

Evaluation of Mannheim Peritonitis Index in Predicting the Prognosis of Hollow Viscus Perforation: A Prospective Observational Study**Kallagunta Pavan Kumar¹, Vijendra Kumar², Abhishek Singh Rathore³, Om Kumar Sharma⁴**¹3rd Year PG Resident, Dept of General Surgery, Rohilkhand Medial College and Hospital Bareilly UP India²Assistant Professor, Dept of General Surgery, Rohilkhand Medial College and Hospital Bareilly UP India^{3,4}Associate Professor, Dept of General Surgery, Rohilkhand Medial College and Hospital Bareilly UP India

Received: 25-05-2024 / Revised: 23-06-2024 / Accepted: 26-07-2024

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Conflict of interest: Nil

Abstract:**Introduction:** Peritonitis secondary to hollow viscous perforation is a potentially life-threatening condition. Hollow viscus perforation is a common abdominal emergency faced by the general surgeons worldwide. The prognosis is still poor for patients with peritonitis caused by hollow viscus perforation, despite improvements in diagnosis, treatment, and critical care. Early grading of the severity of peritonitis may improve the management of severely ill patients, which can be done by means of scoring systems.**Aim:** To evaluate Mannheim peritonitis index in predicting the prognosis of hollow viscus perforation.**Materials and Methods:** This Prospective observational Study included 62 patients with hollow viscus perforations who met the inclusion criteria and were admitted to the surgical department of Rohilkhand Medical College and Hospital between 1 November 2022 and 31 October 2023. Observation of these individuals and gathering data on the number of deaths and illnesses throughout this period was thought to be the study's ultimate goal. Risk variables discovered in the MPI were categorized based on the values shown using the history, clinical examination, and lab results. Individual variable scores were then summed to determine the MPI score. Every characteristic in the scoring system was analysed both as a system-wide predictor of morbidity or mortality using statistical package for social sciences (SPSS) software version 16.**Results:** In the present study, the mortality rate for patients with an MPI score of > 29 was 62.5% (5 deaths), 20% (3 deaths) for patients with an MPI score of 21–29, and 0% for patients with an MPI score of < 21, all of which are statistically significant (p = 0.011).**Conclusion:** The MPI scoring system for estimating morbidity and death in patients with hollow viscous perforation is being validated in this study. The study's findings show that the MPI scoring system is an easy-to-use and reliable instrument for evaluating this patient population. It can also be a useful tool for making decisions about a patient's care at every stage of the healthcare system.**Keywords:** Peritonitis, Bowel perforation, Hollow viscus perforation, Mannheim peritonitis index, Perforation peritonitis, Prognostic index.

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Introduction

The death rate from perforation peritonitis remains high even with surgical therapy, state-of-the-art intensive care units, antibiotics of the last generation, and improved pathophysiological understanding.

A variety of etiologic factors, including as bacteria, fungi, viruses, chemical irritants, and foreign materials, can induce peritonitis, which is characterized as an inflammation of the peritoneal cavity. [1] Surgeons worldwide frequently treat hollow viscus perforation as an abdominal

emergency. Peritonitis due to hollow viscus perforation is a potentially life-threatening situation. Early prognostic assessment of peritonitis is important to identify high-risk individuals for more aggressive treatment procedures, such as planned laparotomy, radical debridement, lavage system, and open management. There is not a single, readily accessible laboratory test that can be used to predict the prognosis or degree of peritonitis in patients.

Several scoring systems have been employed to prognosticate patients with peritonitis like, Acute physiology and chronic health evaluation (APACHE) II score, Simplified acute physiology score (SAPS II), Sepsis severity score, Multiple organ dysfunction score, Mannheim Peritonitis Score (MPI). [2,3]

The MPI was developed by Wacha [4] through discriminant analysis of 17 potential risk factors, of which 8 were of prognostic relevance.

Mannheim peritonitis index [5]

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 not colonic	4
Diffuse generalised peritonitis	6
Exudates	
• Clear	0
• Cloudy, purulent	6
• Faecal	12
Total	47

Definitions of organ failure:

Kidney: creatinine >177 µmol/L, urea >167 µmol/L, oliguria <20 ml/hr

Lung: pO₂ <50 mmHg, pCO₂ >50 mmHg

Shock: hypodynamic or hyperdynamic.

Patients were divided into three categories according to the score:

1. Category I for Score less than 21
2. Category II for score between 21 to 29
3. Category III for Score more than 29

Materials and Methods

Study setting: Department of General Surgery.

Study duration: 1st November 2022-31st October 2023 (12 Months)

Study design: Prospective observational Study

Ethical aspects: Institutional ethics committee approval was taken prior to conducting this study

Sample size: In our study a total of patients was be taken are 62

Inclusion Criteria:

- Patients who had given informed consent form
- Patients who had clinical suspicion and investigatory support for the diagnosis of peritonitis secondary to hollow viscous perforation who then confirmed by intra-operative findings were included.

Exclusion Criteria:

- Hollow viscous perforation due to penetrating abdominal injury, age <18 years and >70 years.

- Patients who were not willing to participate in the study.

Methodology:

This study included all patients with hollow viscous perforations who met the inclusion criteria and were admitted to the surgical department of Rohilkhand Medical College and Hospital between 1 November 2022 and 31 October 2023. Patients were informed, the purpose and goals of the study, and their full informed consent was obtained before they could participate. This study includes patient investigations and personal data collection. Observation of the patients during the pre-, peri-, and post-operative phases of an emergency laparotomy. Observation of these individuals. Gathering data on the number of deaths and illnesses throughout this time was thought to be the study's ultimate goal.

The patient was selected to the study once the operation results confirmed the diagnosis of peritonitis. Risk variables discovered in the MPI were categorized based on the values shown using the history, clinical examination, and lab results. Individual variable scores were then summed to determine the MPI score. According to Billing [5], the cases were first divided into three categories: under 21 points, between 21 and 29 points, and over 29 points.

Apart from personal details like name, age, and gender, the following details were also recorded: hospital file number, dates of admission and discharge, number of days spent in the hospital, date of surgery, and details about the patient's condition (such as surgical findings, medical interventions, and the course of the illness). The

patient was evaluated, any difficulties were noted, and the patient was discharged based on whether they had improved or died. The amount of time that passed between the initial diagnosis and the occurrence (death or hospital release), was calculated. For thirty days, outpatient follow-up was maintained in order to determine perioperative morbidity and mortality. If there were absence of adverse factors, the score might be as low as zero or as high as 47 if all the negative factors were verified. Every characteristic in the scoring system was analysed both as a system-wide predictor of morbidity or death and as an independent predictor.

Statistical Analysis

The statistical package for social sciences (SPSS) software version 16 was used for analysis after the data was gathered, entered, and tabulated in MS Excel. Using chi square analysis, each MPI score variable and additional patient characteristics were examined, and the study's findings were documented in variety of ways. The study findings were expressed as numbers and percentages in the tables and graphs. The Chi-square test of significance was used to compare the proportions. In this investigation, a significance level of $P < 0.05$ was considered.

Results:

In this study, 62 patients with hollow viscus perforation were evaluated. The age distribution among the study patients where the majority of patients i.e. 19 (30.6%) in the current study were in the 46–60 year age group.

These were followed by 16 (25.8%) patients in the 31–45 year age group, 14 (22.6%) patients in the 60–70 year age group, and remaining 13 (20.9%) patients in the 18–30 year age group. (Table 1) The gender distribution of the study patients with the

majority of patients being male (61.3%) and the females making up 38.7%. (Table 2) In the present study, the anatomical site of the perforation in the majority of patients was the ileum (32.25%), followed by the stomach (30.64%) and duodenum (22.6%). 3.2%, 6.45%, and 4.83% of cases were found to be colonic, appendicular, and jejunal, respectively. (Table 3) The preoperative duration wise distribution of patients with majority of the patients (66%) had preoperative duration of 24hrs and more and remaining 34 % had < 24 hrs preoperative duration of presentation. (Table 4) In the current study, 29% of patients had localized peritonitis whereas 71% of patients had diffuse peritonitis. Sepsis, multiple organ failure, and a strong inflammatory response are linked to diffuse peritonitis. (Table 5)

Intraoperative intra-abdominal collection was found to be clear, purulent, and faeculent in the present study. 51.6% of the patients had purulent or hazy exudate; 9.67% had faeculent exudate; and 39% had clear fluid exudate. (Table 6) In the current study out of 62 patients, only 9 % of patients had malignancy remaining 91 % of patients were not having malignancy. (Table 7)

In the current study out of 62 patients, 16.2% of study (10) patients had organ failure. 83.8% of study (52) patients does not show organ failure. (Table 8) In the current study out of 62 patients, majority of the study patients (96.88%) had sepsis from non-colonic origin and remaining 3.22% had sepsis from colonic origin. (Table 9)

In the present study, the mortality rate for patients with an MPI score of > 29 was 62.5% (5 deaths), 20% (3 deaths) for patients with an MPI score of 21–29, and 0% for patients with an MPI score of < 21. (Table 10)

Table 1: Age wise distribution among the study participants

Age group	Frequency(n=62)	Percentage (%)
18-30 years	13	20.9%
31-45 years	16	25.8%
46-60 years	19	30.6%
60-70 years	14	22.6%

Table 2: Gender distribution among the study participants

Gender	Frequency(n=62)	Percentage (%)
Male	38	61.30%
Female	24	38.70%

Table 3: Anatomical site of perforation in study patients

Site of perforation	Frequency(n=62)	Percentage (%)
Gastric	19	30.64%
Duodenal	14	22.60%
Ileal	20	32.25%
Jejunal	3	4.83%
Appendicular	4	6.45%
Colonic	2	3.20%

Table 4: Showing preoperative duration wise distribution of patients

Duration of presentation	Frequency(n=62)	Percentage (%)
<24 Hours	21	34%
24 Hours & more	41	66%

Table 5: Type of peritonitis in study population

Type of peritonitis	Frequency(n=62)	Percentage (%)
Localized	18	29%
Diffuse	44	71%

Table 6: Character of exudate in study patients

Type of exudate	Frequency(n=62)	Percentage (%)
Clear	24	38.7%
Purulent	32	51.60%
Faecal	6	9.67%

Table 7: Showing presence of malignancy in patients with peritonitis

Malignancy	Frequency(n=62)	Percentage (%)
Present	6	9%
Absent	56	91%

Table 8: Distribution of organ failure in patients with peritonitis

Organ failure	Frequency(n=62)	Percentage (%)
Present	10	16.20%
Absent	52	83.80%

Table 9: Origin of sepsis (colonic /non-colonic) in our study

Sepsis	Frequency(n=62)	Percentage (%)
Colonic origin	2	3.22%
Non-colonic origin	60	96.88%

Table 10: Association of MPI score with mortality incidences

MPI Score	No: of cases	Discharged	Death
<21	39	39	0
21-29	15	12	3
>29	8	3	5

Discussion:

The majority of the patients within the current study 19 (30.6%) were in the 46–60 year age group. These were followed by 16 (25.8%) patients in the 31–45 year age group, 14 (22.6%) patients in the 60–70 year age group, and remaining 13 (20.9%) patients in the 18–30 year age group. Of the study patients, men made up the majority (61.3%), with women making up 38.7%.

The stomach (30.64%), ileum (32.25%), and duodenum (22.6%) were the anatomical sites of perforation in the majority of individuals in the current analysis. The colonic, appendicular, and jejunal regions were identified in 3.2%, 6.45%, and 4.83% of cases, respectively. The distribution of patient's preoperative durations showed that 66% of patients had preoperative durations of 24 hours or longer, whereas 34% of patients had preoperative durations of less than 24 hours. Localized peritonitis affected 29% of patients in the current study, while diffuse peritonitis affected 71% of patients. Diffuse peritonitis is associated with sepsis, multiple organ failure, and a robust inflammatory response. An abscess will develop as

a result of localized peritonitis, the body's defensive reaction.

In the current investigation, intraoperative intra-abdominal collection was determined to be faeculent, purulent, and clear. Three-quarters of the patients had clear fluid exudate, 9.67% had faeculent exudate, and 51.6% had purulent or hazy exudate. Of the 62 individuals in the current study, only 9% had cancer; the remaining 91% of patients did not have cancer. 16.2% of the 62 individuals in the study experienced organ failure. In 83.8% of study participants, organ failure is not evident.

The majority of the 62 study participants (96.88%) had sepsis that was not colonic in origin, while the remaining 3.22% had colonic sepsis. Most patients (82%) spent less than 10 days in the hospital, with the remaining 18% (11 patients) staying for 11–20 days. Majority of the study patients (54.8%) in the current study had MPI score <21. 24.2%, 21% of study patients had MPI score of 21–29 and >29 respectively. Most common procedure performed was resection & anastomosis, exploratory laparotomy with ileostomy in 20 patients (i.e. 32.25%) followed by primary closure, resection

and anastomosis & Modified Graham's Live Omental Patch Closure in 19(30.64%) and 14 (22.6%) patients respectively. 4.83%, 6.45%, and 3.2% patients underwent primary closure, peritoneal lavage & appendicectomy, and exploratory laparotomy with hemicolectomy respectively.

The commonest symptom was abdominal pain seen in 57 (91.9%) patients followed by vomiting, abdominal distension & fever seen in 37(60%), 36 (58 %) & 35 (56 %) respectively. 44%, 45 % of the study patients passes flatus and stools respectively With reference to study outcome, where the incidence of mortality in the current study was found to be 12.9%. 24.19% of study patients were having wound sepsis and wound dehiscence and remaining 62.9% patients were discharged without complications

In the current study, out of 35 patients of age group <50 years, 2 (5.7%) patients died, while out of 27 patients with age group of >50 years, 6 (22.2%) patients died & the findings regarding the relationship between mortality incidence and age above 50 years were statistically significant ($p=0.054$). The p value for the gender-incidence mortality relationship in our study was 0.39, which is statistically not significant and contrasts with the MPI results. There was no significant association (p -value >0.05) with incidence of mortality based on anatomical site of perforation.

In the present study, the mortality rate for patients with duration of presentation for <24 hrs were 33.3% (7 deaths), and 2.4% (1 death) for patients with 24hrs duration of presentation, there was statistically significant association is present in the present study ($p =0.0005$). The mortality rate for patients with diffuse peritonitis was 18.2% (8 deaths), and 0% for patients with localized peritonitis, there was statistically significant association is present in the present study ($p =0.05$). The mortality rate for patients with a faecal exudate was 33.3% (2 deaths), 15.6% (5 deaths) for patients with purulent exudate, and 4.16% for patients with clear exudate, there was no statistically significant association is present ($p =0.137$).

The current study's p value for the relationship between the presence of malignancy and the incidence of mortality was 0.0043, which is statistically significant. The association of presence of organ failure with incidence of mortality rate with p value of < 0.00001 which was statistically

significant. The study's p value for the relationship between the origin of sepsis (colonic versus non-colonic) and the incidence of mortality was 0.1117, which is statistically not significant and displays results that are in contrast with MPI. In the present study, the mortality rate for patients with an MPI score of > 29 was 62.5% (5 deaths), 20% (3 deaths) for patients with an MPI score of 21–29, and 0% for patients with an MPI score of < 21 , all of which are statistically significant ($p =0.011$).

Conclusion:

We can calculate the likelihood that a patient will survive by use MPI to assess the severity of their sickness early on. This aids in the pre-operative evaluation of patients' prognosis based on MPI scores. In the current study, the mortality rate for patients with MPI score of > 29 was 62.5% (5 deaths), 20% (3 deaths) for patients with MPI score of 21–29, and 0% for patients with MPI score of < 21 , The MPI scoring system for estimating morbidity and death in patients with hollow viscous perforation is being validated in this study. The study's findings show that the MPI scoring system is an easy-to-use and reliable instrument for evaluating this patient population. It can also be a useful tool for making decisions about a patient's care at every stage of the healthcare system.

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