

Effectiveness of Mannheim Peritonitis Index in Predicting the Morbidity and Mortality of Patients with Hollow Viscus Perforation

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Citation

Karki OB, Hazra NK, Timilsina B, Kunwar D. Effectiveness of Mannheim Peritonitis Index in Predicting the Morbidity and Mortality of Patients with Hollow Viscus Perforation. *Kathmandu Univ Med J.* 2018;64(4):296-300.

ABSTRACT

Background

Peritonitis due to hollow viscus perforation is one of common surgical emergency. Its accurate diagnosis and management is a challenge to every surgeon. This led to the development of disease severity grading systems that would aid in management and appropriately predict possible outcome.

Objective

Evaluation of Mannheim Peritonitis Index (MPI) score for predicting the morbidity and mortality in patients with peritonitis due to hollow viscus perforation.

Method

Prospective study of 126 patients operated for perforation peritonitis in Manipal College of Medical Sciences, Pokhara, Nepal from May 2015 to April 2018. Mannheim Peritonitis Index score was calculated for each patient. Data was analysed for predicting mortality and morbidity using SPSS 20. Pearson's Chisquare was used as a statistical test and considered as significant difference if $p \leq 0.05$.

Result

Perforated appendix (35.7%), peptic ulcer perforation (31%) and truma (19%) were common causes of perforation peritonitis. Mean score was 18.55. The overall mortality and morbidity was 9% and 43% respectively with Mannheim Peritonitis Index scores of ≤ 20 , 21-29, and ≥ 30 had a mortality of 0%, 14%, and 46% respectively. Presence of generalized peritonitis, organ failure at time of admission, type of intra peritoneal exudate carried more significance in predicting the mortality and morbidity in the post op period than other variables.

Conclusion

Mannheim Peritonitis Index is a simple and specific scoring system for predicting the mortality in patients with secondary peritonitis. Increasing scores are associated with poorer prognosis, needs intensive management.

KEY WORDS

Mannheim peritonitis index, Morbidity, Mortality, Perforation peritonitis

INTRODUCTION

Peritonitis denotes inflammation of the peritoneum from any cause. Peritonitis secondary to hollow viscus perforation is a common abdominal emergency faced by the general surgeons worldwide.¹ Despite advances in diagnosis, management and critical care, prognosis remains poor.^{2,3}

Grading the severity of the peritonitis improves the management of severely ill patients. Some of the scoring systems in practice to grade the severity of acute peritonitis are Acute physiology and chronic health evaluation (APACHE) II score, Simplified Acute Physiology Score (SAPS), Sepsis severity score (SSS) and Mannheim peritonitis index (MPI).^{4,5} The need of such scoring system is to assess the severity of illness and objectively predict morbidity and mortality.

MPI was developed by Wacha and Linder in 1983 in a German retrospective study and then validated.⁶ Of the possible twenty risk factors only eight proved to be of prognostic relevance and were entered into a score.⁶ (Table 1). The information is collected at the time of admission and first laparotomy.

MPI is a specific score, which has a good accuracy and provides an easy way to handle with clinical parameters, allowing the prediction of the individual prognosis of patients with peritonitis.^{7,8}

The objectives of this study were to evaluate the spectrum of perforation peritonitis and their management and to assess the predictive value of MPI in predicting mortality and morbidity in patients with hollow viscus perforation.

METHODS

Prospective study of 126 patients was conducted in Department of Surgery, Manipal College of Medical Sciences, Pokhara, Nepal from May 2015 to April 2018 on patients presenting to our institution with peritonitis secondary to hollow viscus perforation. Diagnosis of peritonitis was established by operative findings or surgical interventions during management. Therefore nonrandomized sampling technique was used.

Inclusion Criteria

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

Exclusion Criteria

- Patients with high index of suspicion of perforation peritonitis based on clinical and radiological studies but did not undergo surgery
- Those admitted after laparotomy done elsewhere for peritonitis

- Transferred/Referred out patients to continue treatment at other center
- Patients absconded or discharged against medical advice
- Primary peritonitis (spontaneous bacterial peritonitis)
- Associated severe neurological or vascular injury that could affect the outcome.

Initial preoperative work up and resuscitation included intravenous fluids, antibiotics, analgesics, nasogastric decompression, foley's catheterization. Standard operative procedures were followed for different causes of perforative peritonitis. Peritoneal lavage was given in all cases. Post operatively all the patients were transferred to surgical ICU where the post operative care and antibiotics were continued.

Patients were followed up postoperatively till the outcome i.e. mortality or discharge. Mortality was defined as death occurring during the hospital stay. Duration of ICU stay, hospital stay, requirement of inotropes, complications were noted. Mannheim peritonitis index (Table 1) was calculated for every patients included in the study. Maximal possible score is 47 and minimal possible score is zero.⁴

Table 1. Mannheim Peritonitis Index

Risk factor	Score
Age > 50 years	5
Female gender	5
Organ failure*	7
Malignancy	4
Pre-operative duration of peritonitis >24 hours	4
Origin of sepsis non colonic	4
Diffuse generalized peritonitis	6
Exudate	
Clear	0
Cloudy, purulent	6
Faecal	12

*Definitions of organ failure: Kidney: creatinine >177 µmol/L, urea >167 µmol/L, oliguria <20 ml/h; Lung: pO₂ <50 mmHg, pCO₂ >50 mmHg; Shock: hypodynamic or hyperdynamic; Intestinal obstruction (only if profound): Paralysis >24 h or complete mechanical ileus

Based on the MPI score, patients were categorized into three groups: i) Score ≤ 20 ii) Score 21-29 iii) score ≥ 29.

The data were entered in Microsoft Excel and statistical analysis was done using SPSS software version 20 (Chicago, IL, USA). The statistical analysis was done by Pearsons Chi-square test for qualitative data, students t-test for quantitative data. Chi-squared test was used for intergroup comparisons. P value < 0.05 was taken as statistically significant in the study. Predictiveness of MPI was tested through ROC curve, and statistic significance of every single MPI inclusion criteria performed in order to verify the relevance on prognosis.

This study was conducted after obtaining the clearance from the ethical committee of the institute and informed written consent from the patients included in the study.

RESULTS

In the study, 126 patients with diagnosis of secondary peritonitis were included. The mean age of patients was 40.13 ± 22.64 years ranging from 5 to 87 years and majority of patients (40%) belonged to age group of 20- 40 years. (fig. 1) There was male preponderance (70%). The mean MPI score in our study was 18.55 ± 7.536 with mean intensive care unit and hospital stay as 4.99 ± 2.30 days and 8.55 ± 4.820 days respectively. Perforated appendix (35.7%), peptic ulcer perforation (31%) were common causes of perforation peritonitis followed up by bowel perforation secondary to trauma (19%). (Table 2)

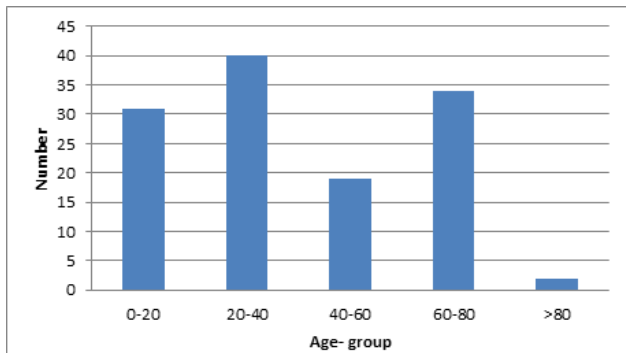


Figure 1. Age-group distribution of patients

Table 2. Etiology of perforation peritonitis

Etiology	Number	Percentage
Perforated Appendix	45	35.7
Peptic ulcer	39	31
Intestinal obstruction	11	8.7
Trauma	24	19
Non specific ulcer	2	1.6
Tubercular ulcer	2	1.6
Typhoid ulcer	2	1.6
Inflammatory bowel disease	1	0.8

Closure with omentum patch (Graham’s patch) and appendectomy were done in 29% each while primary repair of perforation (15%), stoma formation (9%) and resection anastomosis (7%) were other operations performed.

There were eleven deaths (8.7%) in our study. Mortality as per the anatomical site of perforation is given in table 3. MPI score was analysed with the mortality and showed 46.2% mortality in patients with MPI score > 29, compared to 14.3% and 0% in patients with MPI score 21-29 and <21 respectively. (fig. 2) (Table 4)

Outcome of patients according to MPI variables was also calculated as in table 5.

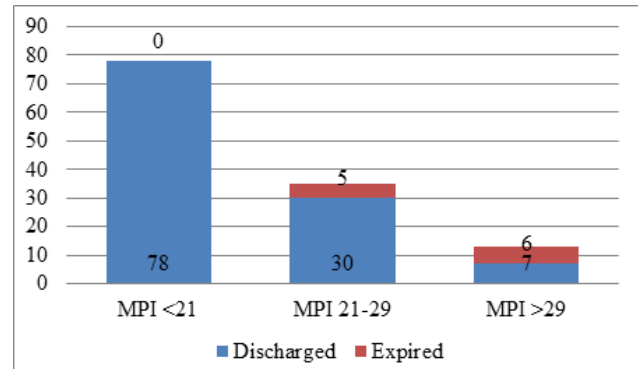


Figure 2. Outcome of patients on different MPI score

Table 3. Site of perforation

Site	Discharge (%)	Mortality (%)	Total
Stomach	24(85.7)	4(14.3)	28
Duodenum	16(94.1)	1(5.8)	17
Jejunum	11(84.6)	2(15.4)	13
Ileum	6(75)	2(25)	8
Appendix	44(97.7)	1(2.2)	45
Colon	9(90)	1(10)	10
Urinary bladder	3(100)	0	3
Gallbladder	2(100)	0	2

Table 4. Mortality and morbidity distribution according to MPI score

Outcome	MPI <21 n=78	MPI 21-29 n=35	MPI>29 n=13	P value
Mortality	0(0%)	5(14.3%)	6(46.2%)	0.000
Complications	39(50%)	25(71.4%)	13(100%)	0.001
ICU stay >5 days	22(28.2%)	23(65.7%)	7(53.8%)	0.01
Hospital stay >10 days	5(6.4%)	13(37.1%)	7(53.8%)	0.001
Inotropic support required	0(0%)	4(11.4%)	10(76.9%)	0.00

Table 5. Outcome of patients according to MPI variables

MPI Variable	Survived (%)	Death (%)	Total
Age> 50 yrs	40(86.7)	6(13)	46
Female Sex	34((89.5)	4(10.5)	38
Organ Failure	36(76.5)	11(23.4)	47
Malignancy	4(66.6)	2(33.3)	6
Preoperative duration >24 hrs	80(88.8)	10(11.1)	90
Origin of sepsis not colonic	29(87.8)	4(12.1)	33
Diffuse Generalised peritonitis	74(87)	11(12.9)	85
Exudates			
Clear	38(100)	0	38
Purulent	72(90)	8(10)	80
Fecal	5(62.5)	3(37.5)	8

Out of the remaining 115 patients who survived, 44.3% had complications. The various complications encountered were as follows: 31% had surgical site infection (SSI), 17% respiratory complications, 13% developed prolonged ileus, 7% urinary tract infection, burst abdomen in 4%, fecal fistula in 2%.

Outcome when measured in terms of morbidity like ICU stay of more than five days, hospital stay of more than ten days, requirement of inotropes, complications were found to be statistically significant with the higher MPI scores. From the ROC curve, (fig. 3) the area under the curve for MPI was calculated as 0.710 with sensitivity of 95.6% and specificity of 50% at an MPI of 29 points.

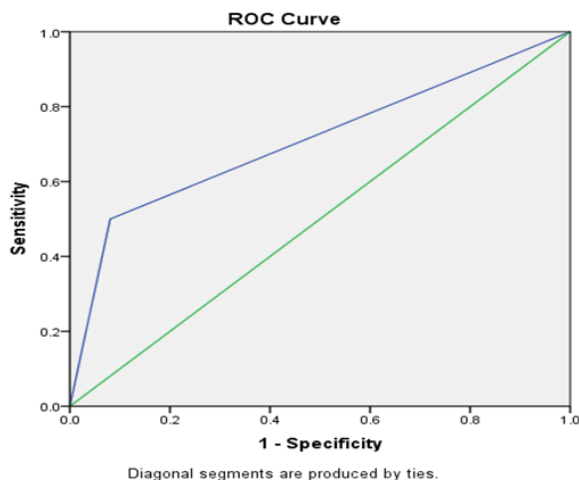


Figure 3. ROC curve of sensitivity and specificity of MPI score for mortality

DISCUSSION

Perforation peritonitis is the most common surgical emergency. Effective preoperative management, timely surgery and proper post-operative care will decide the outcome.

In our study, we found among the patients presenting with perforation peritonitis most were males and they were of 20-60 years age-group. The results of our study are comparable with other published series in terms of demography.^{6,9,10} Pain is the predominant feature and it was present in almost all the patients. Similar observations were made by Desa et al. in their studies.¹¹

Different studies have mortalities ranging from 6.4% to 17.5%.^{9-10,12} Mortality rate in our study was 9%. Jhobta et al. reported a mortality of 10% which was quite close with that of Afridi et al. (10.6%).^{1,13} When the mortality rate was calculated by MPI score for each group, it was seen that with increasing MPI score the mortality rate also increases.¹⁴ This is in agreement with the studies done by Qureshi et al. where they observed that the mortality rate increased

with increasing MPI scoring.¹⁵ The overall morbidity rate was 43%. Surgical site infection (31%), respiratory complications (17%) were common complications among patients of our study. Worldwide, morbidity rates in surgery for peritonitis vary widely with reports ranging from 18% to 67%.^{6,9,14} Ndonga et al. found a rate of 61.1% in jejunoileal perforations.¹⁶ Ohmann et al. reported duodenal ulcer perforation as the commonest cause for peritonitis in his series.¹⁷ Kachroo et al. found appendicular perforation as the commonest cause.¹⁸ Etiologically, in our study peptic ulcer perforation and perforated appendix were common followed up by trauma. Similar study from Nepalgunj showed peptic ulcer perforation as a common cause of secondary peritonitis.¹⁹ Studies from west show a different picture with colonic perforation due to diverticular disease and cancer (16-70%) the leading causes followed by trauma, peptic ulcer perforation (16%) and perforated appendicitis (8%).²⁰

In our study 62% of patients had MPI score has <21, of which 0% mortality; 28% patients were MPI score 21-29, in that the mortality rate is 14%. In patients with MPI score >29, the mortality rate is 48%. Similar to results of study by Srinivasarangan et al. and Muralidhar et al. we had sensitivity of 95.6% and specificity of 50% at an MPI of 29 points.²⁰

Seiler et al. analyzed 258 patients with an exclusive diagnosis of generalized peritonitis and reported so far the highest mean of 27.1 points.²¹ Billing et al. in a meta analysis of 2003 patients reported a mean sensitivity of 86% (54%-98%) an specificity of 74% (58%-97%) at a score of 26 points.⁹

Our study showed the MPI to be an accurate and reliable predictor of surgical mortality. Although in our patients, presence of organ failure, malignancy, generalized peritonitis showed a statistical significant difference between survival and deceased group other parameters: age over 50 years, female sex, non colonic origin of sepsis were not statistically significant, they showed a good predictive power when all the MPI variables were considered together

CONCLUSION

Perforation of hollow viscus is a common surgical emergency. MPI is disease specific, easy with good accuracyscoring system for predicting the mortality and morbidity in patients with secondary peritonitis. Increasing scores are associated with poorer prognosis, needs intensive management and hence it should be used routinely in clinical practice.

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