International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Effectiveness of Mannheim Peritonitis index in Predicting the Morbidity and Mortality of Patients with Hollow Viscous Perforation

Dr. Sonia Tata[1], Dr. Suhas Taralekar[2], Dr. Abay Kumar[3], Dr. Rachana Gaidole[4]

Abstract: ***Aim:*** *This study was conducted to know efficacy of MPI for predicting morbidity and mortality in hollow viscous perforation.* ***Methods:*** *The present study was conducted at Bharati hospital and research centre, Bharati Vidyapeeth Medical College, Pune from September 2020 to August 2022. The consecutive cases of peritonitis getting admitted in general surgery ward from 2020 to 2022 were included.74 cases of peritonitis were included in the study.* ***Results:*** *The mean age of the patients was 44.84 ± 19.65 years ranging between 18 to 85 years, out of 74, there were 50 (67.6%) male and 24 (32.4%) females, with male to female ratio of 2.08: 1. Pain was the most common symptom reported among 73 (98.6%) patients, followed by vomiting (46 (62.2%)), abdominal distention (19 (25.7%)), organ failure (12 (16.2%)), and fever only in 5 (6.8%) patients. The vitals were unstable in 9 (12.2%) patients. The most common site of perforation reported in this study was gastric present in 34 (45.9%) patients, followed by appendicular in 19 (25.7%), ileal in 6 (8.1%), 5 each had at caecum, duodenum and jejunum. The most common type of peritonitis was localised peritonitis observed in 46 (62.2%) patients and diffuse peritonitis was observed in28 (37.8%) patients. The most common site of perforation reported in this study was gastric present in 34 (45.9%) patients, followed by appendicular in 19 (25.7%), ileal in 6 (8.1%), 5 each had at caecum, duodenum and jejunum. The most common type of peritonitis was localised peritonitis observed in 46 (62.2%) patients and diffuse peritonitis was observed in28 (37.8%) patients. Purulent exudate was characterized in 60 (81.1%) patients and regular in 14 (18.9%) patients. Out of 74 there were 68 (91.9%) patients who were discharged, death was reported in 2 (2.7%) patients and discharge against medical advice (DAMA) was given in 4 (5.4%) patients.* ***Conclusion:*** *The results of this study provided that Mannheim Peritonitis Index scoring system is a simple and effective tool for assessing this group of patients, and can be used as a guiding tool to decide on the management of patient at all level of health care system.*

Keywords: Hollow viscous perforation, MPI, Mortality, Peritonitis

1. Introduction

Peritonitis secondary to hollow viscous perforation carries high risk of morbidity and mortality. Despite advances in medical field, the morbidity and mortality of peritonitis due to hollow viscous perforation remains high. A good scoring system is required for stratifying patients in different groups, use of different treatment modalities and monitoring outcome and improving standard of care.[1, 2] Several scoring systems are there like acute physiology and chronic health evaluation II (APACHE II), Sepsis Severity Score (SSS), BOEYS etc. MPI is simple to calculate and specific allowing prediction of outcome of individual patient with peritonitis due to hollow viscous perforation. Mannheim Peritonitis Index (MPI) was developed by Wacha and Linder in 1983.[3]

It was developed based on the retrospective analysis of data from 1253 patients with peritonitis, in which 20 possible risk factors were considered. Of these only 8 proved to be of prognostic relevance and were entered into the MPI, classified according to predictive powers.4The prognosis of peritonitis remains poor despite development in diagnosis and management. Early identification of patients with severe peritonitis may help in selecting patients for aggressive surgical approach.[5 - 7] Grading the severity of acute peritonitis has assisted in no small way in decision making and has improved therapy in the management of severely ill patients.[8] Empirically based risk assessment for important clinical events has been extremely useful in evaluating new therapies, in monitoring resources for effective use and improving quality of care.[1, 2]

Many scoring systems have been designed and used successfully to grade the severity of acute peritonitis like, Acute physiology and chronic health evaluation (APACHE) II score, Simplified acute physiology score (SAPS), Sepsis severity score (SSS), Ranson score, Imrite score, Mannheim peritonitis index (MPI).[8, 9] MPI was developed by Wacha and Linder in 1983.3 It was developed based on the retrospective analysis of data from 1253 patients with peritonitis, in which 20 possible risk factors were considered. Of these only 8 proved to be of prognostic relevance and were entered into the Mannheimperitonitis index, classified according to their predictive power. Patients with a score exceeding 26 were defined as having a high mortality rate.[9] The Mannheim peritonitis index (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.[10]

This study was conducted to know efficacy of MPI for predicting morbidity and mortality in hollow viscous perforation.

2. Materials and Methods

The present study was conducted at Bharati hospital and research centre, Bharati Vidyapeeth Medical College, Pune from September 2020 to August 2022. The consecutive cases of peritonitis getting admitted in general surgery ward from 2020 to 2022 were included.74 cases of peritonitis were included in the study.

Tool of data collection: A specially designed proforma was filled for each patient. These proforma had general information about the patients, pre and post - operative labs and other variables

Inclusion criteria:

- Patients with peritonitis due to any intra - abdominal organ perforation in the age group of 18 - 60 yrs were included

Exclusion criteria:

All patients with

- Polytrauma, primary peritonitis
- Postoperative peritonitis
- Age group <18and>60yrs were excluded

3. Methodology

The study group comprised of patients above pediatric age group and both genders who undergo emergency laparotomy surgery at Bharati Hospital and Research Center, Pune. Once diagnosis of peritonitis was determined by detailed history taking which included symptoms & duration of the disease; General Physical & Systemic Examination, pre and post - operative findings were registered in the postoperative report, the patient was recruited into the study.

Using data recollection sheets, risk factors found in MPI were classified according to values indicated in Table and individual variable scores were added to establish initial MPI score. In addition to personal data such as name, age, sex, etc., the following intra - hospital information was also be registered: file number; dates of admission and discharge from the hospital; days hospitalized; date of surgery and information related to illness (surgical findings, medical treatment and evolution of illness). Patient evolution was followed, indicating presence of complications and discharge due to improvement or death. Time elapsed from initial diagnosis to moment of event (death or discharge from hospital) was determined. The minimum possible score is zero, if no adverse factor were present, and maximum is 47 if presence of all were confirmed.

Patients were divided into three groups according to the following categories; MPI points fewer than 21; from 21 to 29, and more than 29. These categories and useful clinical reference at 26 MPI points was considered as done in the study published by Billing A et al.1[1]

Statistical analysis:

The collected data was entered in Microsoft excel sheet and analysed. The results were presented in tabular and graphical format. Data was analysed using software SPSS.

4. Results

Table 1: Patient details

Gender	**Frequency**	**Percent**
Female	24	32.4
Male	50	67.6
Pre - OP duration		
<24 HOURS	60	81.1
>24 HOURS	14	18.9
Symptoms		
Pain	73	98.6
Vomiting	46	62.2
Abdominal distension	19	25.7
Fever	5	6.8
Unstable vitals	9	12.2
Organ failure	12	16.2
Pneumoperitoneum on X - ray	58	78.4
Intra - OP procedure		
Emergency laparotomy (EL)	68	91.1
Laparoscopy	6	8.1

A total of 74 patients with features of peritonitis were included in the present study. The mean age of the patients was 44.84 ± 19.65 years ranging between 18 to 85 years, out of 74, there were 50 (67.6%) male and 24 (32.4%) females, with male to female ratio of 2.08: 1. The patients were divided based on preoperative duration considering the cut off value of 24 hours into 2 groups, there were 60 (81.1%) of patients in whom the preoperative duration was < 24 hours and in 14 (18.9%) patients the duration was > 24 hours. Pain was the most common symptom reported among 73 (98.6%) patients, followed by vomiting (46 (62.2%)), abdominal distention (19 (25.7%)), organ failure (12 (16.2%)), and fever only in 5 (6.8%) patients. The vitals were unstable in 9 (12.2%) patients. Among 74 patients with peritonitis the intra operative procedure used in 68 (91.1%) patients was emergency laparotomy and in 6 (8.1%) patients laparoscopy was used.

Table 2: Site of perforation, distribution of patients according to sepsis origin peritonitis type exudate characters and Outcomes

Site of perforation		Frequency	Percent
Appendicular		19	25.7
Caecal		5	6.8
Duodenal		5	6.8
Gastric		34	45.9
Ileal		6	8.1
Jejunal		5	6.8
		Frequency	Percent
Origin of sepsis	Colonic	74	100.0
Type of peritonitis	Diffuse	28	37.8
	Localised	46	62.2
Character of exudate	Feculent	14	18.9
	Purulent	60	81.1
Outcomes			
DAMA		4	5.4
Death		2	2.7
Discharge		68	91.9

The most common site of perforation reported in this study was gastric present in 34 (45.9%) patients, followed by appendicular in 19 (25.7%), ileal in 6 (8.1%), 5 each had at caecum, duodenum and jejunum. The most common type of peritonitis was localised peritonitis observed in 46 (62.2%) patients and diffuse peritonitis was observed in28 (37.8%) patients. Purulent exudate was characterized in 60 (81.1%) patients and regular in 14 (18.9%) patients. Out of 74 there were 68 (91.9%) patients who were discharged, death was reported in 2 (2.7%) patients and discharge against medical advice (DAMA) was given in 4 (5.4%) patients.

Table 3: Mannheim Peritonitis Index (MPI) and Distribution of patients as per MPI category

	Mean	SD
Pre – operative score	3.49	3.55
Intra operative score	8.30	4.53
Total score	11.76	5.37
Duration of stay	11.28	7.82
MPI Score category		
>21	66	89.2
>21	8	10.8

The mean preoperative MPI score was 3.19 ± 3.55, intraoperative mean score was 8.30 ± 4.53 and the total of both scores was 11.76 ± 5.37. The mean duration of hospital stay was 11.28 ± 7.82 days. There were 66 (89.2%) patients with MPI score of <21 and 8 (10.8%) patients had the score of ≥21.

Table 4: Association of MPI score categories with demographic and clinical parameters

		Total score category		P Value
		<21	≥21	
		N%	N%	
Gender	Male	20 (83.33)	4 (16.7)	0.4240
	Females	46 (92)	4 (8)	
Pre – OP duration	<24 Hours	53 (88.3)	7 (11.7)	0.999
	>24 Hours	13 (92.9)	1 (7.1)	
Pain	No	1 (100)	0	0.999
	Yes	65 (89)	8 (11)	
Organ failure	No	58 (93.50)	4 (6.50)	0.020
	Yes	8 (66.67)	4 (33.33)	
Type of peritonitis	Diffuse	20 (71.4)	8 (28.6)	<0.001
	Localised	46 (100)	0	
Outcome	DAMA	3 (75)	1 (25)	0.005
	Death	0	2 (100)	
	Discharge	63 (92.6)	5 (7.4)	

We found significant association between category of MIP total score with organ failure (p=0.020), type of peritonitis (p<0.0001) and outcome (p=0.005). There was no significant association reported between the MPI total score category with gender, preoperative duration and pain.

Table 5: Comparison of MPI scores according to outcome

	Outcome			
	Death		Discharge	
	Mean	SD	Mean	SD
Preoperativescore	14.00	0.00	3.16	3.18
Intraoperativescore	12.00	0.00	8.03	4.35
Totalscore	26.00	0.00	11.16	4.83

The association of MPI scores with outcomes as death and discharge was analyzed using students ‘t’ test. The mean values of preoperative, intraoperative and total MPI scores were higher in patients with death as outcomes compared to the patients who were discharged. The statistical significance was not able to be generated as in death group the standard deviation value was ‘0’.

5. Discussion

The present study was undertaken at this institute with a total of 74 patients. This study was conducted to know the morbidity and mortality in the patients of perforative peritonitis and patients were categorized into groups based on the Mannheim peritonitis index (MPI) scoring system. Inflammation of the peritoneal cavity is referred to as peritonitis, and it can be categorized based on the underlying cause (primary or secondary), severity (localized or generalized), or the presence of infectious agents (septic or non - septic).[12]

The mean age of the patients was 44.84 ± 19.65 years, ranging from 18 to 85 years; out of 74, there were 50 (67.6%) males and 24 (32.4%) females, with a male to female ratio of 2.08: 1.82 men and 18 women underwent emergency laparotomies out of the 100 perforation peritonitis cases that were treated over the course of two years and studied by Sharma R et al (male: female ratio 4.56: 1).[13] In our study, the median patient age was 37.96 17.49 years. Peritonitis is a clinical diagnosis that is primarily based on a patient's medical history and physical examination. Abdominal pain is always the main symptom. The pain may be piercing or nagging; frequently, it is constant, severe, and made worse by movement. The majority of patients lie still while bending their knees and elevating their heads; this reduces the tension in the abdominal wall and lessens pain. Symptoms such as nausea, vomiting, and anorexia are common. However, the symptoms can vary depending on the etiology of the peritonitis and the timing of their onset.[14]Similar to the literature, in our study among all patients, pain was the most common symptom (98.6%), followed by vomiting (62.2%), abdominal distention (25.7%), organ failure (16.2%), and fever (6.8%). In nine (12.2%) patients, the vital signs were unstable.

The most prevalent presenting symptoms were abdominal swelling (73.1 percent), fever and night sweats (53.8 percent), anorexia (46.9 percent), weight loss (44.1 percent), and abdominal pain with a mean duration of 1.5 months of symptoms, according to Manohar A et al[15] (35.9 percent). The typical symptom duration was 1.5 months. Only 18 patients had organ failure, and 87 patients had preoperative durations longer than 24 hours, per Yadav S et al'sfindings.1[6]The most common site of perforation reported in this study was gastric, present in 34 (45.9%) patients, followed by appendicular in 19 (25.7%), ileal in 6 (8.1%), and 5 each at the caecum, duodenum, and jejunum. According to Sharma Ret al[13] the most common origin of sepsis was ileal, with small intestine dominating the source of perforation. The gastric perforation was second to the small intestine in presenting as peritonitis.

In the present study, the origin of sepsis in all 74 patients was colonic. The most common type of peritonitis was localized peritonitis, which was observed in 46 (62.2%) patients, and diffuse peritonitis was observed in 28 (37.8%) patients. Purulent exudate was found in 60 (81.1%) of the patients and regular in 14 (18.9%).79 patients presented with diffuse generalized peritonitis, and 21 patients with localized peritonitis, according to Mohan PB et al.[17] The majority of the patients (82) had exudates that were cloudy and purulent.10 patients had clear exudates, while 8 patients had feculent exudates. The death rate in present study was reported to be 2.7% (2 of 74) in present study, while 68 (91.9%) were discharged, and DAMA was given in 4 (5.4%)

patients. The mean preoperative MPI score was 3.19 ± 3.55; the intraoperative mean score was 8.30 ± 4.53; and the total of both scores was 11.76 ± 5.37. The mean duration of hospital stay was 11.28 ± 7.82 days. The MPI score was in study population was categorized into groups as per cut off value of 21. There were 66 (89.2%) patients with MPI score of <21, and 8 (10.8%) patients had the same score of ≥21. In the study group of 100 patients, Ohmann C et al[18] found that 52% of patients had MPI scores of less than 21, of whom 5.8% developed wound infections with 0% mortality and 94.2 % of patients being normal, 41.4 % of patients had morbidity and mortality MPI scores of 21 to 27, and those with MPI scores of more than 27 had the highest mortality of 84.2%.

In the present study, the association of morbidity with the category of the MIP total score showed a positive association with organ failure, a diffuse type of peritonitis, and death. Similar to our study, Mohan PB et al[17] found that patients with organ failure had significantly higher MPI scores than those without organ failure. Patients with a score of 29 had the least amount of morbidity, which was statistically significant. According to Krishna VM et al, patients with MPI scores greater than 27 had a higher rate of wound infection (morbidity) (76.20%) than those with MPI scores less than 27, which was 6.55 percent.1[9]A straightforward and affordable scoring system for peritonitis is the Mannheim Peritonitis Index (MPI). MPI was developed by Wacha using data collected from 1253 patients with peritonitis treated between 1963 and 1979. Of the 17 potential risk factors, 8 had prognostic relevance and were currently used frequently to predict mortality from peritonitis.[3]

With overall mortality and morbidity of 9% and 43%, respectively, and Mannheim Peritonitis Index scores of 20, 21 - 29, and 30, KarkiOB et al.[20] had mortality of 0%, 14%, and 46%, respectively. Patients with MPI scores between 21 and 29 had a mortality rate of roughly 65 percent, according to Függer R et al's analysis of patients with scores below 21.[21]MPI is a quick and reliable tool for peritonitis outcome prediction. The MPI provides a clear score for each person that is fairly accurate. It makes predictions about each patient's prognosis for peritonitis using clinical parameters. This study provides statistically significant evidence that the MPI scoring system is an easy - to - use tool for estimating morbidity and mortality in patients with peritonitis. It was discovered that feculent exudate and organ failure were both independently significant predictors of mortality.

6. Conclusion

Early evaluation of severity of illness using MPI allows us to estimate the probability of patients survival. This is a validation study of the Mannheim Peritonitis Index scoring system for predicting the morbidity and mortality in patients with hollow viscous perforation. The results of this study provided that Mannheim Peritonitis Index scoring system is a simple and effective tool for assessing this group of patients, and can be used as a guiding tool to decide on the management of patient at all level of health care system.

References

[1] Bion J. Outcomes in intensive care. BMJ: British Medical Journal.1993 Oct 10; 307 (6910): 953.
[2] Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: a severity of disease classification system. Critical care medicine.1985 Oct 1; 13 (10): 818 - 29.
[3] Wacha H. Mannheim peritonitis index - prediction of risk of death from peritonitis: construction of a statistical and validation of an empirically based index. Theor Surg.1987; 1: 169 - 77.
[4] Bohnen J, Boulanger M, Meakins JL, McLean AP. Prognosis in generalized peritonitis: relation to cause and risk factors. Archives of Surgery.1983 Mar 1; 118 (3): 285 - 90.
[5] Giessling U, Petersen S, Freitag M, Kleine - Kraneburg H, Ludwig K. Surgical management of severe peritonitis. Zentralblatt fur Chirurgie.2002 Jul 1; 127 (7): 594 - 7.
[6] Farthmann EH, Schöffel U. Principles and limitations of operative management of intraabdominal infections. World journal of surgery.1990 Mar; 14: 210 - 7.
[7] Ponting GA, Sim AJ, Dudley HA. Comparison of the local and systemic effects of sepsis in predicting survival. British journal of surgery.1987 Aug; 74 (8): 750 - 2.
[8] Kologlu M, Elker D, Altun H, Sayek I. Validation of MPI and PIA II in two different groups of patients with secondary peritonitis. Hepato - gastroenterology.2001 Jan 1; 48 (37): 147 - 51.
[9] Bosscha K, Reijnders K, Hulstaert PF, Algra A, Van der Werken C. Prognostic scoring systems to predict outcome in peritonitis and intra - abdominal sepsis. Journal of British Surgery.1997 Nov; 84 (11): 1532 - 4.
[10] Correia MM, Thuler LCS, Velasco E, Vidal EM, Schanaider A. Peritonitis Index in oncologic patients. RevistaBrasileira de Cancerologia.2001; 47 (1): 63 - 8.
[11] Billing A, Fröhlich D, Peritonitis Study Group. Prediction of outcome using the Mannheim peritonitis index in 2003 patients. British journal of surgery.1994 Feb; 81 (2): 209 - 13.
[12] Volk SW. Peritonitis. Small Animal Critical Care Medicine.2015: 643.
[13] Sharma R, Ranjan V, Jain S, Joshi T, Tyagi A, Chaphekar R. A prospective study evaluating utility of Mannheim peritonitis index in predicting prognosis of perforation peritonitis. Journal of Natural Science, Biology, and Medicine.2015 Aug; 6 (Suppl 1): S49.
[14] Ordoñez CA, Puyana JC. Management of peritonitis in the critically ill patient. Surgical Clinics.2006 Dec 1; 86 (6): 1323 - 49.
[15] Manohar A, Simjee AE, Haffejee AA, Pettengell KE. Symptoms and investigative findings in 145 patients with tuberculous peritonitis diagnosed by peritoneoscopy and biopsy over a five year period. Gut.1990 Oct 1; 31 (10): 1130 - 2.
[16] Yadav S, Suthar R, Meena R, Meena RS. A prospective study of effectiveness of Mannheim peritonitis index scoring system in predicting the morbidity and mortality in peritonitis due to hollow viscous perforation. IntSurg J 2020; 7: 2255 - 60.

[17] Mohan PB, Periannan K. Effectiveness of Mannheims peritonitis index in predicting the mortality and morbidity in patients with hollow viscous perforation in GMKMCH, Salem. International Surgery Journal.2019 Nov 26; 6 (12): 4402 - 7.
[18] Ohmann C, Wittmann DH, Wacha H. Prospective evaluation of prognostic scoring systems in peritonitis. European Journal of Surgery.1993 May 1; 159 (5): 267 - 74.
[19] Krishna VM, Joseph PK, Vattikutti V, Garika G. Evaluation of Mannheim Peritonitis index in predicting the prognosis of hollow viscus perforation. International Journal of Medical Science and Public Health.2017 Feb 1; 6 (2): 250 - 7.
[20] 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 (KUMJ).2018 Oct 1; 16 (64): 296 - 300.
[21] Függer R, Rogy M, Herbst F, Schemper M, Schulz F. Validation study of the Mannheim Peritonitis Index. [Article in German] Chirurg 1988; 59: 598 - 601.