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Original Research Article

A prospective study evaluating utility of Mannheim peritonitis index in predicting the outcome of peritonitis following hollow viscus perforation

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ABSTRACT

Background: Gastrointestinal perforations account for about 25% of acute abdominal emergencies. Despite advancements in diagnosis, management and critical care of patients due to hollow viscus perforation, the prognosis remains worrisome as the overall mortality rate due to perforation peritonitis is 6 to 27%. The aim of the study was to evaluate the prognostic value of Mannheim peritonitis index scoring system in patients with perforation peritonitis, to assess it as a clinical tool in stratifying these patients according to individual surgical risk.
Methods: A prospective study of 58 patients with peritonitis due to non-traumatic hollow viscus perforation who presented to the department of general surgery, Jorhat medical college hospital, Jorhat from June 2020 to May 2021. The structured scoring system of MPI was applied along with other clinical and biochemical parameters recorded in pre-structured proforma. The study patients were divided into three groups according to MPI score. Group 1: MPI score less than 21, group 2 MPI score in between 21-29, and group 3 MPI score more than 29. Data was analysed for predicting the outcome by using IBM statistics SPSS software 21.0 version.
Results: MPI scores of <21, 21-29, and >29 had a morbidity of 27.6%, 51.7% and 20.7% respectively. No mortality in patients with MPI less than 21; whereas those patients with MPI score more than 29 had the highest mortality rate of 60%. Patient with MPI score 21 to 29 had mortality rate of 40%. The number of post-operative complications, duration of ICU and hospital stay proportionately increased with the MPI score.
Conclusions: MPI is an independent, disease specific, easier to calculate with very minimum basic investigations, simple and effective objective scoring system in predicting the morbidity and mortality.

Keywords: Mannheim peritonitis index, Non traumatic hollow viscus perforation, Peritonitis

INTRODUCTION

Acute abdomen constitutes about 5-10% of all emergency department.[1] Gastrointestinal perforations account for about 25% of acute abdominal emergencies.[2] The incidence of perforation following peptic ulcer disease has been reported to be 2% to 5%.[3] The overall mortality rate due to perforation peritonitis is 6 to 27%.[4] Primary peritonitis results from either bacterial, chlamydial, fungal and or mycobacterial infection in the absence of gastrointestinal perforation. Secondary peritonitis occurs as a result of gastrointestinal perforation with acute generalized peritonitis which is the most common cause of acute abdomen and constitutes the third most common cause for emergency explorative laparotomy.[5] It is a common dictum that abdomen is a Pandora's Box and gastrointestinal perforation is one such a condition to prove it.[6] Improved medical and surgical care has reduced this problem in U.K and North America, where vascular lesions and malignancies are the predominant cause of perforations, while in India, perforated peptic ulcer disease followed by appendicitis, ischemia of bowel, tubercular and typhoid ulcer perforation are the most common than malignancies.[7] Perforation of the duodenum, stomach and small intestine form a substantial proportion of emergency workload than colonic

perforations.[8] The diagnosis and treatment of gastro intestinal perforation remains main challenge to the surgeon in our country.[9] Despite advances in antibiotics, surgical technique, radiographic imaging and resuscitation therapy the outcome of perforation peritonitis is very unpredictable. For this reasons, emphasis must be placed on early identification of severe peritonitis which allows delivery of optimal care, such as aggressive resuscitation, early surgical intervention and proper postoperative care to improve their treatment outcome.[10,11] Therefore, the scoring system is required for exact recognition of severity of disease and accurate classification of patient risk.[12]

Many scoring systems have been developed for prognostication of the outcome of patients with peritonitis. Some of the scoring systems used are Mannheim peritonitis index (MPI), peritonitis index Altona (PIA), sepsis score, acute physiological and chronic health evaluation score (APACHE II), and the physiological and operative severity score for enumeration of mortality and morbidity (POSSUM). The MPI score was originally developed by Wacha and Linder based on the retrospective study analysis of data from 1253 patients with peritonitis, in which 20 possible risk factors were considered.[13] Only 8 risk factors proved to be of prognostic relevance and were entered into Mannheim Peritonitis Index, because of their consistent with their predictive power. In MPI score, the minimum possible score is zero, if there is no adverse factor. The maximum score is 47, if presence of all factors is confirmed.

Aim and objectives

The aim and objective of the study was to evaluate the MPI score in identification and stratifying the high risk patients for ICU care and to predict the outcome of patients with peritonitis following hollow viscus perforation.

METHODS

A prospective study was conducted in department of general surgery at Jorhat medical college hospital, Jorhat, from June 2020 to May 2021 and it included 58 patients who were clinically diagnosed as non-traumatic hollow viscus perforation with radiological evidence. After fulfilling the inclusion and exclusion criteria and an informed written consent was taken following which the patients were divided into three groups after calculation of their MPI score. These groups were categorized into low-risk group MPI <21, moderate risk group MPI in between 21-29 and high-risk group MPI >29. This study included the patients with aged 13 years and above having clinical suspicion and investigatory support for the diagnosis of peritonitis due to hollow viscous perforation and who are later confirmed by intra-operative findings. The patients who have given consent to participate in the study. The patients with traumatic hollow viscous perforation, oesophageal perforation, biliary tree perforation and perforation of genito-urinary tract like urinary bladder rupture and female reproductive tract were excluded.

Statistical analysis

The data collected was tabulated on Microsoft Excel. The categorical variables were summarized as proportions and percentages and continuous data was presented as mean±SD. Statistical test such as χ^2 test and Spearman Correlation was used. Diagramatic presentations were also made wherever suitable.

RESULTS

The study data was conducted for one year duration in which, the study have included 58 patients with non-traumatic hollow viscus perforation with the mean age of 35.8±13.6 years, sex ratio of male and female are 4.8:1. The median duration of symptoms presenting at the emergency setting was 3 days (0,5 d), with median hospital duration of stay was 12 days (5,19 d). The overall survival outcome was 91%. The maximum number of non-traumatic hollow viscus perforation patients had duodenal perforation 22 (37.9%) followed by appendicular perforation 17 (29.3%).

Table 1: Mannheim peritonitis index score.

Risk factor	Score
Age >50 years old	5
Female sex	5
Organ failure	7
Malignancy	4
Preoperative duration of peritonitis >24 hours	4
Origin of sepsis not colonic	4
Diffuse generalized peritonitis	6
Exudate	
Clear	0
Cloudy or purulent	6
Fecal	12

In our study, the most common complication was Surgical Site Infection (SSI) in 26 patients followed by respiratory complication in 25 patients, dyselectrolytemia in 13 patients, paralytic ileus in 12 patients and renal complications in 9 patients. Post-operative ICU care was required to 12 patients had MPI 21-29 and 8 patients had MPI>29. All complications were observed mostly in the patients of moderate and high-risk group. Among the total population, 41.4% (24 patients) had no complications, 50% (29 patients) had complications and 8.6% (5 patients) had expired. The distribution of outcome with MPI score categorizing was highly statistically significant p=0.0001 (χ^2 =34.680, df=4). The positive linear correlation for duration of hospital stay

and MPI score which was statistically significant (n=58, p<0.01) with r=0.356**.**

Table 2: Baseline characteristics.

Characteristics	Results
Age (mean±SD)	35.8448±13.55923 years
Sex (M:F)	4.8:1
Duration of symptoms (mean±SD)	3.05±2.298 days
Hospital stay (mean±SD)	12.43±7.197 days
Patient outcome (Survival %)	91.37%
Organ failure (%)	34.5%
Malignancy (%)	3.4%
Preoperative peritonitis>24 hours (%)	91.4%
Source of sepsis is not colonic (%)	98.3%
Diffuse generalized peritonitis (%)	79.3%
Exudate (clear/cloudy, purulent/fecal) in %	13.8%, 84.5%, 1.7%
MPI score (mean±SD)	22.1552±6.89216

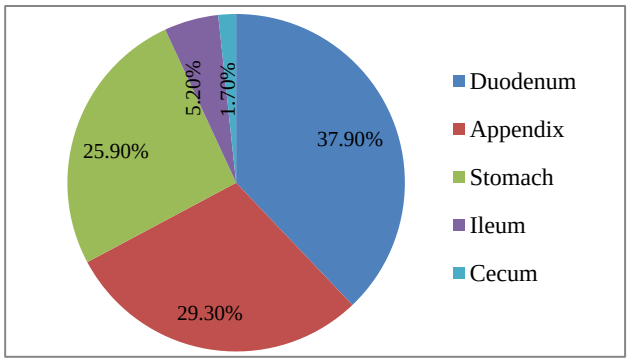

Figure 1: Site of perforation.

DISCUSSION

The study was conducted included 58 patients of non-traumatic hollow viscus perforation peritonitis those who attended emergency department from June 2020 to May 2021with the age of the patients were ranging from 16 to 79 years with the mean age of 35.84 (SD 13.55) years. It was compared with the study conducted by Singh et al who studied on 504 cases of perforation peritonitis in which the mean age group was 36.8 years.[14] In Bali et al study the age range was from 13 years to 88 years (mean age was 37.8 years).[15] Both the study findings were similar to our study. There was a male preponderance (83%) in this study and compared to Anjaneya et al study with male preponderance of 82%, and in Meena et al study with male preponderance of 91.2%.[16,17]

Most of the patients were presented with history of abdominal pain, abdominal distension, vomiting and fever with varying duration. This was similar to the findings by Attri et al and Sreenidhi et al study.[18,19] In the present study the most common etiology of peritonitis was duodenal perforation followed by appendicular perforation. It was comparable with the findings of Attri et al study wherein the most common aetiology of peritonitis was duodenal perforation followed by appendicular perforation, and the findings of Velappan et al study.[18,20] MPI scoring was done in all patients and were categorized into three categories as MPI score <21 in 31 (53.4%) patients, MPI score 21-29 in 18 (31%) patients and 9 (15.5%) patients were in MPI score >29. In a Tukka et al study of 52 patients, 62% of patients had MPI score less than 21, 23% were in the moderate risk group had MPI score 21-29, and 15% of patients were in high-risk group had MPI score >29.[21]

In low risk group of MPI <21, 27.6% of patients had developed complications as morbidity, 51.7% of patients in moderate risk group of MPI 21-29 had morbidity and 20.7% of patients had morbidity in high risk group of MPI >29. In our study observed that most common complications were Surgical site infection (SSI) includes wound infection and wound dehiscence followed by respiratory complications which included atelectasis, pneumonia and pleural effusion. A study by Afridi et al and Abdullah et al on perforation peritonitis, surgical site infection was the most common complication.[22,23] In Tukka et al study, 12%, 41.4%, and 15% of patients had morbidity as wound infection in MPI <21, MPI 21-29 and MPI >29 respectively.[21] There was no mortality in low risk group, 40% mortality rate in moderate risk group, and 60% of mortality observed in high risk group.

This was statistically significant. It was similar with Függer et al study, as there was no mortality in MPI <21, it was 29% in MPI between 21 to 29, and mortality increased to 100% in patients with MPI greater than 29.[24] In Ermolov et al study there were no lethal issues in the first group (MPI<21 scores), in the second group (MPI 21-29 scores) 42% of the patients died, 100% mortality was noted in the third group when MPI was >29 scores.[25] In Sreenidhi et al study there was 11% mortality rate in MPI score 21-29, and 100% of mortality rate in MPI score >29, but no mortality in MPI score <21.[19,25]

Table 3: Morbidity and MPI score.

MPI score	SSI	Respiratory	Renal	Dyselectrolytemia	Paralytic ileus	Post operative ICU care
<21	8	3	0	1	1	0
21-29	13	15	3	9	7	12
>29	5	7	6	3	4	8

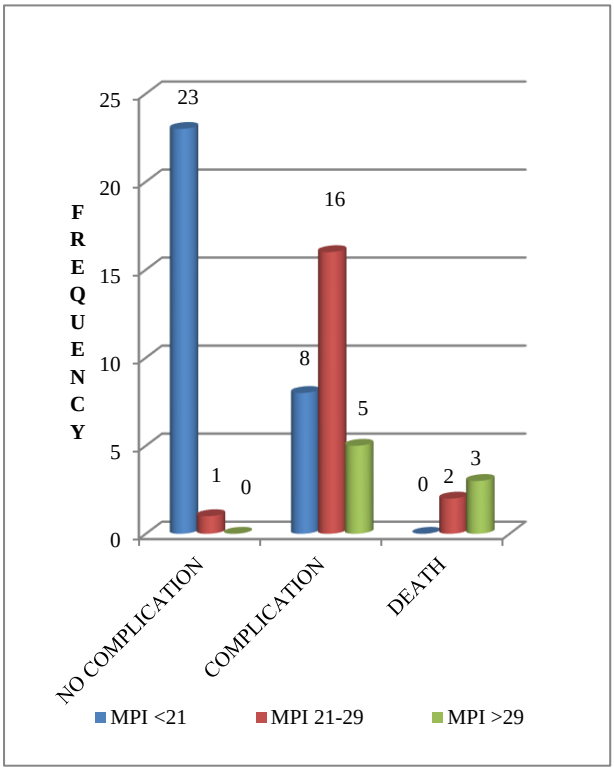

Figure 2: MPI severity grade and final outcome.

The p value of this study is 0.03. In Tukka et al study, there was no mortality in MPI <21 group, 41.4% mortality rate in MPI 21-29 group, and 50% mortality rate in MPI>29 group, which was statistically significant.[21] In our study, overall ICU care was required to 12 patients in moderate risk group and all 8 patients in high risk group. It was compared to Patil et al study more ICU care was needed to MPI>21 group of study populations.[26] In our study, the mean days of hospitalization for those who survived were 12.43±7.19 days.

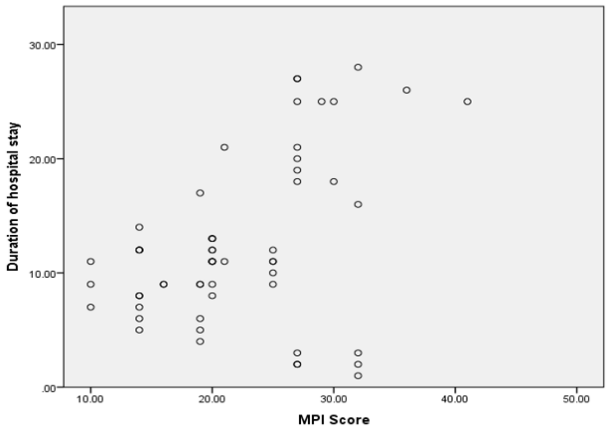

Figure 3: Duration of hospital stay and MPI score correlation.

It was compared with Muralidhar et al study of mean duration of hospital stay was 15.5 days and it was 13.3 days in Sreenidhi et al study.[19,26,27] Thus, overall mortality in our study is 5 (8.6%) due to multi organ failure following a sequence of secondary peritonitis and sepsis. In regards to site of perforation, 2 died had gastric perforation, 2 died had duodenal perforation and 1 died had ileal perforation. Remaining 53 patients were discharged. The Sreenidhi et al study, where overall mortality rate was 19% and it was 10.6% in Afridi et al study.[19,22] The number of postoperative morbidity, duration of ICU stay, overall length of hospital stay and mortality were proportionately increased with the MPI score. In our study observed that out of 8 variables used in MPI scoring system, preoperative duration of peritonitis, diffuse generalised peritonitis, organ failure on admission, origin of sepsis not colonic and intra peritoneal exudate (cloudy/purulent, feculent) carried a more significance in predicting both morbidity and mortality in the post-operative period than the other variables. It was similar to Tukka et al study observation.[21]

CONCLUSION

MPI scoring system is easy score to apply and determination of risk during operation and surgeon can know about the possible outcome and the appropriate management can be decided according to MPI score, in earlier to prevent any future untoward events. The result of this study proves that MPI is an independent, disease specific, easier to calculate with very minimum basic investigations, simple and effective objective scoring system in predicting the morbidity and mortality. Much larger scale studies are needed to understand the full scope of the MPI score. Thus, the management of patients with generalized peritonitis, scoring and categorizing the patients into various groups are beneficial.

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