)	Male		Female	
	No. of cases	%age	No. of cases	%age
16-25	14	23.33	4	6.67
26-35	11	18.33	2	3.33
36-45	8	13.33	0	0
46-55	13	21.67	1	1.67
56-65	5	8.33	0	0
66-75	1	1.67	0	0
>75	1	1.67	0	0
Total	53	88.33	7	11.67
Range	17-85		20-50	
Mean	40.53 ± 15.92		29.57 ± 9.81	

Table 2 : Age wise Distribution of Site of Perforation

Site of Perforation	Age groups (Years)							Total
	16-25	26-35	36-45	46-55	56-65	65-75	>75	
Gastric	2	4	2	7	3	1	0	19
Duodenal	2	1	1	3	0	0	0	7
Jejunal	2	1	0	1	0	0	1	5
Ileal	12	7	5	3	2	0	0	29
Total	18	13	8	14	5	1	1	60

Majority of the patients in our study population were males (53 out of 60) with a bimodal distribution where the number of patients was almost equal in the age groups of 16-25 and 46-55 (14 and 13 respectively). Out of 14 cases in the younger age group, 12 cases had ileal perforation while 7 cases out of the 13 cases of 46-55 age group had gastric perforation. This is attributable to the fact that typhoid disease is prevalent more in the younger population and is one of the most common causes of ileal perforation. Similar results can also be seen in the female group where 6 out of 7 cases belong to the younger population. Whereas increased incidence of smoking and alcohol consumption in addition to NSAID abuse is more common in middle to old age population which results in peptic ulcer disease with complications as gastric and duodenal perforation.

Abdominal pain was the most consistent presenting symptom in our study (60 cases, 100%), followed by

nausea/vomiting (38 cases, 63.34%). Guarding was the most common sign seen on abdominal examination (59 cases, 98.33%) followed by abdominal tenderness (56 cases, 93.34%). In addition, 9 cases had bilateral chest crepitations which may be attributed to development of concurrent respiratory infections in the setting of septicemia or due to pre-existing COPD especially in smokers.

Table 3 : Time Difference between onset of Sympmtoms and Presentation to the Hospital

Duration	No. of patients	Percentage (%)	No. of deaths	p- value	Significance
≤ 24 hrs	23	38.33	2	0.036	Significant
2-3 days	18	30.00	1		
4-5 days	13	21.67	0		
6-7 days	2	3.33	1		
8-9 days	1	1.67	1		
10 th day	3	5.00	2		
Total	60	100	7		

Majority of patients in our study presented within the first 72 hrs of the onset of symptoms (41 out of 60) resulting in timely resuscitative measures and surgical intervention which is evident by highly low levels of mortality (3 cases) which signifies the importance of early presentation to the surgical emergency. Mortality rates were higher in patients presenting a week or later

(4 out of 6 cases) where the patients usually land up with severe septicemia and multi organ dysfunction (MODS).

Table 4 : Time delay between Hospital admission and Surgery

Duration between admission and surgery	No. of cases	Percentage	No. of deaths	p-value	Significance
Within 24 hrs	53	88.33	7	0.634	Non-significant
Day 2	6	10.00	0		
Day 3	0	0	0		
Day 4	1	1.67	0		
Total	60	100	7		

Majority of the patients (88.34%) were operated within 24 hrs of admission. One patient was operated on Day 4 as the patient did not give consent for surgery initially. All the 7 deaths that have occurred in the study were in those patients who were operated at the earliest. This may be due to the maximum number of patients falling under this group which suggests a multimodal array of factors responsible for surgical outcome. Maximum patients being operated within first 24 hrs gives an impression that the surgeons are well acquainted with the benefits of early intervention after prompt diagnosis and adequate resuscitation.

Table 5 : VITALS

Heart Rate (/min)	No. of cases/No of deaths	p-value and significance	Blood pressure (mmHg)	No. of cases/No of deaths	p-value and significance	Respiratory rate (/min)	No. of cases/No of deaths	p-value and significance
<100	37/1	0.045 Significant	≤ 90	19/6	0.019 Significant	<20	19/0	0.044 Significant
100-120	22/6		91-139	30/1		20-24	19/1	
>120	1/0		≥ 140	11/0		>25	22/6	
Total	60/7		Total	60/7		Total	60/7	
Range	78-130		Range	90-160		Range	15-34	
Mean ± SD	98.62±11.08		Mean ± SD	109.23±20.46		Mean ± SD	22.98±5.10	

Tachycardia is one of the earliest signs to depict the presence of infection in the body. Its presence indicates timely antibiotic administration and fluid resuscitation. 23 patients in our study had heart rate above 100/min. Similar to tachycardia, low BP is a feature of septicemia as endotoxins released by bacteria cause peripheral vasodilation superadded by third space volume loss

resulting in hypotension and poor tissue perfusion. 49 patients in our study has SBP <140 mm Hg. Sepsis results in metabolic acidosis where body tries to compensate by increasing the respiratory rate (Tachypnoea). 41 patients had RR >20/min. All the 7 deaths had tachycardia, hypotension and tachypnoea in different intensities.

Table 6 : Hematological Investigations – Part 1

Total Leucocyte Count (TLC) (/mm ³)	No. of cases/No of deaths	p-value and significance	S. urea (mg%)	No. of cases/No of deaths	p-value and significance	S. Creatinine (mg%)	No. of cases/No of deaths	p-value and significance
< 4000	0/0	0.038 Significant	21-40	49/3	0.047 Significant	≤ 1.5	39/6	0.048 Significant
4000-11000	41/2		41-60	7/1		1.6-1.9	20/0	
> 11000	19/5		> 60	4/3		≥ 2.0	1/1	
Total	60/7		Total	60/7		Total	60/7	
Range	4000-16000		Range	20-108		Range	0.7-3.5	
Mean ± SD	10163.58 ± 2685.57		Mean ± SD	38.20 ± 16.82		Mean ± SD	1.32 ± 0.44	

Table 7 : Hematological Investigations – Part 2

S. Sodium (mEq/L)	No. of cases/No of deaths	p-value and significance	S. Potassium (mEq/L)	No. of cases/No of deaths	p-value and significance
< 136	31/3	0.659 Non-significant	< 3.5	7/1	0.926 Non-significant
136 -144	29/4		3.5 -5.2	52/6	
> 144	0/0		> 5.2	1/0	
Total	60/7		Total	60/7	
Range	122 -142		Range	3-5.3	
Mean ± SD	134.07 ± 5.25		Mean ± SD	4.33 ± 0.56	

19 cases had TLC count > 11000/mm³ out of which 5 deaths (of total 7) were recorded. This can be explained by the fact that body activates inflammatory cascade in response to bacterial load resulting in raised TLC. 11 patients had blood urea levels >40mg% where out of total 7 deaths, 4 were recorded. This may be attributed to the setting of poor renal function as a result of decreased tissue perfusion in septicemia.

Serum sodium and potassium levels in all of our patients were on the lower side of the spectrum probably due to inflammatory cascade and dehydration and the values were found to be statistically non-significant.

DISCUSSION

Secondary peritonitis due to perforation of a hollow viscus organ primarily small bowel is a common occurrence in surgical emergency setting. This prospective study of 60 patients at GMC and Rajindra hospital, Patiala was undertaken to evaluate preoperative predictors of mortality in small bowel perforation where mortality was taken as the final outcome.

Age is an important prognostic factor in predicting the mortality in patients of perforation peritonitis as evident by reviews done by Sanjay G and Robin K et al^[13] where higher mortality was observed in patients aged 50 years and above. Barut et al^[17] in their study observed 8 deaths in 26 cases aged above 60 years where they concluded that age is an important predictor of mortality in such patients. Older patients tend to have a reduced physiological reserve as a result of which the body is not able to handle stressful events such as septicemia leading to prolonged hospital stay and a delayed recovery resulting in higher mortality rates. In our study as well, out of the total 7 deaths that occurred, maximum mortality was seen in the 56-65 years age group.

53 out of the total cases in our study were males. This heavy preponderance could be due to alcohol addiction, excessive smoking, outdoor life and consumption of irregular meals along with lack of exercise. Similar results were obtained in studies done by Choudhary J et al^[19], Memon AA et al^[20] and Jhobta RS et al^[5].

Table 8 : Comparison of Studies in regards to age

Study	Male	Female
Choudhary (2010) ^[19]	85.5%	11.6%
Memon AA et al (2012) ^[20]	77%	23%
Jhobta RS et al (2006) ^[5]	84%	16%
Present Study	88.34%	11.67%

A delay in presentation to the hospital is one of the most important factor in contributing to higher morbidity and mortality rates in cases of perforation peritonitis. This is usually due to lack of health awareness especially among the rural population, lack of proper health care facilities in the vicinity and dependence upon local quacks/chemists for the treatment. Studies done by Gupta SK et al^[3], Afridi SP et al^[11], Tanveer et al^[16] and Robin K and Sanjay G^[13] have observed higher mortality rates in patients presenting late to the hospital.

Chalya LP et al^[21] in their study observed that majority of patients in their study presented in poor general condition and concluded that early presentation equals lower morbidity and mortality rates. Paryani JJ et al^[22] stated that delayed presentation leads to septicemia

leading to lower survival rates. In our study as well, 16 out of 60 cases presented after 4 days from the onset of symptoms with 4 out of total 7 deaths occurring in such group. Therefore it is imperative on part of health department and administration to make the population aware about the importance of seeking early specialized treatment from the professionals for their diseases.

The timing of surgical intervention is as important as is the presentation to the hospital. Early intervention is associated with lower mortality rates as evident by study done by Singh R et al^[4] where 75% patients were operated within 24hrs of admission out of which only 3 patients died. However, in our study, 53 (88%) cases underwent laparotomy within 24 hrs but all 7 deaths occurred in this group only. This was attributed to the fact that majority of these were of old age and had

presented late to the hospital.

Tachycardia, Hypotension and tachypnoea are the important signs with which the patients of perforation peritonitis usually present. Monitoring and understanding of these vitals is important in predicting the overall outcome for the patient. Studies done by Barut I et al^[17], Samuel CJ et al^[18] and Singh R et al^[4] have recognized that patients having heart rate > 100/min had poor operative outcomes. 6 patients in our study had heart rate > 100/min who later on passed away. Barut I et al^[17] and Samuel CJ et al^[18] also observed hypotension (<90 mm Hg SBP) as a poor prognostic factor. Singh R et al^[4] considered > 20/min RR to be associated with higher mortality whereas Paryani JJ et al^[22] mentioned > 30/min RR to be related to increased mortality.

Paryani JJ et al^[22] observed raised TLC count to have poor outcome after surgery. Singh R et al^[4] in his study observed septicemia in patients having TLC count > 11000/mm³. He also mentioned RFT's to be independent predictors of mortality. Deranged levels were associated with increased mortality. Jhobhta RS et al^[5] in his study reported hyponatremia in 29% cases whereas hypokalemia was seen in 9% of the patients, although no relation to mortality was associated. Tan KK et al^[23] observed deranged serum potassium levels to be associated with worse outcomes in perforation

patients. Evaluation suggests that correction of the electrolytes is imperative for better surgical outcomes and subsequent reduction in mortality rates.

CONCLUSION

Perforation peritonitis is one of the most common presentations to the hospital emergency and is associated with significant morbidity and mortality. Through our study we have come to a conclusion that it is possible to predict mortality in perforation peritonitis patients via a number of factors, of which age, early presentation to the hospital along with early intervention and deranged hematological interventions are significant ones. A large sample size would be required for evaluation of certain other intrinsic factors which may play a role in occurrence of mortality in such patients.

LIMITATIONS

Larger sample size may be required to increase the statistical power of the study and therefore form detailed correlations between various variables. This being a single centre study, its findings may not be applicable to other settings.

CONFLICT OF INTEREST

The authors report no conflicts of interest related to this study

FINANCIAL SUPPORT

The authors received no financial support for the research, authorship and/or publication of this article.

REFERENCES

1. Simmen HP, Heinzelmann M, Largiader F. Peritonitis: Classification and causes. *Digestive Surgery*. 1996 Nov 6;13(4-5):381-3.
2. Yildirim M, Engin Ö, İlhan E, Coşkun A. RISK FACTORS AND MANNHEIM PERITONITIS INDEX FOR THE PREDICTION OF MORBIDITY AND MORTALITY IN PATIENTS WITH PEPTIC ULCER PERFORATION. *Nobel Medicus Journal*. 2009 Sep 1;5(3).
3. Gupta SK, Gupta R, Singh G, Gupta S. Perforation peritonitis: A two year experience. *Jk Science*. 2010 Jul 1;12(3):141.
4. Singh R, Kumar N, Bhattacharya A, Vajifdar H. Preoperative predictors of mortality in adult patients with perforation peritonitis. *Indian journal of critical care medicine: peer-reviewed, official publication of Indian Society of Critical Care Medicine*. 2011 Jul;15(3):157.
5. Jhobta RS, Attri AK, Kaushik R, Sharma R, Jhobta A. Spectrum of perforation peritonitis in India-review of 504 consecutive cases. *World journal of Emergency surgery*. 2006 Dec;1:1-4.
6. Møller MH, Shah K, Bendix J, Jensen AG, Zimmermann-Nielsen E, Adamsen S, Møller AM. Risk factors in patients surgically treated for peptic ulcer perforation. *Scandinavian journal of gastroenterology*. 2009 Jan 1;44(2):145-52.
7. Külah B, Gülgez B, Ozmen MM, Ozer MV, Coşkun F. Emergency bowel surgery in the elderly. *The Turkish Journal of Gastroenterology: The Official Journal of Turkish Society of Gastroenterology*. 2003 Sep 1;14(3):189-93.
8. SEO JH, PARK HK, PARK YH, LEE HK, LEE WG, CHO SY, LEE JN, LEE YD. Prognostic factors in duodenal ulcer perforation. *Journal of the Korean Surgical Society*. 2001:425-31.
9. Malik AA, Wani KA, Dar LA, Wani MA, Wani RA, Parray FQ. Mannheim Peritonitis Index and APACHE II-Prediction of outcome in patients with peritonitis. *Turkish journal of trauma and emergency surgery*. 2010 Jan 1;16(1):27-32.
10. Desa LA, Mehta SJ, Nadkarni KM, Bhalerao RA. Peritonitis: A study of factors contributing to mortality. *Indian J Surg*. 1983;45:593-604.
11. Afridi SP, Malik F, Ur-Rahman S, Shamim S, Samo KA.

- Spectrum of perforation peritonitis in Pakistan: 300 cases Eastern experience. *World Journal of Emergency Surgery*. 2008 Dec;3:1-5.
12. Hiyama DT, Bennion RS. Peritonitis and Intraperitoneal Abscess: Maingot's Abdominal Operation Micheal J. vol.;1:634-53.
 13. Gupta S, Kaushik R. Peritonitis-the Eastern experience. *World journal of emergency surgery*. 2006 Dec;1:1-6.
 14. Testini M, Portincasa P, Piccinni G, Lissidini G, Pellegrini F, Greco L. Significant factors associated with fatal outcome in emergency open surgery for perforated peptic ulcer. *World Journal of Gastroenterology*. 2003 Oct 15;9(10):2338.
 15. Kumar S, Gupta A, Chaudhary S, Agrawal N. Validation of the use of POSSUM score in enteric perforation peritonitis-results of a prospective study. *Pan African Medical Journal*. 2011;9(1).
 16. Ahmad T, Khan MI, Hussain N, Siddiqui E, Islam ZU. Perforation operation interval as a prognostic factor in typhoid ileal perforation. *J Surg Pakistan (International)*. 2009 Jan;14:11-4.
 17. Barut I, Tarhan OR, Cerci C, Karaguzel N, Akdeniz Y, Bulbul M. Prognostic factors of peptic ulcer perforation. *Saudi medical journal*. 2005 Aug 1;26(8):1255-9.
 18. Samuel JC, Qureshi JS, Mulima G, Shores CG, Cairns BA, Charles AG. An Observational Study of the Etiology, clinical presentation and outcomes associated with peritonitis in Lilongwe, Malawi. *World journal of Emergency surgery*. 2011 Dec;6:1-5.
 19. Choudhary J. Spectrum of perforation peritonitis-260 cases experience. *Journal of NAMS*. 2010 Jul;10(2).
 20. Memon AA, Siddiqui FG, Abro AH, Agha AH, Lubna S, Memon AS. An audit of secondary peritonitis at a tertiary care university hospital of Sindh, Pakistan. *World journal of emergency surgery*. 2012 Dec;7:1-5.
 21. Chalya PL, Mabula JB, Koy M, Kataraihya JB, Jaka H, Mshana SE, Mirambo M, Mchembe MD, Giiti G, Gilyoma JM. Typhoid intestinal perforations at a University teaching hospital in Northwestern Tanzania: A surgical experience of 104 cases in a resource-limited setting. *World journal of emergency surgery*. 2012 Dec;7:1-1.
 22. Paryani JJ, Patel V, Rathod G. Etiology of peritonitis and factors predicting the mortality in peritonitis. *National Journal of Community Medicine*. 2013 Mar 31;4(01):145-8.
 23. Tan KK, Bang SL, Sim R. Surgery for small bowel perforation in an Asian population: predictors of morbidity and mortality. *Journal of Gastrointestinal Surgery*. 2010 Mar 1;14(3):493-9.