Original Research

EVALUATION OF THE PREDICTIVE ABILITY OF THE MANNHEIM PERITONITIS INDEX (MPI) IN PATIENTS WITH SECONDARY PERITONITIS

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ABSTRACT

Background: Secondary peritonitis is a major cause of morbidity and mortality worldwide, particularly in resource-limited settings. Several prognostic scoring systems have been developed to predict outcomes in patients with secondary peritonitis, among which the Mannheim Peritonitis Index (MPI) is widely used due to its simplicity and reliance on eight readily assessable prognostic variables.

Objective: To evaluate the predictive ability of the Mannheim Peritonitis Index in patients with secondary peritonitis.

Study Design: Observational study.

Duration and Place of Study: This study was conducted at People's University of Medical and Health Sciences Nawabshah Pakistan from March 2025 to March 2026

Methodology: This observational study was conducted in the Department of Surgery and included 120 patients with surgically confirmed secondary peritonitis. Patients aged 18 years and above were enrolled. Clinical, laboratory, and intraoperative findings were recorded for all participants. The MPI score was calculated for each patient and used to stratify patients according to risk. Morbidity and mortality outcomes were assessed over a 30-day follow-up period. Statistical analysis was performed using SPSS. Associations between MPI scores and clinical outcomes were evaluated using the Chi-square test and receiver operating characteristic (ROC) curve analysis.

Results: A total of 120 patients were included, comprising 88 (73.3%) males and 32 (26.7%) females. The majority of patients belonged to the younger age group (verify age range and frequency), accounting for 55% (n=66) of the study population. Generalized peritonitis was present in 98 (81.7%) patients. Delayed presentation and preoperative shock were observed in 112 (93.3%) patients. The overall mortality rate was 12.5% (n=15). Mortality was significantly higher among patients older than 50 years, with 11 deaths occurring in this age group. Higher MPI scores were associated with increased morbidity and mortality.

Conclusion: The Mannheim Peritonitis Index is a valuable and reliable prognostic tool for predicting morbidity and mortality in patients with secondary peritonitis. Higher MPI scores are associated with poorer clinical outcomes and may assist clinicians in risk stratification and management planning.

Keywords: Secondary Peritonitis, Mannheim Peritonitis Index, MPI, Morbidity, Mortality, Prognostic Scoring System.

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INTRODUCTION

Secondary peritonitis is one of the leading causes of morbidity and mortality among patients with non-traumatic abdominal emergencies worldwide [1, 2]. It results from contamination of the peritoneal cavity following perforation, infection, ischemia, or disruption of the gastrointestinal tract and other intra-abdominal organs. Despite advances in surgical techniques, antimicrobial therapy, and intensive care management, secondary peritonitis continues to pose a significant challenge to surgeons, particularly in developing countries where delayed presentation, limited healthcare resources, and inadequate access to specialized care contribute to poor outcomes [3].

The clinical course of secondary peritonitis can vary from localized infection to severe generalized peritonitis associated with systemic inflammatory response syndrome (SIRS), sepsis, septic shock, and multiorgan failure (MOF). These complications are associated with prolonged hospital stay, increased healthcare costs, and high mortality rates [4]. Early identification of high-risk patients is therefore essential for timely intervention, appropriate allocation of resources, and improved clinical outcomes.

Several prognostic scoring systems have been developed to predict the severity and outcome of secondary peritonitis. These scoring systems assist clinicians in risk stratification, treatment planning, and evaluation of prognosis. Among the available scoring methods, the Mannheim Peritonitis Index (MPI) has gained widespread acceptance because of its simplicity, reliability, and ease of application in routine clinical practice [5]. Such prognostic tools are valuable for surgeons as they help estimate disease severity, predict patient outcomes, and facilitate decision-making regarding management strategies [6].

The MPI is based on eight independent prognostic factors, including age, gender, organ failure, malignancy, duration of peritonitis before surgery, origin of sepsis, extent of peritoneal contamination, and character of peritoneal exudate. The total score ranges from 0 to 47, with higher scores indicating a greater risk of adverse outcomes [7]. Previous studies have demonstrated that patients with MPI scores greater than 26 have a significantly increased risk of mortality and postoperative complications [8-10]. Owing to its practicality and predictive accuracy, the MPI has been reported to be superior to several other scoring systems in forecasting outcomes and guiding clinical management in patients with secondary peritonitis [11].

Given the continued burden of secondary peritonitis and the need for reliable prognostic indicators, the present study was conducted to evaluate the predictive ability of the Mannheim Peritonitis Index in patients with secondary peritonitis and to determine its usefulness in predicting morbidity and mortality in our clinical setting.

METHODOLOGY

This observational study was conducted in the Department of Surgery. A total of 120 patients with surgically confirmed secondary peritonitis were enrolled in the study. Both male and female patients aged 18 years and above were included. Patients presenting with clinical features suggestive of secondary peritonitis and subsequently confirmed at laparotomy were recruited. All enrolled patients were followed for a period of 30 days after surgery to assess morbidity and mortality outcomes.

Ethical approval for the study was obtained from the Institutional Ethical Review Committee prior to data collection. Written informed consent was obtained from all participants or their attendants where applicable.

Exclusion Criteria

Patients with peritonitis secondary to abdominal trauma were excluded from the study.

A predesigned proforma was used to collect demographic, clinical, laboratory, and operative data. The recorded variables included age, gender, duration of symptoms before admission, vital signs at presentation, smoking status, alcohol intake, associated comorbidities, time of surgery, source of peritonitis, characteristics of peritoneal exudate, and evidence of organ dysfunction.

The Mannheim Peritonitis Index (MPI) score was calculated for each patient based on the eight established prognostic parameters. According to the calculated MPI score, patients were categorized into three risk groups: Group I (MPI score <21), Group II (MPI score 21–29), and Group III (MPI score >29).

Postoperative morbidity and mortality occurring within 30 days of surgery were documented and analyzed. Morbidity was defined as the occurrence of postoperative complications during the follow-up period, while mortality was defined as death from any cause within 30 days following surgical intervention.

Data were entered and analyzed using SPSS version 21. Quantitative variables were expressed as mean ± standard deviation, while qualitative variables were presented as frequencies and percentages. The Chi-square test was used to determine the association between MPI categories and clinical outcomes. Receiver Operating Characteristic (ROC) curve analysis was performed to evaluate the predictive accuracy of the MPI score, and the Area Under the Curve (AUC) was calculated. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Overall, there are a total of 120 patients included in this study. The majority of them were males,

representing 73.3% of the total sample size (n=88). Most of the patients were aged between 1 years to 30 years, representing 55% of the total population.

Table number 1 shows the demographic parameters of our study.

Table No. 1:

Demographics	**N**	**%**
Age (yrs)		
18 to 30	66	55.0
31 to 50	22	18.3
51 to 80	32	26.7
Gender		
Male	88	73.3
Female	32	26.7

Table number 2 shows the clinical parameters of our study.

Table No. 2:

Demographics	**N**	**%**
Peritonitis		
Generalized	98	81.7
Localized	22	18.3
Symptoms duration (hrs)		
Less than 24	10	8.4
More than 24	110	91.6
Preoperative Shock		
Yes	112	93.3
No	8	6.7
Source of contamination		
Large Bowel	20	16.7
Appendix	40	33.3
Small Bowel	36	30.0
Peptic Ulcer	21	17.5
Others	3	2.5
Nature of contamination		
Feculent	23	19.2
Purulent	75	62.5
Clear	22	18.3
Hospital Stay (days)		
Less than 5	29	24.1
6 to 14	68	56.7
More than 15	23	19.2
Infections		
SSSI	33	27.5
DSSI	10	8.3
None	44	36.7
Others	33	27.5
MPI Score		
Less than 21	55	45.8
21 to 29	36	30.0
30 to 47	29	24.2
Outcome		
Expired	15	12.5
Discharged	105	87.5

Superficial surgical site infection - SSSI
Deep surgical site infection - DSSI

Table number 3 shows the significance of MPI.

Table No. 3:

Demographics	Discharged (n=105)	Expired (n=15)	p-value
Peritonitis			
Generalized	83	15	
Localized	22	0	0.043
Symptoms duration (hrs)			
Less than 24	10	0	
More than 24	95	15	0.244
Presence of malignancy			
Yes	2	0	
No	103	15	0.702
Age (yrs)			
Below 50	84	4	
Above 50	21	11	0.001
Gender			
Male	80	8	
Female	25	7	0.153
Nature of contamination			
Feculent	15	8	
Purulent	68	7	
Clear	22	0	0.001
Organ Failure			
Nil	81	3	
Renal	13	7	
Liver	5	3	
Others	6	2	0.001
MPI Score			
Less than 21	55	0	
21 to 29	34	2	
30 to 47	16	13	0.001

DISCUSSION

The present study evaluated the predictive ability of the Mannheim Peritonitis Index (MPI) in patients with secondary peritonitis and demonstrated a significant association between MPI score and both morbidity and mortality. Despite considerable advances in surgical techniques, antimicrobial therapy, and intensive care management, secondary peritonitis continues to be associated with substantial morbidity and mortality worldwide. Early assessment of disease severity is therefore essential for appropriate risk stratification, timely intervention, and optimization of patient outcomes.

In the current study, patients were stratified into three groups according to their MPI scores. Mortality increased progressively with increasing MPI scores, with the highest mortality observed among patients with MPI scores between 30 and 47. Of the 15 deaths recorded, 13 occurred in patients with MPI scores above 30, while no mortality was observed among patients with MPI scores below 21. These findings highlight the usefulness of MPI as a prognostic tool in predicting adverse outcomes in patients with secondary peritonitis.

The study population consisted predominantly of male patients (73.3%), which is comparable to findings reported in previous studies. Furthermore, most patients presented late to the hospital, with symptoms lasting more than 24 hours, and a large proportion were admitted in preoperative shock. Delayed presentation remains a common problem in developing countries and has been associated with increased disease severity, postoperative complications, and mortality.

Age was identified as an important predictor of mortality in the present study. Patients older than 50 years experienced significantly higher mortality rates compared to younger patients. Similar observations have been reported by several investigators [12–14]. Shah et al. also identified advanced age as an important risk factor for poor outcomes in patients with generalized peritonitis [15]. The increased mortality observed among elderly patients may be attributed to reduced physiological reserve, delayed recovery, impaired immune response, and the presence of multiple comorbid conditions.

The nature of peritoneal contamination was another important determinant of outcome. Patients with feculent contamination exhibited significantly higher mortality rates compared to those with purulent or clear contamination. These findings are in agreement with previous reports that identified fecal contamination as a marker of severe intra-abdominal infection and poor prognosis [12–14]. Extensive bacterial contamination and a heightened

inflammatory response may contribute to the increased risk of septic complications and organ dysfunction in these patients.

Organ failure was strongly associated with mortality in the current study. Renal failure was the most common organ dysfunction observed among non-survivors, followed by hepatic failure. Similar findings have been reported by Sharma et al., who demonstrated significantly increased mortality among patients with secondary peritonitis complicated by organ failure [16]. Organ dysfunction reflects advanced systemic involvement and remains one of the most reliable indicators of poor prognosis.

The prognostic value of the MPI observed in the present study is consistent with findings from previous investigations. Gaurav et al. reported significantly increased mortality among patients with MPI scores greater than 30, supporting the results of our study [17]. Likewise, Sreedath et al. observed mortality rates approaching 87% among patients with MPI scores greater than 29 [18]. Differences in mortality rates between studies may be explained by variations in sample size, patient demographics, disease severity, healthcare facilities, and the proportion of elderly patients included in the study population. Similar observations have been documented by other investigators [19].

Although the majority of published studies support the usefulness of MPI as a prognostic tool, conflicting evidence exists. Van Ruler et al. reported limited predictive value of prognostic scoring systems, including MPI, in patients with peritonitis [20]. Nevertheless, the findings of the present study suggest that MPI remains a practical, inexpensive, and reliable scoring system for predicting outcomes in patients with secondary peritonitis, particularly in resource-limited healthcare settings.

Limitations

This study had certain limitations. It was conducted at a single center with a relatively limited sample size, which may affect the generalizability of the findings. In addition, the study lacked intensive care unit support, which could have influenced patient outcomes. Larger multicenter prospective studies are recommended to further validate the predictive accuracy of the Mannheim Peritonitis Index.

CONCLUSION

The Mannheim Peritonitis Index is a simple, practical, and easily applicable scoring system that utilizes readily available clinical, operative, and laboratory parameters. The present study demonstrated a significant association between MPI scores and both morbidity and mortality in patients with secondary peritonitis. Higher MPI scores were associated with poorer clinical outcomes and increased mortality. Therefore, MPI may serve as a valuable prognostic tool for risk stratification and clinical decision-making in patients with secondary peritonitis.

Funding Source

No external funding was received for this study.

Conflict of Interest

The authors declare no conflict of interest related to this study.

Ethical Approval

Approval was obtained from the Institutional Ethical Review Committee prior to commencement of the study, and all study procedures were conducted in accordance with ethical principles and institutional guidelines.

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