

Original Research Article

MANNHEIM PERITONITIS INDEX SCORING AS A PROGNOSTIC MARKER IN PERFORATION PERITONITIS

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Received : 20/09/2024
Received in revised form : 11/11/2024
Accepted : 28/11/2024

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DOI: 10.70034/ijmedph.2024.4.225

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2024; 14 (4); 1236-1241

ABSTRACT

Background: Secondary peritonitis is the most common type of peritonitis all over the world. Acute secondary peritonitis due to hollow viscus perforation is a life-threatening surgical condition with significant morbidity and mortality. Several scoring systems have been developed to assess the severity and its relation to morbidity and mortality. We conducted this study to evaluate the role of the Mannheim peritonitis index (MPI) in predicting outcomes in perforation peritonitis patients in a north India hospital.

Materials and Methods: A prospective observational study of 50 patients with hollow viscus perforation with secondary peritonitis presented to the emergency department, of north India hospital from May 2022 to April 2023. Each operated patient was scored according to the MPI to predict mortality and morbidity. Data was analyzed using appropriate analysis strategy.

Results: The majority of the patients were discharged uneventfully and about 12% (6/50) of the patients expired. The patients with an MPI score of more than 26 had mortality of 27.3%, whereas no mortality was recorded in patients with a MPI score of ≤ 26 . Higher mortality was associated with age greater than 50 years, female sex, duration of peritonitis >24 h, organ failure and fecal contamination. 75% patients of low risk group and 90.9% of high risk group patients develop wound infection, p-value is 0.139. 3.6% patients of low risk group and 45.5% patients of high risk group develop multiorgan failure and septic shock, p-value is 0.001. 17.9% patients of low risk group and 59.1% patients of high risk group needs ventilatory support, p-value is 0.003.

Conclusion: MPI is a specific, easily reproducible, and less cumbersome scoring method for predicting mortality in patients with hollow viscus perforation (secondary) peritonitis with minimal laboratory investigations. Higher scores correlate with a poorer prognosis. MPI is accurate to be used with patients with peritonitis and should be considered reliable and simple reference for estimating their risk of death.

Keywords: Mortality, prognosis, mannheim peritonitis index, secondary peritonitis, hollow viscus perforation.

INTRODUCTION

Peritonitis is inflammation of the peritoneum and is most commonly due to localized or generalized infection. Currently, peritonitis is organized into three division based upon the source and nature of microbial contamination. Primary peritonitis is an infection without any visceral perforation, usually from extra-peritoneal source and mono microbial in nature.

Secondary peritonitis is the most common type of peritonitis all over the world. Secondary peritonitis follows an intra-peritoneal source usually from perforation of hollow viscous (infection like typhoid or non-infective like duodenal ulcer perforation, blunt trauma abdomen etc.).

Tertiary peritonitis developed following treatment failure of secondary peritonitis. Despite advances in diagnosis, surgical techniques, antimicrobial therapy

and intensive care units, it remains a potentially fatal affliction.^[1]

Secondary peritonitis is a life threatening condition. One of the reason for high mortality is that peritonitis due to perforation affects the general condition and leads to complications causing multiple organ failure, acute respiratory distress syndrome and sepsis. The course of the disease is influenced by the physiological reserve of the patient, the acute severity, subsequent management and complications.

Early prognostic evaluation of patients with peritonitis is desirable to select high risk patients for intensive management and also to provide a reliable objective classification of severity and operative risk. Thus any study of the factors affecting mortality in peritonitis requires not only measurement of individual clinical and laboratory data but also evaluation of disease severity from systemic perspective.

Realizing the need for a simple accurate scoring system in these conditions. The present study will be undertaken to evaluate the performance of MANNHEIM PERITONITIS INDEX Scoring System in predicting the risk of morbidity and mortality in patient with peritonitis due to hollow viscous peritonitis. The severity of disease can be calculated using MPI system. The MPI provide an easy and reliable means of risk evaluation and classification for patients with peritoneal inflammation.

MPI which was developed based on the retrospective analysis of data from 1253 patient with peritonitis, in which 20 possible risk factors were considered. Of these only 8 proved to be of prognostic relevance and were entered into MPI, classified according to their predictive power patient with score exceeding 26 were defined as having high mortality rate.^[2] The MPI is a specific score, which has a good accuracy and provides an easy way to handle with clinical parameters allowing the prediction of individual prognosis of patient with peritonitis.^[3]

Several scoring system are in place to stratify the patients with peritonitis due to hollow viscous perforation like SIMPLIFIED ACUTE PHYSIOLOGICAL SCORE, SEVERITY SEPSIS SCORE, APACHE II and ACUTE PHYSIOLOGICAL SCORE. Utilization of scoring system would be of great help in salvaging a priceless life of a patient. Our study is aimed at testing the effectiveness of MANNHEIM PERITONITIS INDEX.

MATERIALS AND METHODS

SOURCE OF DATA

This was a prospective observational analytical study conducted in the department of General Surgery at tertiary care hospital of North India for a period of 1 year between May 2022 and April 2023,

50 patients diagnosed as a case of perforation peritonitis over a period of 12 months were included.

METHOD OF COLLECTION OF DATA

Inclusion Criteria

1. All patients diagnosed as a case of intestinal perforation or hollow viscous perforation.
2. Traumatic perforation peritonitis

Exclusion Criteria

1. Age < 18 years
2. Primary peritonitis
3. Perforation peritonitis managed conservatively

All patients presented with acute abdomen a detailed history of each patient will be obtained with history of presenting symptoms, premorbid conditions and the patient past history, thorough physical examination done as a part of initial assessment. All the patients will undergo following routine investigations:

Hematological Investigations, biochemical investigations and ABG.

For diagnosis X-ray abdomen (erect): Chest x-ray (erect): USG abdomen and CECT abdomen (if needed)

The diagnosis of intestinal perforation will be confirmed by chest x-ray/ (erect)/ USG abdomen / CECT abdomen. The patient will be assessed by the parameter of MPI score. MPI scoring system was done in all patients and patient were classified those with score less than 26 and more than 26 and outcome will be assessed accordingly.

The patient will be managed as per our standard departmental protocol, patient will be resuscitated with IV fluids along with correction of electrolyte imbalance, broad spectrum antibiotics cover will be given to all patients, GI decompression through Ryle's tube will be done. All patients who will fit to withstand general anesthesia will undergo to exploratory laparotomy for peritoneal toilet and source control.

MPI SCORE

Risk Factors	Weighting if present
1) Age > 50 years	5
2) Female sex	5
3) Organ failure	7
4) Malignancy	4
5) Preoperative duration of peritonitis > 24 hrs	4
6) Origin of sepsis not colonic	4
7) Diffuse generalized peritonitis	6
8) Exudate	
Clear	0
Cloudy. Purulent	6
Faecal	12

Definitions of organ failure

Kidney	Creatinine level > 2 mg/dl Urea level >167 m mol/l Oliguria < 20 ml/h
Lung	PO ₂ < 50 mm Hg PCO ₂ >50 mm Hg
Shock (Definition according to Shoemaker)	Hypodynamic or Hyperdynamic
Intestinal obstruction (only if profound)	Paralysis > 24 h or complete mechanical ileus

PO₂, Partial pressure of O₂, PCO₂, Partial pressure of CO₂

Postoperative outcomes will be assessed in terms of

- Wound infection
- Wound dehiscence
- Localized abdominal abscess
- Multiorgan failure and septic shock
- Chest infection like pneumonia and pleural effusion.

Statistical Analysis

Data obtained from this study will be put to statistical analysis using ANOVA (analysis of variance) test, to study the multiple variables and compare it with outcome. A p-value <0.05 was considered statistically significant.

RESULTS

DESCRIPTIVE STATISTICS

In this study 50 cases of perforation peritonitis which were operated over a period of one years from May 2022 to April 2023 taken as study group. The mean age of patients was 42.08(SD 18.185) years ranging from 20 to 85 years, youngest patient was 20 years old and oldest was 85 years old. Mean hospital stay was 14.58 (SD 8.107) days, hospital stay ranging from 1 to 50 days.

AGE WISE DISTRIBUTION

Majority of patients belonged to below 50 age group, in which most of the patients were in 20-29 age group i.e.16(32%). 33 (66%) patients belonged to below 50 age group, out of which 1 patient expired i.e.3%. 17 (34%) belonged to more than 50 age group, out of which 5 patients expired i.e.29.4%. Thus majority of patients expired belonged to above 50 age group.

SEX WISE DISTRIBUTION

Males accounted for 72% of the total patients, out of which 3 males expired i.e. 8.3% and females accounted for 28% of the total patients, out of which 3 females expired i.e. 21.4%. Thus females had high

percentage of mortality as compared to male with poor prognosis. Overall male to female ratio is 2.57.

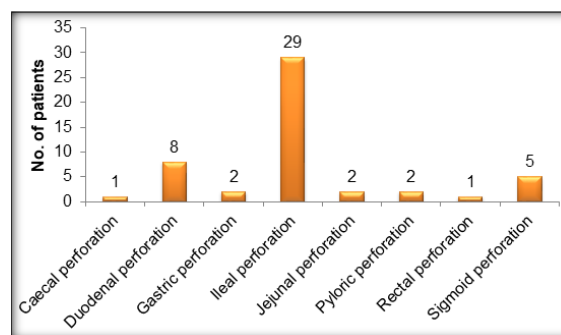


Figure 1: Location of perforation

ORGAN FAILURE

Out of 50 patients of perforation peritonitis,76% of study group patients had no organ failure, out of which 1 patient expired i.e.2.7%, where as 24% of study group patients had organ failure out of which 5 patients expired i.e.41.7%. The study showed patients with organ failure had poor prognosis.

TYPE OF PERITONITIS

In 50 patients of study group, all patients presented with generalized peritonitis no patient presented with localized peritonitis.

TYPE OF EXUDATE

In 50 patients of perforation peritonitis, 34% of study group patients presented with faecal exudate, out of which 3 patients expired i.e.17.6% and 66% of study group patients presented with purulent exudate, out of which 3 patients expired i.e.9.1%. The study shows patients with faecal exudate had poor prognosis.

OUTCOME

All the patients in low risk group got discharged i.e.100% and in high risk group 15 out of 22 patients got discharged i.e. 68.2%, 1 DAMA i.e. 4.5% and 6 expired i.e.27.3%. Thus all mortality occurred in high risk group. p-value is 0.006 which was statistically significant.

Table 1: Mean Age and Hospital Stay

	Mean	SD	Minimum	Maximum
Age (years)	42.08	18.185	20	85
Hospital stay (days)	14.58	8.107	1	50

Table 2: Location of Perforation

Location of perforation	No. of patients	Percentage	Expired	Percentage
Caecal perforation	1	2.0	0	0
Duodenal perforation	8	16.0	0	0
Gastric perforation	2	4.0	1	50
Ileal perforation	29	58.0	2	6.9
Jejunal perforation	2	4.0	2	100
Pyloric perforation	2	4.0	0	0
Rectal perforation	1	2.0	1	100
Sigmoid perforation	5	10.0	0	0
Total	50	100.0	6	12

Table 3: Duration of Peritonitis

Duration of peritonitis	No. of patients	Percentage	Expired	Percentage
Less than 24 hours	7	14.0	0	0

More than 24 hours	43	86.0	6	14
Total	50	100.0	6	12

Table 4: Origin of Sepsis

Origin of sepsis	No. of patients	Percentage	Expired	Percentage
Colonic	7	14.0	1	14.3
Non colonic	43	86.0	5	11.6
Total	50	100.0	6	12

Table 5: MPI SCORE

Total score-group	No. Of patients	Percentage
Less than or =26	28	56.0
More than 26	22	44.0
Total	50	100.0

Table 6: Wound Infection

Group		Wound infection		Total	p value
		No	Yes		
Less than 26	No.	7	21	28	0.112
	%age	25.0%	75.0%	100.0%	
More than 26	No.	2	20	22	
	%age	9.1%	90.9%	100.0%	
Total	No.	9	41	50	
	%age	18.0%	82.0%	100.0%	

Table 7: Multiorgan failure and septic shock

Group		Multiorgan failure and septic shock		Total	p value
		No	Yes		
Less than 26	No.	27	1	28	0.001
	%age	96.4%	3.6%	100.0%	
More than 26	No.	12	10	22	
	%age	54.5%	45.5%	100.0%	
Total	No.	39	11	50	
	%age	78.0%	22.0%	100.0%	

Table 8: Ventilatory Support

Group		Ventilatory support		Total	p value
		No	Yes		
Less than 26	No.	23	5	28	0.003
	%age	82.1%	17.9%	100.0%	
More than 26	No.	9	13	22	
	%age	40.9%	59.1%	100.0%	
Total	No.	32	18	50	
	%age	64.0%	36.0%	100.0%	

Table 9: Outcome

Group		Outcome			Total	P-value
		Dama	Discharged	Expired		
Less than 26	No.	0	28	0	28	0.006
	%age	0%	100.0%	0%	100.0%	
More than 26	No.	1	15	6	22	
	%age	4.5%	68.2%	27.3%	100.0%	
Total	No.	1	43	6	50	
	%age	2.0%	86.0%	12.0%	100.0%	

DISCUSSION

For surgeons peritonitis still remains as a challenging topic despite advancements in surgical technique and intensive care treatment. Various factors like age, sex, duration, site of perforation, extent of peritonitis and delay in surgical intervention are associated with morbidity and mortality. A successful outcome depends upon early surgical intervention, source control and exclusive intraoperative peritoneal lavage.

There is no ideal scoring system for the pre-operative assessment of patients needing emergency surgery. Some pre-operative scoring systems provide approximate estimate of mortality risk but none have been shown to be sufficiently specific for use on individual patients.

This study was done in North India hospital included 50 patients who presented to surgery department and were diagnosed with hollow viscous perforation. All the patients were appropriately assessed and managed according to standard guidelines.

In our study, majority of patients belongs to below 50 age group i.e 66%. 1 out of 33 patients i.e. 3.1% expired in group below 50 age group and 5 out of 17 i.e. 29.4% expired in group above 50 age group. Thus, increasing age correlates with higher mortality similar to the study by Sharma et al.^[4]

Kusumoto Yoshiko,^[5] et al, in their study of patients operated for intra-abdominal infections found that there was no mortality in less than 50 years age group, while mortality occurring only in patients older than 50 years.

The mean age of patients was 42.08(SD 18.185) years ranging from 20 to 85 years. Muralidhar,^[6] et al, reported mean age in study was 43.8 (SD 15.8) years (range 18–85). There was male preponderance, males accounted for 72% of the patients and females accounted for 28% of the total patients and male to female ratio is 2.57 similar to the study by Mathur et al,^[7] and Huttunen et al.^[8]

In our study, mortality was 8.3% in men and 21.4% in woman. Kusumoto Yoshiko,^[5] et al, found out in their study of 108 patients operated for intra-abdominal infections the mortality was 5.3% in men and 15.2% in women

In our study the most common etiology of peritonitis was ileal perforation was seen in 58% patients, duodenal perforation in 16% patients, sigmoid perforation in 10% patients, jejunal perforation in 4% patients, pyloric perforation in 4% patients and gastric perforation in 4% of patients, caecal and rectal perforation in 2% patients each. Ohmann,^[9] et al, reported duodenal ulcer perforation as the commonest cause for peritonitis in his series, while Kachroo,^[10] et al found appendicular perforation as the commonest cause.

In our study, majority of patients i.e. 86% patients presented to hospital after 24 hrs of the onset of symptoms with 14% mortality whereas patient presented within 24 hrs had no mortality. In the study by Rodolfo L,^[11] all the patients who died were having a preoperative duration of greater than 24 hours.

In our study, 41.7% patient died out of 12 patients presented with organ failure where as 2.7 % patient died out of 38 patients who was not presented with organ failure. In the study by Rodolfo L,^[11] et al 11(6.32 %) patient's died and all of them presented with the variable of organ failure.

In our study, 14.3% patients died with colonic perforation and 11.6% with non-colonic perforation. Chao –Wen Hsu,^[12] et al, in their study of 141 patients with colorectal perforations found mortality of 36.9%.

56% patients had MPI score less than or equal to 26 i.e. low risk group and 44% patients had MPI score more than 26 i.e. high risk group. Rodolfo L,^[11] et al, in their study found out that 26 MPI point was a useful reference.

In the study group of 50 patients, 75% patients of low risk group and 90.9% of high risk group patients develop wound infection, p-value is 0.139 .10.7% patients of low risk group and 18.2%

patients of high risk group develop wound dehiscence, p-value is 0.362. 3.6% patients of low risk group and 45.5% patients of high risk group develop multiorgan failure and septic shock, p-value is 0.001 .17.9% patients of low risk group and 59.1% patients of high risk group needs ventilatory support, p-value is 0.003. 46.4% patients of low risk group and 77.3% patients of high risk group develops chest infection and pleural effusion, p-value is 0.026. 0% patient of low risk group and 31.8% patients of high risk group develop renal failure, p-value is 0.002.

Muralidhar,^[6] et al, evaluated Overall morbidity in his study was 38%. Pulmonary complications were seen in 18% cases, surgical site infection (SSI) was seen in 16% cases, Hypotension in 6% cases, wound dehiscence was in 4% cases, Intra-abdominal abscess and ARF was observed in 2% cases respectively. According to the analysis MPI score of ≥ 26 had 5.72 times higher risk of morbidity than MPI score of ≤ 25 .

In our study group of 50 patients, all patients in low risk group get discharged where as in high risk group 68.2% patients get discharged, 27.3% patients expired and 4.5% get discharged against medical advice and was statistically significant (p=0.006).

Muralidhar,^[6] et al., reported MPI score of 26 and more were associated with 29.4% mortality compared to patients with MPI score of 25 and less which was 6.1% mortality and was statistically significant (p=0.03).

Kusumoto Yoshiko and Nakagawa Masayuki,^[5] et al. evaluated the reliability of the MPI in predicting the outcome of patients with peritonitis. A comparison of MPI and mortality showed patients with a MPI score of 26 or less to have mortality of 3.8%, where as those with a score exceeding 26 had mortality of 41%.

Qureshi AM, Zafar A, Saeed K, Quddus A,^[13] et al. Mortality rate for MPI score more than or equal to 26 was 28.1% while for less than 26 it was 4.3%. For MPI scores 20 or less than 20 mortality rate was 1.9%, for scores 21-29 it was 21.9% and for score 30 or more it was 28.1%. Chi-square showed significant association between mortality and increasing MPI score (p<0.01).

Liverani A, Correnti SF, Pagnelli MT, Antonini G, Mercati U,^[14] et al. The overall mortality was 8.1% for patients with a score less than 26 the mean mortality rate was 2% and for score greater than 26, 40.5%.

CG Nwigwe,^[15] et al. (2007) studied 67 consecutive patients with generalized peritonitis. The mean MPI score for survivors was 30.6, for MPI > 30 mortality was 92.3%. In this study the cut off point for Mannheim peritonitis index of 25 was associated with the highest degree of accuracy.

Despite of all efforts this study had some limitation. As sample size is quite low, larger the sample size may give some more finding. Also, on the conclusion, MPI is a useful method to determine study group outcome in patients with peritonitis.

CONCLUSION

The MPI is one of the most simple scoring system in use that allows the surgeon to easily determine the outcome risk during initial surgery. MPI scoring system done in all patients depending on preoperative and intraoperative findings and patients were categorized into two categories low risk group i.e. ≤ 26 and high risk group i.e. >26 .

MPI scoring as prognostic scoring is significant in determining post op complications such as ventilatory support, multiorgan failure, septic shock and mortality. However post op complications such as wound infection is seen more in high risk group, but there p-value is statistically not significant. Higher mortality was associated with age greater than 50 years, female sex, duration of peritonitis >24 h, organ failure and fecal contamination.

We concluded that mannheim peritonitis index is simple, effective and accurate method to predict mortality and morbidity in hollow viscous perforation.

REFERENCES

1. Sahu SK, Gupta A, Sachan PK and Bahl DV. Outcome of secondary peritonitis based on Apache II Score. *The internet J Surg.* 2007; 14:2.
2. Wacha H, Linder MM, Feldman U, Wesch G, Gundlach E, Steifensand RA. Mannheim peritonitis index - prediction of risk of death from peritonitis: construction of a statistical and validation of an empirically based index. *Theoretical Surg.* 1987; 1:169-77.
3. Correia MM, Thuler LCS, Velasco E, Vidal EM, Schanaider A. Prediction of death using mannheim Peritonitis index in oncologic patients. *Revista Brasileira de Cancerologia.* 2001; 47:63-8.
4. Sharma S, Singh S, Makkar N, Kumar A, Sandhu MS: Assessment of severity of peritonitis using Mannheim peritonitis index. *Niger J Surg.* 2016, 22:118-22. 10.4103/1117-6806.189009
5. Kusumoto Yoshiko and Nakagawa Masayuki. Study of Mannheim Peritonitis Index to Predict Outcome of Patients with Peritonitis. *Japanese Journal of Gastroenterological Surgery.* 2004; 37(1): 7-13
6. Muralidhar VA, Madhu CP, Sudhir S, Srinivasarangan M. Efficacy of Mannheim Peritonitis Index (MPI) Score in Patients with Secondary Peritonitis. *J Clin Diagn Res.* 2014, 8:NC01-3.
7. Mathur GM, Sharma R: A study of typhoid fever in Jaipur, India. *Trop Geogr Med.* 1971, 23:329-34.
8. Huttunen R, Kairaluoma MI, Mokka RE, Larmi TK: Nontraumatic perforations of the small intestine. *Surgery.* 1977, 81:184-8.
9. Ohmann C, Wittmann DH, Wacha H. Prospective evaluation of prognostic scoring systems in peritonitis. *Eur J Surg* 1993 159: 267-74.
10. Kachroo R, Ahmad MN, Zargar HU. Peritonitis – an analysis of 90 cases. *Indian J Surg* 1984; 46: 204-9.
11. Rodolfo L. Bracho-Riquelme MC, Men C, Mannheim Peritonitis Index Validation Study at the Hospital General de Durango (Mexico), *Cir Ciruj* 2002;70:217-225.
12. Chao-Wen Hsu, Colorectal perforation: Spectrum of the disease and its mortality. *J Soc Colon Rectal Surgeon (Taiwan)* September 2007, 81.
13. Abrar Maqbool Qureshi, Predictive power of Mannheim peritonitis index. *Journal of College of Physicians and Surgeons of Pakistan* 2005 Nov; 15 (11) : 693-6.
14. Liverani A, Correnti SF. The value of 2 distinct prognostic scores in patients with peritonitis. The MPI versus the APACHE II score. *Chirurg.* 1990; 61 (4) : 297-300.
15. C G Nwigwe, Validation of Mannheim peritonitis index (A Nigerian study) *Ebonyl Medical Journal* Vol. 6 (1) 2007: 3-8.