
ORIGINAL ARTICLE**Evaluation of Mannheim Peritonitis Index Score for predicting the outcomes in patients with peritonitis**

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Abstract

Background: Peritonitis is one of the most common causes of acute abdomen presenting in an emergency. In India, visceral perforation is the most common cause of peritonitis. There are many scoring systems available to predict mortality in patients with peritonitis. Out of these, Mannheim Peritonitis Index (MPI) is a simple and clinical parameter-based system available for prognostication of outcomes in patients of peritonitis in all age groups. *Material and Methods:* In this prospective observational study, 58 patients (age group > 12 years) with perforative peritonitis admitted to a tertiary care teaching hospital were enrolled. All necessary treatment protocols were followed and observations were generated as per the parameters of MPI. Observations were evaluated with statistical analysis using Chi-square test and Fischer's test. *Results:* In our study, it was found that age more than 50 years, presence of diffuse peritonitis, and organ failure were statistically significant independent risk factors. Overall mortality increased with increasing MPI score. No mortality was recorded with MPI score lesser than 20(0/34 cases); while for MPI score higher than 30, there was 100% mortality (5/5 cases). *Conclusion:* MPI score is a simple, effective, and useful system for predicting post-operative mortality and morbidity in cases of peritonitis. Patients with high MPI scores were found to be having higher mortality. Age, presence of diffuse peritonitis, and associated organ failure were important independent risk factors as far as mortality is concerned.

Keywords: Abdomen, Peritonitis, Mannheim Peritonitis Index Score

Introduction

Gastrointestinal tract-related diseases are encountered more than other human body systems [1-2]. Peritonitis is one of the most common causes of acute abdomen presenting in an emergency. In India, visceral perforation is the most common cause of peritonitis. In about 70-80% of cases, the most common condition found is duodenal perforations [3]. In most cases, the patients are admitted to tertiary care hospitals in the late phase of peritonitis. There are no specific criteria of peritonitis that can predict the postoperative outcome

[4], hence knowing the prognosis of the condition is essential for proper counseling of relatives. Even though there are good intensive care units, availability of higher antibiotics, a better understanding of pathophysiology, and newer surgical techniques; the mortality rate in cases of peritonitis is still high. Therefore, a good scoring system that can assess the prognosis of a patient, compare different treatment modalities, and which can help to differentiate the outcome of various surgical methods is essential in patients of peritonitis.

There are many scoring systems available to predict mortality in patients with peritonitis such as Mannheim Peritonitis Index (MPI) score, Physiological and Operative Severity Score for quantification of Mortality and Morbidity (POSSUM), Sepsis-related Organ Failure Assessment (SOFA), Surgical Apgar Score (SAS), Boeys Score, and APACHE II score [5].

MPI is a simple scoring system that requires fewer resources and was used in our study for evaluation of patients with peritonitis. It includes factors like age, sex, preoperative duration of peritonitis, origin of sepsis, organ failure, diffuse or localized peritonitis, characteristic of exudate, and underlying malignancy. We aimed to assess and grade MPI score and to assess the outcome of the patients in terms of survival and death in association with MPI score.

Material and Methods

This prospective observational study was conducted at a tertiary care teaching hospital from Jan 2021 to June 2022. Patients presenting with acute abdomen to a tertiary care centre and diagnosed with perforative peritonitis, irrespective of the cause, were included in this study using purposive sampling technique. Patients below 12 years of age were excluded. The study protocol was reviewed and approved by the Institutional Ethics Committee. Consent taken from all the patients regarding participation in the study along with routine consent for surgical intervention and management. In case of minor patients (< 18 years) consent obtained from the legal guardians.

The sample size was calculated taking into account the acceptable level of significance, power of study, underlying event rate and standard deviation in the population by using the following formula:

$n =$ desired sample size

$Z_{1-\alpha/2}$ = critical value and standard value for the corresponding level of confidence

p = expected prevalence or based on previous research

$q = 1 - p$

d = margin of error or precision

Sample size $(n) = \{(Z_{1-\alpha/2})^2 \cdot (p)(q)\} / (d)^2$

Average p value considered as 68, d -5% the calculated sample size was 58.

Study procedure: A proper detailed history was obtained from the patient or his/her relative on admission of the patient in the casualty. Following general and systemic examination, essential vital parameters were noted. The blood pressure of the patient was measured using a mercury sphygmomanometer in the right arm supine position. Then the patient was sent for an urgent X-ray of the abdomen in a standing position and checked for any gas under the diaphragm. In case of doubtful circumstances, an abdominal X-ray in a standing position was repeated after inserting a nasogastric tube and injecting about 50-60 cc air through it. If needed CT scan of abdomen and pelvis with contrast was also carried out. As soon as gas under diaphragm was confirmed, the patient was posted for early exploration after stabilization of vitals and empirical antibiotics were started. In case of trauma, Ultrasonography (USG) of abdomen and pelvis or Computed Tomography (CT) scan were done to diagnose any visceral or solid organ injury. On exploratory laparotomy, the cause of peritonitis was confirmed and controlled. Characteristic of peritoneal fluid was noted and it was sent for culture and sensitivity. The laparotomy was closed after copious peritoneal lavage and drainage. In the postoperative period, the patient received proper postoperative care along with chest physiotherapy and antibiotics as per the culture sensitivity report.

MPI Score

Risk factors	Points
Age > 50 yrs	5
Female gender	5
Organ failure	7
Malignancy	4
Preoperative duration of peritonitis > 24hr	4
Origin of sepsis not colonic	4
Diffuse generalized peritonitis	6
Exudates	
Clear	0
Cloudy, purulent	6
Fecal	12

Results

A total of 58 patients were enrolled in this study. The demographical characters like age and sex distribution and other observational parameters as

per MPI score are summarized with their association with patient outcome in the form of mortality in Table 1.

Table 1: Patient demographics and MPI score

Risk Factors	Survived	Death	Total	<i>p</i>
Age <50 yrs >50 yrs	26 19	0 13	26 32	0.0008 (Highly Significant)
Sex Male Female	33 12	7 6	40 18	0.18 (Not Significant)
Organ failure Present Absent	0 45	2 11	02 56	
Malignancy Present Absent	0 45	1 12	01 57	
Pre-operative duration < 24hrs > 24hrs	14 31	3 10	17 41	0.57 (Not Significant)
Origin of sepsis Non-colonic Colonic	37 8	11 2	48 10	0.84 (Not Significant)
Diffuse peritonitis Present Absent	27 18	12 1	39 19	0.02 (Significant)
Exudate Clear Cloudy/Purulent Fecal	14 27 4	1 11 1	15 38 05	0.08 (Not Significant)

The value of *p* was calculated using the Pearson Chi-square test with the help of SPSS for age, sex, pre-operative duration, and diffuse peritonitis.

The total MPI score and its association with patient outcomes are summarized in Table 2.

Table 2: MPI score and patient outcomes

MPI Score	Alive	Death	Total
< 20	34	0	34 (59%)
21-29	11	8	19 (33%)
30 & more	0	5	05 (8%)
Total	45 (78%)	13 (22%)	58

The value of p was calculated using Fisher's exact test with the help of SPSS.

Discussion

This study was carried out in rural medical hospital. In our study, most of the patients were having peritonitis due to perforation. In the present study the causes of perforation were Duodenal Ulcer (DU) perforation, gastric perforation, perforated appendix, traumatic sigmoid and ileal perforation. DU, gastric ulcers were common in old age where NSAIDs used for backache and joint pain was found to be an etiological factor for perforation. If a patient with peritonitis does not receive any treatment, there can be high mortality. The patient with perforation peritonitis should be posted for emergency exploratory laparotomy. In case of DU perforation, laparotomy followed by closure of perforation with omentoplasty is done. Omentoplasty can be done in either of the two ways: 1) in Grahams patch, free omental graft is fixed over closed perforation; 2) in Cellan-Jones technique, pedicled omental graft is used.

This is followed by proper peritoneal lavage and placement of drain. Emergency laparotomy was also done in traumatic perforation. Other definitive surgeries were dependent on visceral pathology. For example, appendectomy was performed in perforated appendix. In sigmoid perforations and

in some ileal perforations due to diffuse peritonitis, resection and diverting proximal stoma was done [6, 7]. There are many scoring systems available to predict mortality in patients with peritonitis such as MPI score, Physiological and Operative Severity score for quantification of Mortality and morbidity (POSSUM) [8], Sepsis related Organ Failure Assessment (SOFA) [9], Surgical Apgar Score (SAS) [10], Boeys Score, and APACHE II score.

MPI score was calculated in all cases of peritonitis and consists of various factors like age, sex, duration of peritonitis, diffuse or localized peritonitis; any associated organ failure, malignancy and peritoneal fluid nature. This scoring system has been found as a simple and easy in predicting post-operative outcome.

The total number of patients in this study was 58. Their age ranged from 16 years to 104 years as the oldest. In our study we found that age was one of two independent risk factors for mortality (apart from diffuse peritonitis). All the deaths (total=13) in present study occurred in age group more than 50 years and when compared with age group less than 50, the findings were statistically highly significant ($p = -0.008$), comparable with most of the studies [5, 8, 9, 11]. There was male predominance with MPI score less than 20. MPI score was found to be independent of sex. Wabwire *et al.* conducted a study in which he found that the number of males suffering from peritonitis were more as compared to females with a sex ratio of 4:1 [11]. Meman *et al.* (2008) performed a study about the diseases presenting as acute abdomen which showed that 70.30 % were males and 29.69% were females [12]. Unver *et al.* in their study group had 73.2% male patients and 26.8% female patients

[13]. Onder *et al.* had a group study which had 87.2% male patients and 12.8% female patients [14]. These findings are similar to our study. In our study, it was found that the association between duration and postoperative outcome was not statistically significant ($p = 0.575$). But other studies like Malik *et al.* had concluded that late presentation of patient to hospital directly affects mortality rate [15]. Kocer *et al.* found that patients who presented to hospital before 24 hours had a 3.4 times lower risk of mortality as compared to patients admitted after 24 hours [16]. Svanes *et al.* also documented that delayed presentation of patients after 24 hours increased complications by 3 times, mortality by 5 times and hospital stay by 2 times [17]. As our hospital is a tertiary care hospital, many patients are referred from other local health centers. These patients might have received initial treatment such as intravenous fluid for resuscitation, Ryle's tube aspiration, antibiotics, etc. which might have affected our outcome. A total of 3 patients in this study who were suffering from malignancy and organ failure had died. We found that the presence of diffuse peritonitis was an independent risk factor of mortality. Total number of deaths in patients with diffuse peritonitis was 12 as compared to patients with localized peritonitis, among whom 1 died, which was stati-

stically significant ($p = 0.02$). We found the MPI score to be significantly associated with postoperative outcome. It was seen that maximum number of deaths occurred in those patients whose MPI score was more than 21 with a value of $p = 0.000$ by Fischer's exact test. Mortality associated with MPI score between 21-29 was 42.10% and score more than 30 was 100%. Horiuchi *et al.* conducted a study which concluded that patients with perforation peritonitis had a mortality of 23.1% [18]; which is comparable with our study. Thus, we found that MPI score was an effective scoring system in predicting postoperative outcome along with individual factors like age of patient, presence of diffuse peritonitis and presence of organ failure. Other factors in MPI like sex, origin of sepsis did not independently affect the outcome of patients in our study. Surgical intervention should never be delayed to avoid unnecessary postoperative complications [19].

Conclusion

MPI score is a useful system in predicting postoperative outcome in cases of peritonitis; a simple and effective scoring system for predicting mortality and morbidity in patients with perforation peritonitis.

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