



MANNHEIM PERITONITIS INDEX IN OUTCOME PREDICTION OF PERITONITIS AFTER HOLLOW VISCUS PERFORATION

Dr Zeeshan Alam¹, Dr Abrar Ul Haq², Dr Hazrat Abu Bakar Saddiqe^{3*}, Dr Muhammad Abu Bakkar⁴, Dr Bakir khan⁵, Dr Taimour Saeed⁶

¹Postgraduate Resident General Surgery, Lady Reading Hospital MTI Peshawar, KPK, Pakistan

²Orthopaedic and spine surgery unit A, Hayatabad Medical complex MTI Peshawar, KPK, Pakistan

^{3*}Postgraduate Resident, General Surgery Lady Reading Hospital MTI Peshawar, KPK, Pakistan
Email: drabubakarburki@gmail.com

⁴Postgraduate Resident, General Surgery Lady Reading Hospital MTI Peshawar, KPK, Pakistan

⁵Postgraduate Resident, General surgery Lady reading hospital MTI Peshawar, KPK, Pakistan

⁶Postgraduate resident, General surgery Lady reading hospital MTI Peshawar, KPK, Pakistan

***Corresponding Author:** Dr Hazrat Abu Bakar Saddiqe
*Email: drabubakarburki@gmail.com

ABSTRACT:

Objective: To assess Mannheim Peritonitis Index in outcome prediction of peritonitis after hollow viscus perforation.

Methodology: Ninety five patients of hollow viscus perforation were selected for this prospective study conducted at department of surgery department of Lady Reading Hospital, Peshawar from July 2023 to January 2024. Mannheim Peritonitis Index was assessed for post procedure morbidity, complications and mortality.

Results: Mean age 45.21 ± 15.68 years while symptoms duration was 2.91 ± 1.34 days. The assessment of MPI grades indicated that 46 patients (48.4%) exhibited an MPI score below 22, 31 patients (32.6%) fell within the MPI score range of 22 to 29, and 18 patients (18.9%) recorded an MPI score exceeding 29. MPI grading and complications showed a notable association between higher MPI grades (22 to 29 and > 29) and an increased incidence of complications ($P = 0.0001$). A further analysis of mortality outcomes demonstrated an absence of mortality in patients with an MPI score below 22. In contrast, mortality rates were 12.9% in patients with MPI scores ranging from 22 to 29, and notably higher at 66.7% in patients with an MPI grading surpassing 29. This observed association between mortality and MPI grading proved to be significant ($P = 0.0001$).

Conclusion: Our study yields a conclusive finding that the MPI scoring system proves to be both effective and efficient in predicting mortality and post-procedure complications among patients experiencing peritonitis subsequent to hollow viscus perforation.

Keywords: Mannheim Peritonitis Index, Peritonitis, Hollow viscus perforation

INTRODUCTION: Peritonitis, which is marked by inflammation of the peritoneum, continues to be a significant difficulty in surgical practice, especially when it originates from a perforation in a hollow organ¹. Despite the progress made in medical research and surgical methods, peritonitis still presents considerable risks of illness and death. This highlights the importance of accurate prognostic

tools to assist in making clinical decisions². The Mannheim Peritonitis Index (MPI) is a useful tool in predicting outcomes and improving management methods for patients with peritonitis^{3,4}.

Hollow viscus perforation, frequently resulting from illnesses that include appendicitis, diverticulitis, and peptic ulcer disease, causes the leakage of stomach contents into the peritoneal cavity^{5,6}. This occurrence initiates an inflammatory process that leads to peritonitis, a condition linked to systemic problems, sepsis, and multi-organ dysfunction syndrome (MODS). Peritonitis severity is determined by multiple factors, such as the degree of contamination, the potency of infectious agents, the patient's immunological condition, and the promptness and effectiveness of surgical intervention⁷⁻⁹.

The Mannheim Peritonitis Index (MPI) is a grading system designed primarily to assess the severity of peritonitis and predict outcomes after surgery¹⁰. The index evaluates various parameters including age, preoperative comorbidities, amount of peritonitis, the existence of fecal contamination, and the requirement for perioperative blood transfusion, offering a comprehensive evaluation of the severity of the condition^{11,12}. The MPI consists of different elements, each giving a numerical value according to its perceived influence on patient outcomes. These components include physiological indicators such as temperature and heart rate, laboratory values like leukocyte count and serum creatinine, and intraoperative discoveries such as the amount of contamination and fecal spillage^{13,14}.

The MPI holds importance beyond just making predictions; it also functions as a significant instrument for quality improvement activities and measuring initiatives in the supervision of peritonitis. The Mannheim Peritonitis Index (MPI) is a useful tool for predicting outcomes, directing treatment decisions, and optimizing resource allocation in. The MPI enables clinicians to deliver individualized and efficient therapy by evaluating the severity of peritonitis from multiple perspectives, thereby enhancing the prognosis of patients with this critical condition. The rationale of this study is to assess the Mannheim peritonitis index in outcome prediction of peritonitis after hollow viscus perforation

METHODOLOGY:

Ninety five patients were selected for this prospective study conducted from July 2023 to January 2024 at surgery department of Lady Reading Hospital, Peshawar after taking approval from the hospital. The patients selected for the study were examined clinically and radiological findings were assessed for peritonitis followed by hollow viscus perforation. Age of the patients was 18 to 70 years of either gender. All the patients were assessed prior to procedure using Mannheim Peritonitis Index scoring, three categories of the scoring were made, less than 22, 22 to 29 and > 29. The Mannheim Peritonitis Index was based on the proposal of Linder MM et al.¹⁴ The procedures were performed by an experienced surgeon having experience of more than five years. Post procedure data including morbidity, complications and mortality were recorded on the pre-designed pro-forma. Sample size was calculated taking previous frequency of MPI grading > 29 in patients with peritonitis 14%¹⁵, margin of error 7% and confidence interval 95%.

SPSS 23 was utilized for data analysis. ANOVA and Chi Square tests were deployed for association keeping the value of P significant at < 0.05.

RESULTS:

Ninety five patients were selected for this study with mean age 45.21±15.68 years while symptoms duration was 2.91±1.34 days. Frequency of male patients was 44 (46.3%) while female patients' frequency was 51 (53.7%). Regarding the site of perforation duodenum perforation was 47 (49.5%), appendix 26 (27.4%), stomach 14 (14.7%) while ileal perforation was required in 8 (8.4%) patients. Duration of stay at the hospital was 11.16±4.81 days. About 41 (43.2%) patients required admission to ICU. MPI grading showed that 46 (48.4%) patients had MPI score < 22, thirty one (32.6%) patients had MPI score 22 to 29 while 18 (18.9%) patients had MPI score > 29. Table 2 shows the list of overall complications encountered in our study. Table 3 shows that mean hospital stay was 7.28±2.41 days in patients with MPI score < 22, in patients with MPI 22 to 29 the mean stay at hospital was 13.03±2.28 days while patients having MPI > 29 had mean stay at the hospital 17.83±3.05 days with notable association (P = 0.0001). ICU admission was required in 2 (4.3%) patients having MPI score

< 22%, twenty four patients (77.4%) with MPI 22 to 29 required ICU admission while 125 (83.3%) patients required ICU admission having MPI > 29 (P = 0.0001). Infection at surgical site was seen in 3 (6.5%) patients having MPI grading < 22, 13 (41.9%) patients had SSI having MPI 22 to 29 while 10 (55.6%) patients had SSI having MPI > 29. Details of other complications with respect to MPI grading can be seen at table no 4, which also revealed that complications were higher in MPI grading 22 to 29 and > 29 (P = 0.0001). Mortality was not observed in patients having MPI < 22, 4 (12.9%) mortality was seen in patients with MPI 22 to 29 while 12 (66.7%) patients had faced mortality having MPI grading > 29, the association between mortality and grading of MPI was significant (P = 0.0001)

Table 1 MPI grading of the patients

MPI grading of patients	Frequency	Percent
< 22	46	48.4
22 to 29	31	32.6
> 29	18	18.9
Total	95	100.0

Table 2 Complications

Complications	Frequency	Percent
SSI	26	27.4
Respiratory	10	10.5
Dyselectrolytemia	9	9.5
Renal	6	6.3
No complication	44	46.3
Total	95	100.0

Table 3 ssoication of hospital stay with MPI grading

MPI grading	N	Mean	Std. Deviation	P value
< 22	46	7.28	2.410	0.0001
22 to 29	31	13.03	2.287	
> 29	18	17.83	3.053	
Total	95	11.16	4.814	

Table 4 Association of ICU admission, complications and mortality with MPI grading

		MPI score						P value
		< 22		22 to 29		> 29		
		N	%	N	%	N	%	
ICU admission required	Yes	2	4.3%	24	77.4%	15	83.3%	0.0001
	No	44	95.7%	7	22.6%	3	16.7%	
Complications	SSI	3	6.5%	13	41.9%	10	55.6%	0.0001
	Respiratory	2	4.3%	5	16.1%	3	16.7%	
	Dyselectrolytemia	3	6.5%	2	6.5%	4	22.2%	
	Renal	2	4.3%	4	12.9%	0	0.0%	
	No complication	36	78.3%	7	22.6%	1	5.6%	
Mortality	Yes	0	0.0%	4	12.9%	12	66.7%	0.0001
	No	46	100.0%	27	87.1%	6	33.3%	

DISCUSSION:

The presentation of acute abdomen accounts for a significant fraction of all cases that present themselves to the emergency room, with the percentage ranging from five percent to ten percent. Perforations of the gastrointestinal tract are a significant contributor to the spectrum of acute abdominal emergencies, accounting for roughly 25 percent of all acute abdominal emergencies. Specifically, the incidence of perforation that results from peptic ulcer illness ranges from 2% to 5%. This is an important discovery.¹⁶ There is a considerable mortality rate associated with peritonitis that is caused by perforation, which can range anywhere from 6% to 27%. While primary peritonitis is

caused by bacterial, chlamydial, fungal, or mycobacterial infections that do not involve gastrointestinal perforation, secondary peritonitis is caused by gastrointestinal perforation, particularly acute generalised peritonitis. Primary peritonitis is distinguished from secondary peritonitis by the presence of gastrointestinal perforation. This latter condition is the third most common reason that calls for an exploratory laparotomy to be performed in an emergency situation.¹⁷ When considering gastrointestinal perforation, the proverb that the abdomen is comparable to a Pandora's Box is a phrase that resonates with the situation. In places such as the United Kingdom and North America, where vascular lesions and malignancies are the leading causes of perforations, the situation has improved as a result of breakthroughs in medical and surgical care. However, the situation in Pakistan is different. Perforated peptic ulcer disease is the most common cause of ulcers in this region, followed by appendicitis, intestinal ischemia, and cystic and typhoid ulcer perforations. Malignancies are the least common cause of ulcers in this region. When compared to colonic perforations, emergency cases that involve perforations of the duodenum, stomach, and small intestine combined form a significant fraction of the total.¹⁸

The diagnosis and treatment of gastrointestinal perforations remain tremendous problems for surgeons in our country, notwithstanding the progress that has been made in antimicrobial treatments, surgical methods, radiographic imaging, and resuscitation¹⁹. The result of perforation peritonitis is still unknown, which highlights the importance of identifying severe peritonitis at an early stage in order to assist the provision of an appropriate level of care. This entails performing forceful resuscitation, intervening surgically at the appropriate time, and managing the patient after surgery with great care. As a consequence of this, the creation of a scoring system becomes an absolute necessity in order to accurately classify patient risk and conduct detailed assessments of the severity of the condition.²⁰

Ninety five patients of hollow viscus perforation were selected for this study. Demographic details showed that patients belonged to age range of 18 to 70 years while the patients' mean duration of symptoms recorded was 2.91 ± 1.34 days, our analysis showed that the frequency of male patients outnumbered the frequency of female patients. Similar demographics have been reported by another study which stated that their patients belonged to the age range of 14 to 76 years while the male frequency was higher than the frequency of female patients.¹⁵

The scoring of MPI revealed that 46 (48.4%) patients had score < 22 , thirty one (32.36%) patients had score 22 to 29 while about 18 (18.9%) patients had score > 29 . Similar observations have been reported by a study conducted in India which reported that MPI score was < 21 in 31 (53.4%) cases, MPI score 21-29 in 18 (31%) and MPI score > 29 in 9 (15.5%) cases²¹.

Our observations revealed that the higher grading of MPI scoring was notably linked with prolonged hospital stay ($P = 0.0001$), while the need for ICU admission was also higher in higher grading of MPI ($P = 0.0001$), these observations are similar to the aforementioned study conducted in India.²¹ Further our subgroup analysis of MPI scoring with complications and mortality revealed that patients with 22 to 29 and > 29 MPI score showed higher frequencies of complications such as infection at surgical site, renal complications, respiratory issues and dyselectrolytemia. ($P = 0.0001$), again these observations are similar to the aforementioned Indian study²¹ as well as another study which revealed that infection at surgical site was higher in frequency in higher grades of MPI¹⁵.

CONCLUSION:

From our study we come to the conclusion that MPI scoring is an effective and efficient scoring system for predicting the mortality and post procedure complications in patients of peritonitis after hollow viscus perforation.

REFERENCES:

1. Yung S, Chan TM. Pathophysiological changes to the peritoneal membrane during PD-related peritonitis: the role of mesothelial cells. *Mediators Inflamm.* 2012;51(32):203-9.
2. Khan PS, Dar LA, Hayat H. Predictors of mortality and morbidity in peritonitis in a developing country. *Turk J Surg.* 2013;29(3):124-7.

3. Sharma S, Singh S, Makkar N, Kumar A, Sandhu MS. Assessment of severity of peritonitis using mannheim peritonitis index. *Niger J Surg.* 2016;22(2):118-22.
4. 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. *J Nat Sci Biol Med.* 2015;6(1):49-53.
5. Anjaneya T, HV VC. Clinical evaluation, management and outcome of hollow viscus perforations. *Int Surg J.* 2019;6(8):2780-4.
6. Velappan DP, Kaveri S. Clinical study and management of hollow viscus perforation of abdomen. *Int Surg J.* 2017;4(5):1773-6.
7. Rongpi R, Ganesan G, Bhattacharjee N, Deuri S, Baro AC. A prospective study evaluating utility of Mannheim peritonitis index in predicting the outcome of peritonitis following hollow viscus perforation. *Int Surg J.* 2022;9(6):1188-92.
8. Dalai P, Chawla A, Samal SR, Behera S, Mishra DN. Study of Mannheim peritonitis index for predicting morbidity and mortality in patients of hollow viscous perforation: In a tertiary care hospital of Eastern India. *Asian J Med. Sci.* 2023;14(12):5-9.
9. Aziz S, Jehan S, Ateeq M. NON Appendicular perforation peritonitis: spectrum and management outcome "Experience at peripheral teaching hospitals. *Professional Med J.* 2014;21(4):613-20.
10. 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 Dec;8(12):1-3.
11. Ntirenganya F, Ntakiyiruta G, Kakande I. Prediction of outcome using the Mannheim peritonitis index in patients with peritonitis at Kigali University Teaching Hospital. *East Cent Afr J Surg.* 2012;17(2):52-64.
12. Kumar P, Singh K, Kumar A. A comparative study between Mannheim peritonitis index and APACHE II in predicting the outcome in patients of peritonitis due to hollow viscous perforation. *Int Surg J.* 2017;4(2):690-6.
13. Ramteke H, Deshpande SG, Bhoyar R, Bhoyar RJ. The Role of the Mannheim Peritonitis Index for Predicting Outcomes in Patients With Perforation Peritonitis in a Rural Hospital in India. *Cureus.* 2023;15(3):e36620
14. Linder MM, Wacha H, Feldmann U, Wesch G, Streifensand RA, Gundlach E. Der Mannheimer Peritonitis-Index. Ein Instrument zur intraoperativen Prognose der Peritonitis [The Mannheim peritonitis index. An instrument for the intraoperative prognosis of peritonitis]. *Chirurg.* 1987;58(2):84-92.
15. Naik M., R., & K., S. A clinical study to predict the outcome of patients with hollow viscus perforation in a tertiary care hospital using manheim peritonitis index. *Surgical Review: Int J Surg, Trauma Orthop.* 2018;4(2), 94-100.
16. Kauffman GL. Acute abdomen. In: Corson JD Williamson RCN, eds. UK: Mosby; 2001: 1-3.
17. Bhansali SK. Gastrointestinal perforations. A clinical study of 96 cases. *J Postgrad Med.* 1967;13(1):1.
18. Yeboah M. Postoperative complications after surgery for typhoid ileal perforation in adults in Kumasi. *West Afr J Med.* 2007;26(1):32-6.
19. Rao M, Samee AA, Khan SM. Hollow viscus perforation: A retro spectrum study. *Int J Recent Sci Res.* 2015;6(3):3250-4.
20. Dorairajan LN, Gupta S, Suryanarayana Deo SV, Chumber S, Sharma LK. Peritonitis in India- A decade's experience. *Trop Gastroenterol.* 1995;16:33- 8.
21. Rongpi R, Ganesan G, Bhattacharjee N, Deuri S, Baro AC. A prospective study evaluating utility of Mannheim peritonitis index in predicting the outcome of peritonitis following hollow viscus perforation. *Int Surg J* 2022;9:1188-92