

Evaluation of Mannheim Peritonitis Index for Prediction of Outcome in Secondary Peritonitis at Patna Medical College and Hospital

Anshu Atreya^{1*}, Jainendra Kumar²

¹Senior Resident, Department of Surgery, Patna Medical College and Hospital, Patna, India

²Associate Professor, Department of Surgery, Patna Medical College and Hospital, Patna, India

Original Research Article

*Corresponding author

Dr Anshu Atreya

Article History

Received: 20.12.2017

Accepted: 26.12.2017

Published: 30.12.2017

DOI:

10.36347/sjams.2017.v05i12.056



Abstract: Peritonitis is commonly encountered condition in a surgical emergency room. Secondary peritonitis in particular due to perforation of the enteral system carries high risk of morbidity and mortality especially if aggressive and adequate treatment is not initiated early. Various scoring system have been developed to predict the associated morbidity and risk of mortality in patients with peritonitis. Most of the scoring system are complex and take into consideration technically difficult and non-reproducible parameters. Mannheim Peritonitis Index is a simple scoring system which takes into account the variables/parameters routinely incorporated in basic clinical evaluation and investigations performed in patients with secondary peritonitis. The present study was conducted in Department of Surgery, Patna Medical College and Hospital, Patna to evaluate the MPI in such class of patients. Altogether 58 patients were included during the study period and the scores were analysed based on three categories to ascertain the morbidity and mortality associated. In the study it was observed that patients with higher MPI (>26) were at increased risk of morbidity and in particular mortality which was least in group of patients with MPI less than 21. The result of the present study is in sync with results of other studies done in the past to evaluate the efficacy of Mannheim Peritonitis Index.

Keywords: Mannheim Peritonitis Index, Secondary Peritonitis.

INTRODUCTION

Peritonitis is defined as the inflammation of the peritoneum, the serosal membrane that lines the abdominal cavity along with visceral organs within.

It usually has acute presentation, as a localized or a generalized process and is usually the result of an infectious process, or may also be of non-infectious origin, due to chemical irritants like bile, gastric secretion, urine, pancreatic enzymes. Clinically four types of peritonitis have been described; primary (spontaneous), secondary (anatomic), tertiary (persistence or recurrence of intra-abdominal infection following apparently adequate therapy of primary or secondary peritonitis), and peritoneal dialysis related peritonitis.

Globally, secondary peritonitis which results due to perforation of the enteral tract is amongst the most common surgical emergencies and is associated with significant morbidity and mortality [1–4]. Bacterial pathogens traverse into the peritoneal cavity following the loss of epithelial integrity, as in case of perforation leading to a cascade of inflammatory response, sepsis, multisystem organ failure and death if not treated timely and aggressively.¹ Adequate resuscitation complemented with early surgical

intervention is required to deliver optimum care for the patients and to improve their treatment results, however despite surgical intervention, intensive medical care and use of latest generation of antibiotics, the mortality remains high [2-6].

Many scoring system have been designed and used successfully to grade the severity of acute peritonitis and to stratify the patients with peritonitis due to hollow viscous perforation like Physiological and Operative Severity Score for enUmeration of Mortality and Morbidity (POSSUM), Sepsis Score of Stoner and Elebute, Peptic Ulcer Perforation (PULP) score, Acute Physiology and Chronic Health Evaluation (APACHE) II score, BOEY score, Simplified acute physiology score (SAPS), Sepsis Severity Score (SSS), Ranson score, Imrite score, Mannheim peritonitis index (MPI)[7-14]. 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.¹⁵ MPI was

developed in 1983 by Wacha and Linder, based on the retrospective analysis of data from 1253 patients with peritonitis.¹⁶ Twenty possible risk factors were considered and amongst which only 8 proved to be of prognostic relevance and were incorporated into the Mannheim Peritonitis Index, classified according to their predictive power. Patients with a score exceeding 26 were defined as having a high mortality rate.¹⁶ MPI though being a simple scoring system, it even allows recollection of retrospective data for analysis since most of the parameters are routinely assessed and documented. The study was carried out to evaluate Mannheim Peritonitis Index (MPI) in patients undergoing management of secondary peritonitis at our institute.

MATERIALS AND METHODS

This prospective, observational, cohort study was conducted in the Department of Surgery, Patna Medical College and Hospital, Patna, India over a period of 12 months, between April 2016 to March 2017.

Inclusion criteria

- Patients aged >14 years with secondary peritonitis undergoing emergency exploratory laparotomy on the even Wednesdays of the month.

Following exclusion criteria were used in this study

- Patients who left with incomplete treatment due to financial or other constraints.
- Cases of primary peritonitis.
- Cases that were ruled out for surgery after investigations.
- Cases refused or unfit for surgery.

The particular days of the month were such chosen to avoid variation in outcome due to different surgical units operating on different days of the week and hence to maintain uniformity of the team/unit under which the patients were managed. All patients underwent initial preoperative work up and resuscitation with intravenous fluids, antibiotics, analgesics, nasogastric decompression. Hollow viscera perforation site was identified during surgery and was managed with appropriate surgical procedure followed by a thorough peritoneal lavage in all cases. The demographic variables and clinical parameters as well as pre and intraoperative findings of all patients undergoing were collected and recorded. Patients were followed up for the final outcome, and results were analysed and compared based on three categories of Mannheim Peritonitis Index: MPI<21, MPI 21-26 and MPI >26.

Table-1: Mannheim Peritonitis Index

Risk Factor	Points
Age > 50 Years	5
Female Sex	5
Organ Failure Renal: Creatinine ≥ 177 µmol/L, Urea ≥ 167 mmol/L, Oliguria < 20 ml/hr; Respi: PaO ₂ < 50 mmHg, PaCO ₂ > 50 mmHg; Shock; Intestinal Obstruction: With paralytic ileus > 24 hr, complete mechanical	7
Malignancy	4
Origin of sepsis non colonic	4
Diffuse generalised peritonitis	6
Preoperative duration of peritonitis > 24 hrs	4
Intra peritoneal exudates	
Clear	0
Cloudy, purulent	6
Faecal	12

RESULTS

A total of 58 patients were included in the study during the study period meeting the study inclusion criteria. Of the 58 patients, 27 patients

(46.55%) were female and 31 (53.45%) were male. 14 patients each were in < 21 and 21-26 Mannheim Peritonitis Index group while 30 patients were with MPI >26.

Table-2: Gender and Age Distribution of the Patients

		MPI Category			Total	p Value	Significance
		< 21	21 – 26	> 26			
No of Patients		14	14	30	58		
Gender Distribution	Male	9 (64.29%)	9 (64.29%)	13 (43.33%)	27 (46.55%)	0.279	Not Significant
	Female	5 (35.71%)	5 (35.71%)	17 (56.67%)	31 (53.45%)		
Age Distribution (Years)		40±14.68	44±11.15	51.20±12.19	47±13	0.033	Significant

46 patients out of total 58 patients included in the study were referred from other medical centres and the mean duration of symptoms at the time of presentation at our institute was 41.05±2.45 hours.

The frequency of different MPI parameters were: Age >50 in 25 cases (43.10%), Female sex in 27 cases (46.55%), Organ failure in 31 cases (53.45%), Associated with Malignancy in 17 cases (29.31%), Non colonic origin in 30 patients (51.72%), Generalised peritonitis was found in 46 patients (79.31%), Duration

of symptoms > 24 hours was found in 51 cases (87.93%), Clear intra peritoneal exudates was found in 13 patients (22.41%), Cloudy/purulent in 13 (27.59%) and faecal in 29 patients (50%)

In the study, perforation in the enteral tract was the commonest cause of peritonitis, present in 39 patients (67.24%) followed by intestinal obstruction in 9 patients (15.51%), pyoperitoneum in 8 patients (13.79%), and uterine perforation in 1 patient (1.72%) and perforated gall bladder in 1 patient (1.72%).

Table-3: Intra-operative finding in different groups of MPI

Finding	Mannheim Peritonitis Index		
	< 21	21-26	>26
Enteral Perforation	7	7	25
Obstruction	4	4	2
Others	2 (Pyoperitoneum) 1 (Uterine Perforation)	3 (Pyoperitoneum)	2 (Pyoperitoneum) 1 (GB Perforation)

The operative procedure included: Primary repair in 14 patients, primary repair with proximal diversion stoma in 11 patients, resection and anastomosis in 7 patients, appendectomy in 7 patients, adhesinolysis in 7 patients, resection with end stoma in 5 patients, peritoneal lavage with biopsy in 5 patients,

cholecystectomy in 1 patient and hysterectomy in 1 patient.

In the postoperative period there were a total of 19 mortalities (32.76%) and 16 cases with post-operative complication in the form of surgical site infection, burst abdomen, LRTI, obstruction, ARDS.

Table-4: Mortality and complication according to MPI group (% represent intra group value)

	Mannheim Peritonitis Index			p Value	Significance
	< 21	21 – 26	> 26		
Total Patients	14	14	30		
Mortality	1 (7.14%)	3 (21.42%)	15 (50.00%)	<0.001	Significant
Complication	2 (14.29%)	4 (28.57%)	10 (33.33%)	0.538	Not Significant

The average duration of hospital stay of alive patient in the three group of MPI were 9.54±2.57, 13.45±3.80 and 17.80±2.57 days for <21, 21-26 and >26 MPI group respectively and the difference of which was statistically significant with p Value < 0.001.

DISCUSSIONS

Peritonitis is a common presentation encountered in the surgical emergency and is associated with high mortality and morbidity [6]. Various factors are involved in the outcome of treatment and that includes general condition of the patient, the severity of the disease process itself, the duration of symptoms, the underlying cause and the promptness of intervention. Various scoring systems have been devised to predict the outcome in this group of patients but despite magnitude of progress in medical science in general and diagnostic and surgical intervention in particular, the accurate prediction of mortality and morbidity associated remains perplexing. Studies have concluded high mortality rates in patients of peritonitis even in good centres and some have quoted the mortality rates as high as 60% [6,17,18].

Mannheim Peritonitis Index has been proposed as a user friendly and as an effective scoring system in predicting outcome in cases of peritonitis. Developed after analysis of 20 parameters in 1253 cases of peritonitis, it incorporates clinical parameters and defines a definite score for an individual, which has a good accuracy.

Clinical research done to determine the efficacy of MPI has reported higher MPI scores correlating with increased morbidity and mortality. In various studies, patients with score less than 21 had a low mortality rate. In a study conducted by Wach *et al.* patients with MPI < 21 points had a mortality rate of 6% whereas Függer *et al.* showed no mortality below 21[19-21]. In general studies have concluded that mortality among patients who obtained < 21 points varied between 0% and 2.3% [21-25]. Similarly studies have used different upper limit cut-off points for better prediction of mortality. With MPI score of 26 or more, mortality of 41% was observed in a study done by Yoshiko K *et al.* whereas Bosscha *et al.* showed 100% mortality above MPI of 27[14,27]. In our study mortality rate with score <21, 21-26 and >26 was

7.14%, 21.42% and 50% respectively and the morbidity rate for patients with a score <21, 21-26, and >26 was 14.29%, 28.57% and 33.33% respectively, which is in line with results of other studies.

In the present study a majority of patients were referred from other medical centres lacking adequate infrastructure for surgical intervention and proper post-operative care and hence there was lag period of 41.05 ± 2.45 hours between the onset of symptoms and presentation at our institute which was also confounded by sheer ignorance of patient towards the early clinical symptoms of the pathology. One patient who underwent surgery at our facility with intra operative finding of uterine perforation had allegedly undergone medical termination of pregnancy by unauthorised individual "quack".

The significant predictive factors observed in the present study were association of organ failure, non-colonic origin of pathology, presence of generalised peritonitis, duration of symptoms and presence of faecal contamination of peritoneal cavity. The repetition of these factors have been demonstrated in a significant number of studies done in past 2 to 3 decades in relation to MPI except in most of the studies there is a discrepancy in relation to the gender of the patients[15,30,31]. The study done by Budzynski P et al attributed this difference to the demographic difference of the studied groups[31].

The judicious implementation of MPI score may help in stratification of patients and serve to facilitate identification of high risk patients requiring damage control surgery, intensive post-operative care treatment as well as to sensitize the treating clinician with the risk of postoperative complication in the patient. However the use of Mannheim Peritonitis Index is restricted in the pre-operative period to stratify patients based on risk of mortality and morbidity since the score takes into account the intraoperative as well as the histo pathological findings. The score doesn't take into consideration the risk associated with comorbidity such as chronic illnesses and major systemic disorders which can be considered as limitation of the MPI system.

CONCLUSION

Mannheim Peritonitis Index though simple, yet it is helpful in determining the subset of patients with secondary peritonitis who have high risk of morbidity and mortality in post-operative period. Early categorization of the patient based on higher MPI can assist the clinician in proper aggressive post-operative treatment plan and intensive monitoring. The Mannheim Peritonitis Index is a good predictor of mortality in patients with secondary peritonitis.

Conflict of Interest

It is declared that there is no conflict of interest involved with the study.

REFERENCES

1. Levison ME, Bush LM. Intra-abdominal Infection. In Mandell, Bennett, & Dolin's Principles and Practice of Infectious Diseases. In: Peritonitis and Intraperitoneal Abscesses. 6th ed. Churchill Livingstone: An Imprint of Elsevier; 2005.
2. Simmen H, Heinzelmann M, Largiader F. Peritonitis classification and causes. Dig Surg. 1996; 13:381-3.
3. Malangoni MA, Inui T. Peritonitis - the Western experience. World J Emerg Surg. 2006;1:25.
4. Agarwall N, Saha N, Srivastava A, Chumber S, Dhar A, Garg S. Peritonitis 10 years' experience in a simple surgical unit. Trop Gastroenterol. 2007;28(3):117-20.
5. Schein M. Surgical management of intra-abdominal infection: is there any evidence? Langenbecks Arch Surg. 2002;387(1):1-7
6. Seiler CA, Brugger L, Forssmann U, Baer HU, Buchler MW. Conservative surgical treatment of diffuse peritonitis. Surgery 2000; 127: 178-84
7. Irvin TT. Mortality and perforated peptic ulcer: a case for risk stratification in elderly patients. Br J Surg. 1989; 76:215-18.
8. Moller MH, Engebjerg MC, Adamsen S, Bendix J, Thomsen RW. The Peptic Ulcer Perforation (PULP) score: a predictor of mortality following peptic ulcer perforation. A cohort study. Acta anaesthesiologica Scandinavica. 2012;56(5):655-62.
9. Moller MH, Adamsen S, Thomsen RW, Moller AM. Preoperative prognostic factors for mortality in peptic ulcer perforation - a systematic review. Scand J Gastroenterol. 2010; 45:785-805.
10. Moller MH, Shah K, Bendix J, Jensen AG, Zimmermann-Nielsen E, Adamsen S, Moller AM. Risk factors in patients surgically treated for peptic ulcer perforation. Scand J Gastroenterol. 2009; 44:145-52.
11. Knaus WA, Zimmerman JE, Wagner DP, Draper EA, Lawrence DE. APACHE-acute physiology and chronic health evaluation: a physiologically based classification system. Critical Care Medicine. 1981:9.
12. Boey J, Choi SKY, Alagaratnam TT, Poon A. Risk stratification in perforated duodenal ulcers. Ann Surg. 1987; 205:22-6.
13. Kologlu M, Elker D, Altun H, Sayek I. Validation of MPI and PIA II in two different groups of patients with secondary peritonitis. Hepatogastroenterology. 2001; 48:147-51.
14. Bosscha K, Reijnders K, Hulstaert PF, Algra A, van der Werken C. Prognostic scoring systems to predict outcome in peritonitis and intra-abdominal sepsis. Br J Surg. 1997;84(11):1532-34.

15. Correia MM, Thuler LCS, Velasco E, Vidal EM, Schanaider A. Peritonitis Index in oncologic patients. *Revista Brasileira de Cancerologia*. 2001;47(1):63–68.
16. 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.
17. Weigelt JA. Empiric treatment options in the management of complicated intra-abdominal infections. *Cleve Clin J Med*. 2007;74(Suppl 4):S29–37
18. Billing A, Frohlich D, Schildberg FW. Prediction of outcome using the Mannheim peritonitis Index in 2003 patients. Peritonitis Study Group. *Br J Surg* 1994;81:209-13
19. Linder MM, Wacha H, Feldmann U, Wesch G, Streifensand RA, Gundlach E. [The Mannheim peritonitis index. An instrument for the intraoperative prognosis of peritonitis] *Chirurg*. 1987;58(2):84–92.
20. Notash AY, Salimi J, Rahimian H, Fesharaki Ms, Abbasi A. Evaluation of Mannheim peritonitis index and multiple organ failure score in patients with peritonitis. *Indian J Gastroenterol*. 2005; 24:197–200.
21. Függer R, Rogy M, Herbst F, Schemper M, Schulz F. Validation study of the Mannheim peritonitis index. *Chirurg*. 1988; 59:598–601.
22. Ermolov AS, Bagdat'ev VE, Chudotvortseva EV, Rozhnov AV. Evaluation of the Mannheim peritonitis index. *Vestn Khir Im I I Grek*. 1996; 155:22–3.
23. Qureshi AM, Zafar A, Saeed K, Quddus A. Predictive power of Mannheim peritonitis index. *J Coll Physicians Surg Pak*. 2005; 15:693–6.
24. Chandrashekar N, Prabhakar GN, Gurukiran CS, Shivakumarappa GM, Naveen HM. Study of prognostic factors in perforative peritonitis. *J Evol Med Dent Sci*. 2013; 2:5568–74.
25. Batra P, Gupta D, Batra R, Kothari R, Deshmukh PR. Mannheim peritonitis index as an evaluative tool in predicting mortality in patients of perforation peritonitis. *CIBTech J Surg*. 2013; 2:30–6.
26. Yoshiko K, Masayuki N. Study of Mannheim peritonitis index to predict outcome of patients with peritonitis. *Jpn J Gastroenterol Surg*. 2004;37:7–13.
27. Wabwire B, Saidi H. Stratified Outcome Evaluation of Peritonitis. *Annals of African Surgery*. 2014;11(2).
28. Melero A. Mannheim peritonitis index validation study at the Hospital General De Durango. *Cirurgia Cirujianos* 2002; 70: 21-225
29. Paudel P, Tiwari A, Pradhan GB, Shrestha S, Bhattachan CL. Evaluation of Mannheim Peritonitis Index for Predicting Outcome in Emergency Exploratory Laparotomy for acute peritonitis. *Journal of Institute of Medicine*. 2014 Sep 2;37(2).
30. Ntiringanya F, Ntakiyiruta G, Kakande I: Prediction of Outcome Using the Mannheim peritonitis Index in Patients with Peritonitis at Kigali University Teaching Hospital. *East and Central African J Surg* 2012 Jul-Aug; 17(2).
31. Budzyński P, Dworak J, Natkaniec M, Pędziwiatr M, Major P, Migaczewski M, Matłok M, Budzyński A. The usefulness of the Mannheim Peritonitis index score in assessing the condition of patients treated for peritonitis. *Polish Journal of Surgery*. 2015 Jun 1;87(6):301-6.