

Original Research Article

A prospective study of effectiveness of Mannheim peritonitis index scoring system in predicting the morbidity and mortality in peritonitis due to hollow viscous perforation

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ABSTRACT

Background: Peritonitis is defined as inflammation of the peritoneal cavity, caused by a number of etiologic agents including bacteria, fungi, viruses, chemical irritants, and foreign bodies. The Mannheim peritonitis index (MPI) is one of the simple scoring systems in use that allows the surgeon to easily determine outcome risk. Aims and objective: To estimate outcome of patients with perforation peritonitis. To evaluate effect of MPI score in identification of high risk cases.

Methods: A prospective study was conducted in 100 patients with peritonitis due to hollow viscous perforation at surgical unit of tertiary care unit. The duration of study was 2 years. All the data was recorded. Written informed consent was obtained and data was analyzed using appropriate analysis strategy.

Results: In this study, total 100 patients enrolled, out of which 54 % patients were in the age group <50 years and 46% patients were in the age group >50 years. Mortality was higher among patients with age group more than 50 years (21%) and in female patients (37.93%). 18 patients had organ failure. 87 patients had preoperative duration was >24 hours. 93% patients had non-colonic origin of sepsis. In 52 (52%) patients total MPI score was <21 while 25 (25%) patients total score was 21-29 and it was >29 in 23 (23%) patients. Mortality was higher among patients with MPI Score more than 29 (95.65%).

Conclusions: MPI is accurate to be used with patients with peritonitis and should be considered reliable and simple reference for estimating their risk of death. This study differs in one adverse outcome variables, non-colonic origin of sepsis, we advocate need for further studies on Mannheim peritonitis index to include colonic origin of sepsis.

Keywords: Gastro-intestinal surgery, Mannheim peritonitis index, MPI score, Perforation peritonitis

INTRODUCTION

Peritonitis was recognized as a universal fatal condition from the earliest of times.^{1,2} Peritonitis is defined as an inflammation of the peritoneal cavity, caused by a number of etiologic agents including bacteria, fungi, viruses, chemical irritants, and foreign bodies.³ In all age-groups it carries a high morbidity and mortality, but particularly in middle and late age groups.

Primary peritonitis is an infection of the peritoneal cavity not directly related to other intra-abdominal abnormalities. Most cases are due to bacterial infection. Secondary peritonitis is the most common and follows an intraperitoneal source usually from perforation of hollow viscera. Secondary peritonitis is a critical and life-threatening surgical condition which is the most common surgical emergency in most of the general surgical units across the world. It is often associated with significant

morbidity and mortality.⁴ Tertiary peritonitis has been considered as a later stage in the disease process, when clinical peritonitis and systemic signs of sepsis persist after treatment for secondary peritonitis and either no organisms or low virulence pathogens, such as enterococci and fungi, are isolated from the peritoneal exudate.⁵ Despite aggressive surgical techniques such as radical debridement, lavage systems, open management and planned re-operation, the prognosis of peritonitis and intra-abdominal sepsis is still poor, especially when multiple organ failure develops.⁶ Early prognostic evaluation is desirable to be able to select high-risk patients for more aggressive treatment, especially in severe peritonitis.^{7,8} Pain is the most common symptom and may be localized or diffuse; it is usually constant and of a sharp, pricking character. Anorexia, malaise, nausea and vomiting are common associated features. Constipation is usually present, unless a pelvic abscess develops (which can cause diarrhoea).⁹⁻¹¹ Along with treatment, control of the primary source of sepsis is essential.¹² Several other factors associated with it like any comorbid condition and presentation to health facility and higher value of various score can be predict worse outcome.¹³⁻¹⁸ Various scoring systems have been used to assess the prognosis and outcome of peritonitis. Those used include the Mannheim peritonitis index (MPI) (1983), the acute physiological and chronic health evaluation score (APACHE II) (1985), the peritonitis index altona (PIA), the sepsis severity score (1983) and the physiological and operative severity score for enumeration of mortality and morbidity (POSSUM).¹⁹ The MPI is a prognostic index for peritonitis with high accuracy in individual prognosis and that it is also very easily documented.^{7,20-23} With this background this study wants to estimate outcome of patients with perforation peritonitis and to evaluate effect of MPI score in identification of high risk cases.

METHODS

A prospective study was conducted in tertiary care center located in western part of India. This study was conducted from august 2016 to July 2018 and included a total of 100 patients with peritonitis due to hollow viscous perforation came to surgical units. Sample size was calculated based on assumption that total number of case came during the study period based on inclusion and exclusion criteria will be included. A total of 108 case came during study period out of which 8 cases were excluded so total 100 cases were included. After obtaining detailed history, complete general physical and systemic examination, the patients will be subjected to relevant investigations. The complete data was collected in a specially designed case recording form.

Inclusion criteria

Patients with clinical suspicion and investigatory support for the diagnosis of peritonitis due to hollow viscous perforation who are later confirmed by intra-operative

findings were included. Along with that various etiologies causing such features like acute peptic disease, typhoid, tuberculosis, appendicitis and malignancy were included.

Exclusion criteria

Patients with hollow viscous perforation due to trauma, patients with associated vascular, neurogenic diseases and patients with any other significant illness which is likely to affect the outcome more than the disease in study were excluded.

Diagnosis was made by a combination of history, clinical examination and on the basis of the reports of the radiological examinations after which the patients was posted for emergency laparotomy. Once the diagnosis of peritonitis was confirmed by the operative findings of the patients, the patients were accepted for the study. Along with all the parameters, MPI was calculated. Age, sex and organ failure was needed to calculate MPI index. The criteria which were used for the presence of organ failure are as follows published by Deitch et al.²⁴ Patients were divided into three categories according to the score: category I for Score less than 21, Category II for score between 21 to 29 and Category III for Score more than 29. MPI was developed by Wacha et al.²⁵ They found linear correlation between mean index score and mean mortality rate. The main advantage of MPI score was easy to use, determine risk during operation and possible outcome easy to asses.

Patient with less score can be treated with usual minimal risks, while patient with high score may need aggressive approach with critical care monitoring. Concept of programmed relaparotomy, zip technique surgery may need to be considered in these cases. This had some disadvantage like it doesn't include possibility of eradicating source of inflammation and this assign colon to be a low risk. All data was entered in Microsoft excel and analyzed using SPSS version 16. This study was approved by institutional ethical committee. Written Informed consent/assent was obtained from all patients. All quantitative data was presented in form of frequency and percentage. All the variables were compared for discharge and died patients. Unpaired t test was applied to compare MPI score.

RESULTS

In our study, maximum number of the patients were in the age group 46-60 years (n=29), 25 patients in the age group 15-30, 23 patients in the age group 31-45, 22 patients >61 years and only 1 patient in the age group <15 years. 54 patients (54%) were in the age group <50 years and 46 patients (46%) were in the age group >50 years. There were 71 patients (71%) were male and 29 patients (29%) were female. The site of perforation was gastric (39%) followed by ileal perforation and appendicular perforation i.e. 26% and 16% respectively.

Table 1: Distribution of different variable in patients.

Variables	Frequency (%)	
Age group (years)	<15	1 (1)
	15-30	25 (25)
	31-45	23 (23)
	46-60	29 (29)
	61 and above	22 (22)
Sex	Male	71 (71)
	Female	29 (29)
Site of perforation	Gastric perforation	39 (39)
	Ileal perforation	26 (26)
	Appendicular perforation	16 (16)
	Colonic perforation	09 (09)
	Duodenal perforation	05 (05)
	Jejunal perforation	04 (04)
	Gall bladder perforation	01 (01)
Pre-operative duration	<24 hours	13 (13)
	24 hours and more	87 (87)
Type of peritonitis	Localised	23 (23)
	Diffuse	77 (77)
Type of fluid (exudate)	Clear	25 (25)
	Feacal	25 (25)
	Purulent	50 (50)
MPI score	<21	52 (52)
	21-29	25 (25)
	>29	23 (23)

Colonic, duodenal, jejunal and gallbladder perforation was found in 9%, 5%, 4% and 1% respectively. Only 18 patients had organ failure and 87 patients had pre-operative duration more than 24 hours. 6 patients had malignancy. Origin of sepsis was colonic in 93% patients. In this study, 77 patients (77%) had diffuse peritonitis while 23 patients (23%) had localized peritonitis. 50 (50%) patients had purulent exudates while clear and fecal exudates were present in 25 (25%) and 25 (25%) patients respectively. In 52 patients total MPI score was <21 while in 25 patients total score was 21-29 and it was >29 in 23 patients.

Table 2: Distribution of different variable in patients.

Variables	Present (%)	Absent (%)
Organ failure	18 (18)	82 (82)
Malignancy	6 (6)	94 (94)
Colonic origin of sepsis	7 (7)	93 (93)
Organ failure	18 (18)	82 (82)
Outcome of patient (death)	27 (27)	73 (73)

Out of 100 patients, 73 patients (73%) got discharged and 27 (27%) died. The highest mortality was in the age group 61 years and above followed by 46-60 years. The lowest mortality was in the age group <15 years followed by 15-30 years. Out of 54 patients of age group <50 years, 6 (12.50%) patients died while out of 46 patients with age group of >50 years, 21 (45.65%) patients died (p<0.001).

Table 3: Distribution of different variable in comparison of discharge and declared in patients.

Variables	Outcome		Total	Chi square test P value
	Declared	Discharge		
Age group (in years)	<50 years	6	48	<0.001
	>50 years	21	25	
Sex	Female	11	18	0.036
	Male	16	55	
Organ failure	Absent	12	70	< 0.001
	Present	15	3	
Duration group	Less than 24 hours	13	0	0.018
	24 hours and more	60	27	
Malignancy	Absent	22	69	0.043
	Present	5	4	
Type of peritonitis	Diffuse	27	50	0.001
	Localised	0	23	
Sepsis	Colonic	3	4	0.032
	Non colonic	24	69	
Exudate	Clear	0	25	<0.001
	Feacal	17	8	
	Purulent	10	40	
Hospital stay group	<10 days	57	26	0.031
	11-20 days	16	1	
MPI group	<21	52	0	<0.001
	21-29	20	5	
	>29	1	22	

Mean age of discharged patients was 39.48 ± 17.284 years while of declared patients was 58.37 ± 16.432 years ($p < 0.001$). A total of 27 patients died, out of which 11 patients (37.93%) were females compared to 16 patients (22.53%) were males ($p < 0.05$). 18 patients showed evidence of organ failure. 15 Patients died among these 18 patients thus resulting in a mortality rate 83.3% (< 0.001). Out of 87 patients who had pre-operative duration of peritonitis more than 24, 27 patients died thus placing the mortality rate of 31.03%. ($p < 0.018$). In present study 9 patients had malignancy. 5 out of 9 patients expired thus placing the mortality rate in presence of malignancy was 55.5% ($p < 0.043$). Out of 23 patients among with localized peritonitis no died and out of 77 patients among with diffuse peritonitis 27 died with a mortality of 35.06% ($p < 0.001$). 7 patients had colonic origin of sepsis out of which 3 patients died. Resulting in a mortality of 42.852% while in noncolonic origin of sepsis the mortality rate in our study was 25.80% (0.032). In this study 57% ($n=57$) patients stay in hospital 5-10 days and 16% ($n=16$) stay in hospital > 10 days. Discharge patients were stay in hospitals for longer duration of 8.64 ± 2.057 in comparison of declared patients their mean duration of hospital stay was 3.30 ± 2.109 (< 0.001). Mortality rate among patients with MPI score > 29 was 95.65% and with MPI < 21 was 0, which is statistically significant with $p < 0.001$. Mean MPI score was 17.97 ± 5.255 for discharge patients while for declared patients it was 33.22 ± 5.018 ($p < 0.001$).

DISCUSSION

This study was conducted with aim to estimate outcome of patients with perforation peritonitis among 100 patients came in surgical unit of tertiary care center. The age range was from 8 years to 90 years. The Maximum numbers of patients were found in the age group of 46-60 years and they constituted about 29% ($n=29$) of the study population. The mean age of the present study population was 43.7 years. Similar finding of mean age ranging from 34.6 to 58.9 years in different studies.^{15,16,26-28} 54% ($n=54$) of patients were in the age group < 50 years and 46% ($n=46$) patients were in the age group > 50 years. But the mean age are very less, as compare to other studies. The increased prevalence of the perforation in the age group of 46-60 years in our study can be attributed to the fact that gastro duodenal perforations due to peptic ulcer disease is a major cause of perforation peritonitis in our study and the increased prevalence of the etiological risk factors such as smoking, alcoholism and NSAID abuse in this age group. Appendicular perforation is more common in the age group of 20-30 years but no age is exempted. Majority of the ileal perforations are seen in the age group of 10-30 years, typhoid being the main etiological factor. In our study the incidence in male sex was 71% ($n=71$) while that in female sex was 29% ($n=29$). This finding make convenes with other studies.^{15,26,27} But different from studies done by Rudolfo et al.¹⁶ Incidence of duodenal perforation are very low as compare to previous studies.²⁶ The increased number of

gastric perforations in our study is due to more prevalence of the acid peptic disease in Rajasthan. In our study 18% ($n=18$) patients of the study population showed evidence of organ failure at presentation. The other studies showed similar finding while some studies had just opposite results.^{15,16,29}

In this study 87% cases presented after 24 hours of onset of the disease. This may be due to Illiteracy or lack of proper referral services. In some patients the delay was due to diagnostic dilemma which demands early use of more sophisticated investigations like CT scan, which is not available at the peripheral hospitals. This finding is quite high from other studies.¹⁵⁻¹⁶ This study had 93% cases were of noncolonic origin. This was similar to study of Jobhta et al and Rudolf et al.^{16,26} 77% ($n=77$) presented with a diffuse form of peritonitis while the remaining 23% ($n=23$) presented with localized peritonitis. Other studies also showed that peritonitis is mainly of diffuse type.^{16,26,29} Diffuse peritonitis is associated with a severe inflammatory reaction and development of sepsis and multiorgan failure. Localization of peritonitis is body's defence mechanism and will lead to formation of abscess. 50% cases had purulent exudate while 25% each were of clear and faecal exudate. This study had comparatively higher number of faecal exudates.^{16,26} Purulent and faecal exudate are associated with delayed presentation and presence of varying degree of septicemia.

52 (52%) patients had MPI score of less than 21, 25 (25%) patients had MPI score between 21 to 29 and 23 (23%) patients had MPI score greater than 29. Among the 100 patients studied by us 27 patients died thus placing the mortality at 27%. Similarly, in the study by Hourichi et al with mortality was found 23.1% and in of Koperna et al a mortality rate was of 18.5%.^{30,31} Mean age for the discharged patients were 39.48 ± 17.284 compared to 58.37 ± 16.432 in the patients who died and this was statistically significant ($p < 0.05$). Some other studies showed similar finding and mentioned that higher the age more will be mortality and also this may be due to presence of some comorbid condition.^{16,20,32-34} Out of total deaths, 11 patients (37.93%) were females compared to 16 patients (22.53%) were males. Similar results were found by some other studies.^{14,15} Out of 18 patients who had organ failure, 15 of them died resulting in a mortality rate of 83.3% compared to 12 patients died (14.63%) out of 82 who showed no evidence of organ failure. Similar studies in other part of world showed organ failure may be one of the sign of mortality.^{16,21,34}

Out of the 13 patients with a preoperative duration of peritonitis of less than 24 hours, no patient died. 87 patients who have preoperative duration of peritonitis of more than 24 hours, 27 patients died and hence preoperative duration of peritonitis of more than 24 hours is an important variable for adverse outcome. Similar results were seen in the study of several authors.^{16,33} Total 9 patients had malignancy out of which 5 were died.

Mortality rate among malignant patients was 55.5% which make consensus with other studies.^{15,35} Peritonitis in oncologic patients presents high mortality rates, essentially related to the severity of the underlying disease. Patients with diffuse peritonitis had 35.06% mortality while other patients with localized peritonitis did not have any mortality. A study done by Wahl et al showed 47% mortality in diffuse peritonitis patients and according to him these group need relaparotomy for persistent recurring infection.³⁶ In this study, Colonic origin cases had 42.85% mortality while non-colonic origin cases had 25.8% mortality so this study showed that presence of colonic origin is an important variable for adverse outcome. This finding is similar with study of Bohnen et al and contrast with study by Linder et al.^{25,37}

The mortality rate in patients with clear exudate was 0.0%, purulent exudate was 20 % while in faecal exudate the mortality was 68% this was statistically significant ($p < 0.05$) and hence presence of faecal exudate is an important variable for adverse outcome. There were many studies mentioned that faecal exudate is an important variable for outcome of patients.^{13,16,36,38} This study showed that there was no death in patients with MPI score less than 21, in MPI score between 21 to 29 the mortality was 20%, while in patients with MPI score greater than 29 the mortality was 95.65%. Mean MPI of Discharged patients was 17.97 ± 5.255 compared to 33.22 ± 5.018 among declared patients. Various other studies also showed that high MPI score is important predictor for worse outcome or more intensive measures need to be done.^{7,16,39}

Despite of all efforts this study had some limitation. As sample size is quite low, larger the sample size may give some more finding. Also, on the conclusion, MPI is a useful method to determine study group outcome in patients with peritonitis. All the MPI variables of adverse outcome named, presence of organ failure; preoperative duration >24 hours; presence of malignancy; age >50 years, female sex; generalized extension of peritonitis and type of exudate behaved as expected, except the non-colonic origin of sepsis in peritonitis.

CONCLUSION

This study concluded that colonic origin of sepsis was associated with worse outcome probably due to presence of fecal exudates. Mortality can be further reduced by early arrival of the patients to hospital and early intervention. Reproducible scoring systems that allow a surgeon to determine the severity of the intra-abdominal infections are essential to ratify the effectiveness of different treatment regimen. MPI is accurate to be used with patients with peritonitis and should be considered reliable and simple reference for estimating their risk of death. As our study differs in one adverse outcome variables, non-colonic origin of sepsis, we advocate need for further studies on Mannheim peritonitis index to include colonic origin of sepsis.

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