

## RE-EVALUATION OF MANNHEM PERITONITIS INDEX IN PREDICTING THE OUTCOME OF PATIENTS WITH PERFORATION PERITONITIS

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### ABSTRACT

**Aim:** The aim of the present study was to examine the efficacy of the MPI score in predicting prognosis in patients with perforation peritonitis in order to aid in therapeutic decision-making.

**Methods:** This cross-sectional study was conducted at the Department of Surgery, Nehru Hospital, BRD Medical College. After obtaining ethical clearance and informed consent, a total of 100 patients with perforation peritonitis were enrolled as per inclusion-exclusion criteria.

**Results:** Among all the patients enrolled, 32.00% were observed under 15-30 years and 47-62 years of age group, followed by 63-78 years. 3.00% of the patients were aged between 79-94 years. The majority of the patients were males [76(76.00%)], followed by females [24(24.00%)]. The majority of the patients had no organ failure [78.79%], while 22 of the enrolled patients had organ failure. The mean CBC was [12139.71±19300.98], and serum lipase was recorded as [99.57±76.25]. The serum creatinine was [1.59±0.91], and the PCO2 was [63.62±72.81]. In the majority of the patients, ileal perforation was recorded [53.00%],

followed by gastric perforation [34.00%], appendicular [5.00%]. In the majority of the patients, ileal perforation was recorded [53.00%], followed by gastric perforation [34.00%], appendicular [5.00%]. The majority of the patients were discharged after surgery [81.00%], while 19 patients were expired. Most patients 65(65.00%) had an MPI score of  $\leq 27$ , followed by a score of  $>27$  in 35 (35.00%) patients.

**Conclusion:** The majority of patients MPI score more than 27 is best predictor for bad outcome or mortality in Peritonitis patients. In addition, the cutoff of 27 points also showed statistical significance than MPI of 26. The surgical and medicinal management of peritonitis can be decided with the use of early peritonitis severity grading.

**Keywords:** Mannheim Peritonitis, Perforation Peritonitis

## 1. INTRODUCTION

The most common surgical emergency in general surgical practice is perforation peritonitis.<sup>1</sup> Peritonitis is inflammation of the peritoneum, which is the lining of the abdominal cavity's inner wall and which also protects the abdominal organs. The causes of peritonitis range from those requiring immediate surgical intervention to those requiring conservative treatment. Extreme abdominal pain, distension of the abdomen, fever, and weight loss may be symptoms.<sup>2</sup> In India, perforation peritonitis has been identified as a prevalent surgical emergency. High mortality is associated with diffuse suppurative peritonitis despite breakthroughs in antimicrobials and supportive treatment. The prognosis of perforation peritonitis depends on the intricate interaction of numerous elements, as well as the success attained with early patient identification and urgent surgical intervention. 19% to 60% is the hospital mortality rate for patients with perforation peritonitis.<sup>3</sup> The diagnosis and treatment of suppurative peritonitis are difficult. Evaluation of novel therapeutic advancements is challenging due to the complexity of surgical operations, the varied nature of treatment, and the complexities of ICU support.<sup>2</sup> In order to reduce morbidity and death rates associated with more aggressive treatment, it is preferable to perform prognostic evaluations on high-risk patients as early as possible, particularly in cases with severe peritonitis. The prognosis of such patients relies on a number of variables, including their age, gender, disease, co-morbidities, time of presentation, therapeutic intervention, and postoperative complications.<sup>4</sup> Biochemical and radiological evaluations are essential for better result and prognosis, particularly in emergency and critical care settings, when it is difficult to establish the course of treatment based on clinical assessment alone. Numerous scoring systems have been developed to evaluate the severity of hollow viscus perforation peritonitis, including the Acute Physiology and Chronic Health Evaluation (APACHE II) score, the Mannheim Peritonitis Index (MPI), the POSSUM score, the Simplified Acute Physiology Score (SAPS), the Sepsis Severity Score (SSS).] These score methods function as a predictor and assist us in evaluating our line of management. Many scoring systems have been developed in the past to assist in assessing the prognosis of critically ill patients. Evaluation of individuals with peritonitis is made more difficult by the variety of aetiologies and treatment approaches.<sup>5</sup> The Mannheim Peritonitis Index (MPI), developed by Wacha and Linder in 1983<sup>6</sup>, is a particular score that has a high degree of accuracy and is simple to use with clinical criteria, permitting the prediction of the individual prognosis of peritonitis patients. Knauset al. created the APACHE II score to stratify the prognosis of critically unwell patients. It has been administered to surgical and nonsurgical patients. It has been validated in several patients over the years and appears to be widely utilized as a prognostic scoring system due to its ease of application and ability to predict outcome.<sup>7</sup> The Mannheim Peritonitis Index is a specific

score that has a high degree of accuracy and clinical parameter manipulation simplicity. It provides for straightforward prognostication of peritonitis patients. The mortality of perforation peritonitis corresponds with the duration and degree of peritoneal contamination, the patient's age, the patient's general health, and the type of the underlying aetiology, and is strongly dependent on early hospitalization, timely diagnosis, and immediate surgical treatment. This study was done to determine the various clinical manifestations, aetiologies, treatments, and postoperative consequences of perforation peritonitis.<sup>1</sup> Various pre-operative scoring methods have been shown to provide an approximation of the risk of mortality, but significant research proving their specificity are still lacking.

Therefore, the purpose of the present study was to examine the efficacy of the MPI score in predicting prognosis in patients with perforation peritonitis in order to aid in therapeutic decision-making.

## 2. MATERIALS AND METHODS

This cross-sectional study was conducted at the Department of Surgery, Nehru Hospital, BRD Medical College. After obtaining ethical clearance and informed consent, a total of 100 patients with perforation peritonitis were enrolled as per inclusion-exclusion criteria.

### INCLUSION CRITERIA-

1. All patients admitted with clinical suspicion and investigatory support for the diagnosis of peritonitis due to hollow viscous perforation which are later confirmed by intra operative finding.
2. Both males and females more than 15 years.

### EXCLUSION CRITERIA-

1. Patients less than 15 years of age were NOT included in this study.
2. All traumatic cases, (solid organ injury, vascular injury Neurological injury) were

### EXCLUDED from this study

3. Colonic perforations of any etiology except caecum were also EXCLUDED.

### METHODOLOGY

Patient presenting with acute abdominal pain later diagnosed with perforation peritonitis was enrolled for the study. A detailed clinical history for thorough clinical examination along with routine blood investigation was sent for investigation.

### RELEVANT INVESTIGATION LIKE

- CBC
- Serum electrolyte Serum amylase Serum lipase LFT
- KFT ABG RBS

### Radiological investigation

X-RAY Abdomen AP view, X RAY chest PA view the final diagnosis of perforation peritonitis was done. The final diagnosis of perforation peritonitis was made by clinically and supported by available laboratory investigation and radiological investigation.

Clinical diagnosis of patient of perforation peritonitis was done in department of surgery best and symptom of pain in abdomen, abdominal distension, and inability to pass flatus and motion, fever, nausea, vomiting, and sign of peritoneal inflammation like guarding, rigidity and rebound tenderness. Once perforation peritonitis is suspected patient was subjected to

routine investigation as per hospital protocol. Plain X RAY chest and abdomen was done in all cases to see free gas under right dome of diaphragm. Patient was subject to further investigation as a part of pre- anesthetic work up like ECG etc.

Standard operating procedure was followed for different cause of perforation peritonitis mortality is defined as any death during the hospital stay using history clinical examination and Mannheim peritonitis index was calculated

Total patient MPI score was the sum total of all the positive risk factor

1. < 26

2. >26

For each physiological variable, the most abnormal measurement was included if the test had been done more than once. Thus, the value of each scoring system was tested in prediction the outcome of patients.

Post-operative following date was recorded-

Appearance of the exudate, whether clear cloudy, purulent or faecal. Extent of exudate; single quadrant or diffuse if 2 or more quadrants involved Source of sepsis, for example perforated duodenal ulcer.

In case where tissue biopsies were taken a follow up was be made on such specimento establish a malignancy was the primary pathology. Laboratory parameters used to define organ failure were those of blood sample drawn within first 24 hours of lapratomy. Outcome evaluation entailed in-patient was follow up. This was conducted regularly every alternate day following the initial visit until patient discharger death. Morbidity during the follow up period was determined by duration of hospital stay and identification of one or more of the following complications, systemic (chest infection), local or gastrointestinal haemorrhage, Wound sepsis, deep space infection, wound dehiscence, Brust abdomen, fistulation or ileus lasting more than 5 days. The study end point was reached at on patient discharge or death.

#### STATISTICAL ANALYSIS:

Data were entered in Microsoft Excel and analyzed using statistical software SPSS version 26 (SPSS Inc., Chicago, IL, USA). The continuous variables were evaluated by mean (standard deviation) or range value when required. The dichotomous variables were presented in number/frequency and were analyzed using the Chi-square test. The cut off of MPI score was done using ROC Curve with 95% CI was used. A p-value of < 0.05 or 0.001 was regarded as significant.

### 3. RESULTS

Table 1: Demographic details

	<b>NUMBER</b>	<b>PERCENTAGE</b>
<b>AGE (YEARS)</b>		
15-30	32	32.00%
31-46	13	13.00%
47-62	32	32.00%
63-78	20	20.00%
79-94	3	3.00%
<b>GENDER</b>		
Female	24	24.00%
Male	76	76.00%
<b>ORGAN FAILURE</b>		
No	78	78.79%

Yes	22	21.21%
<b>Grand Total</b>	100	100.00%

Among all the patients enrolled, 32.00% were observed under 15-30 years and 47-62 years of age group, followed by 63-78 years. 3.00% of the patients were aged between 79-94 years. The majority of the patients were males [76(76.00%)], followed by females [24(24.00%)]. The majority of the patients had no organ failure [78.79%], while 22 of the enrolled patients had organ failure.

Table 2: Biochemical parameters of enrolled patients with perforation peritonitis

BIOCHEMICAL PARAMETERS	MEAN±SD
TLC	12139.71±19300.98
S. AMYLASE	149.99±107.87
S. LIPASE	99.57±76.25
SERUM CREATININE	1.59±0.91
UREA LEVEL	64.53±36.22
PO2	85.61±37.21
PCO2	63.62±72.81

The mean CBC was [12139.71±19300.98], and serum lipase was recorded as [99.57±76.25]. The serum creatinine was [1.59±0.91], and the PCO2 was [63.62±72.81].

Table 3: Site of perforation, surgical outcome and Mannheim peritonitis index (mpi) in enrolled patients with perforation peritonitis

	NUMBER	PERCENTAGE
<b>SITE OF PERFORATION</b>		
Appendicular	5	5.00%
Caecal	4	4.00%
Duodenal	3	3.00%
Gastric	34	34.00%
Ileal	53	53.00%
Jejunal	1	1.00%
<b>SURGICAL OUTCOME</b>		
Discharge	81	81.00%
Expired	19	19.00%
<b>MPI SCORE</b>	<b>N</b>	<b>%</b>
≤27	65	65.00%
>27	35	35.00%
<b>MEAN±SD</b>	26.84±5.43	

In the majority of the patients, ileal perforation was recorded [53.00%], followed by gastric perforation [34.00%], appendicular [5.00%]. The majority of the patients were discharged after surgery [81.00%], while 19 patients were expired. Most patients 65(65.00%) had an MPI score of ≤27, followed by a score of >27 in 35 (35.00%) patients.

Table 4: MPI score, origin of sepsis, extent of peritonitis, nature of exudate related to discharged and expired status of enrolled patients with perforation peritonitis

MPI SCORE	DISCHARGE		EXPIRED		P-VALUE
	N	%	N	%	
≤26	56	69.14%	9	47.37%	X=3.205
>26	25	30.86%	10	52.63%	P=0.0734

ORIGIN OF SEPSIS	DISCHARGE		EXPIRED		
	N	%	N	%	
Colonic	0	0.00%	0	0.00%	
Non-colonic	81	81.00%	19	19.00%	
EXTENT OF PERITONITIS	DISCHARGE		EXPIRED		
	N	%	N	%	
Localized	0	0.00%	0	0.00%	
Diffused	81	81.00%	19	19.00%	
NATURE OF EXUDATE	DISCHARGE		EXPIRED		P-VALUE
	N	%	N	%	
C/T/P	62	62.00%	13	13.00%	X=0.5415
Fecal	19	19.00%	6	6.00%	p=0.4618

Among all the enrolled patients, the majority had an MPI score of  $\leq 26$ , of which 69.14% were discharged. Patients with higher MPI scores had more expired patients [52.63%]. However, non-significant difference was observed in the MPI score of enrolled patients [P=0.0734]. All the patients enrolled had non-colonic sepsis, of which 81.00% were discharged, and the rest expired. Among all the 100 patients with diffused peritonitis, 19.00% were expired. The majority of the patients had clear and purulent exudates, of which 62.00% were discharged, and 13.00% were expired. Statistically, a non-significant difference was observed in the nature of the exudates of enrolled patients [p=0.4618].

Table 5: Association of MPI score with other parameters of enrolled patients with perforation peritonitis

	MPI SCORE				P-VALUE
	$\leq 27.00$		$> 27.00$		
	[n=65]		[n=35]		
	N	%	N	%	
<b>Age</b>					
<50 yrs	29	44.62%	8	22.86%	X=4.620
>50 yrs	36	55.38%	27	77.14%	p=0.0316*
<b>Organ dysfunction</b>					
Present	8	12.31%	14	40.00%	X=10.17 p=0.0014*
<b>Duration of preoperative peritonitis</b>					
<24 hrs	0	0.00%	0	0.00%	--
>24 hrs	65	100.00%	35	100.00%	
<b>Malignancy</b>					
Yes	0	0.00%	1	2.86%	X=1.876 p=0.1708
<b>Origin of Sepsis</b>					
Not colonic	65	100.00%	35	100.00%	--
<b>Diffuse generalized peritonitis</b>					
Yes	65	100.00%	35	100.00%	--
<b>Exudates</b>					
C/P/T	56	86.15%	19	54.29%	X=12.32
Fecal	9	13.85%	16	45.71%	

					<b>p=0.0004*</b>
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Most of the patients were of aged >50 years (63 patients), out of which 36 patients had MPI score  $\leq 27$  followed by 27 patients had MPI score >27. The 14 patients had organ dysfunction with MPI score >27 followed by 8 patients with  $\leq 27$  MPI score. The duration of preoperative peritonitis was >24 hrs in all patients out of which 65 patients had MPI score  $\leq 27$  followed by 35 patients with MPI score >27. The majority of the patients with fecal exudates had higher MPI scores of >27. Statistically, a significant difference was observed in age, organ dysfunction and exudates.

#### 4. DISCUSSION

The present study was conducted to evaluate the usefulness of MPI score in predicting outcomes in patients with perforation peritonitis and thus help in decision-making for treatment. The findings of this study are consistent with those found in previous research, specifically the analysis performed by Wacha H et al.<sup>8</sup> According to the pathophysiology, the clinical spectrum of peritonitis can also be divided into primary, secondary, or tertiary peritonitis. In addition, research by Melgarejo EB et al<sup>9</sup> stated that one of the most significant infectious issues that a surgeon must deal with is still peritonitis. According to Muralidhar VA et al<sup>10</sup> and Wacha and Linder<sup>8</sup> established that the Mannheim Peritonitis Index (MPI) for a retrospective analysis of 1,253 patients with peritonitis and took into account 20 potential risk variables.

According to the findings of a study by Gueiros LD et al<sup>11</sup>, they identified a profile of the patients with 33 female and 42 male patients, a mean age of 42 years, 11 fatalities, and a mortality rate of 14.67%. In our study, the majority of patients were observed under 15-30 years, that is 30 %, and most of them were males 76.00%, with the mean duration of hospital stay was  $10.68 \pm 4.59$  days as most of the patients belonged to the >50 age group 53.00%. They also observed an average hospital stay of approximately 12 days, with a minimum stay of 2 days and a maximum of 68. In our research, the mean pulse rate was recorded highest as  $104.35 \pm 19.44$ , the mean SBP was  $117.47 \pm 22.77$ , and the mean DBP was  $72.68 \pm 16.94$ .

In the present study, 99.00% of patients had no malignancy with no origin of sepsis noted, and the duration of >24hrs is 100.00%. Gueiros LD et al<sup>11</sup> discovered that patients with organ failure, cancer, and age greater than 50 years had statistical significance, with  $p < 0.05$  when comparing the MPI variables in the two groups (survivors and deceased) and preoperative duration was longer than 24 hours in 61 cases 81.3% with non-colonic sepsis origin.

In the current study, 75.00% of patients had clear, purulent exudates, 53.00% had ileal perforations, 34.00% had gastric perforations, 5.00% had appendicular perforations, 67.00% of patients had no complications, and 18.00% had electrolyte imbalances followed by leaks. 81.00% of the patients were released following surgery, while 19 passed away. According to Jabalpur Index (JI), a recently developed simplified scoring system measures peptic perforation. According to Mishra A et al<sup>12</sup>, a simplified scoring system (Jabalpur Index; JI) for peptic perforation was introduced. In this system, each factor received a score based on its severity by the APACHE II scoring system. In a study by Gueiros LD et al<sup>11</sup> purulent exudate was the most frequent, corresponding to 58 cases 77.3%. They observed diffuse peritonitis in 48 patients, of whom 10 died, and 38 were discharged.

In the current study, as per our present study cut-off (MPI of 27), most patients 65.00% had an MPI score of  $\leq 27$ , followed by a score of >27 in 35.00% of patients. On other hand, if we used previous study MPI cut-off, we found that majority of patients with MPI score of  $\leq 26$ , 69.14% were discharged. Patients with higher MPI scores had more expiries (52.63%). Among all the enrolled patients, the majority had an MPI score of  $\leq 27$ , of which 70.37%

were discharged. Patients with higher MPI scores had more expired patients, 57.89%. We also observed that, higher sensitivity (72.84%) and specificity (68.42%) were found while taking our present MPI scoring (MPI 27) as compared to previous literature (MPI 26). Furthermore, as per Notash AY et al<sup>13</sup>, the overall hospital mortality rate was 17.5%, including 80% of patients with MPI >29.

In a study designed by Gueiros LD et al<sup>11</sup>, they said that when there are no risk factors present, the MPI score can be zero, and when there are all risk factors present, it can be 47. Based on the MPI cutoff point, they split the patients into two groups, where the HSCMV patient profile had a stronger impact in predicting mortality. Therefore, there were slight deviations of MPI amongst different studies, and in our study MPI of 27 had best accuracy.

In our study, all patients included had non-colonic sepsis; 81.00% of them were discharged, while the remaining patients expired. 19 % of the 100 patients with disseminated peritonitis died. The majority of the patients had clear and purulent exudates, of which 62.00% were released, and 13.00% expired. The majority of the patients (63 patients) were above the age of 50, and of those, 36 had MPI scores below 27, followed by 27 with MPI scores over 27. Similarly, as per study by Gueiros LD et al<sup>11</sup> 1,285 pre- selected patients were enrolled using research on the aforementioned procedures. Of which, 75 people have met all of the inclusion criteria for the diagnosis of peritonitis. They found the best Kappa concordance index value was used to determine the cutoff point of MPI of 27 points, of calculated 90.90% sensitivity and 78.13% specificity.

## 5. CONCLUSION

We concluded that early evaluation of the severity of peritonitis can aid in determining surgical and medicinal treatment. Scoring systems, such as the Mannheim Peritonitis Index, are necessary for risk classification, evaluation of novel diagnostic techniques and therapeutic breakthroughs, and comparison of treatment outcomes across clinics. When a score range of 27 points is reached, it is suggested that the MPI be utilized in the patient's initial care to initiate an early intervention. This stratification assists in assessing the prognosis and defining the surgical risk, hence influencing the selection and planning of the operation, such as damage control or definitive procedure.

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