Accuracy of Mannheim Peritonitis Index in Predicting Outcome of Patients with Secondary Peritonitis

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ABSTRACT

Objective   To evaluate prognostic value of Mannheim Peritonitis Index (MPI) in predicting the outcome of patients with secondary peritonitis.

Study design   Retrospective cross sectional observational study.

Place & Duration of study   Department of Surgery, Bolan Medical College Quetta, from January 2023to April 2024.

Methods   A total of 111 patients above 16-years of age who presented with secondary peritonitis and underwent exploratory laparotomy were enrolled in the study. The eight prognostic variables of MPI; age, gender, organ dysfunction, presence of malignancy, reporting time of more than 24-hours or less, source of peritonitis, extent of peritonitis, and characteristics of peritoneal exudates, were recorded. MPI score categorized into group1 (score <21), group 2 (score 21-29) and group 3 (score >30). Patients were followed for 30-days to find out the early morbidity and mortality.

Results   The male to female ratio was 2.7:1. Majority (n=81 - 73.9%) of the patients were less than 50-years of age. The number of patients who presented after 24-hours were 101 (91%). The shock was recorded in 104 (93.7%) patients. Generalized secondary peritonitis was noted in 91 (81.1%) patients with source being perforated appendix in 73 (33.3%) followed by small bowel perforation (n=34 - 30.6%). The peritoneal fluid was purulent in 69 (62.2%) patients and feculent in 22 (19.8%). Fifty-one (45.9%) patients had score on MPI <21 (n=34 -30.6%). The overall mortality was 12.6% (n=14).

Conclusion   The MPI score calculated showed significant correlation with morbidity and mortality.

Key words   Secondary peritonitis, Preoperative shock, Mannheim Peritonitis Index, Mortality.

INTRODUCTION:

Secondary peritonitis is one of the leading causes of non-traumatic morbidity and mortality.[1]The

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prediction of secondary peritonitis outcome in limited resource setup is a challenge.[2] The high mortality is expected in complicated intra-abdominal infections, that leads to systemic inflammatory response syndrome (SIRS) and Multi-organ failure (MOF).

In order to predict the outcome of secondary peritonitis various indexes and scoring systems have been developed. This includes Mannheim Peritonitis Index(MPI), World Society of Emergency Surgery Sepsis Severity Score (WSESSSS), Infection Response Organ Dysfunction scores (IROD), Acute Physiology and Chronic Health Evaluation II score(APACHE II) and Quick Sequential (Sepsis related) Organ Failure Assessment (QSOFA).[3] The scoring systems help the operating surgeons to plan

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the management including suitable surgical procedure.[4-6]

The eight prognostic variables of MPI are assigned different score, that ranges from zero to 47. Patients with a score more than 26 were defined as having a high mortality rate with specificity of 79%, sensitivity 84%, and accuracy 81% according to a study.[7] Literature revealed that MPI has an advantage over other scoring systems for better management of the disease and assessment of the prognosis.[8] This study was done to find out the predictive ability of MPI in our setting in patients with secondary peritonitis where surgical intensive care facilities were not present.

METHODS:
Study design, place and duration: This retrospective observational study was conducted in the Department of Surgery, Bolan Medical College Quetta, from January 2023 to April 2024.

Ethical considerations: Approval of the data collection was taken from the IRB of the hospital (letter No 0037/BUMHS/IRB/24 dated 1-1-2023).

Inclusion criteria and exclusion criteria: From hospital record the data of the patients of both genders, more than 16-years of age with suspected secondary peritonitis admitted in the surgical department, operated with diagnosis of secondary peritonitis established and followed for at least 30-days,were retrieved to determine the morbidity and mortality. Secondary peritonitis was defined as clinical symptoms and signs suggestive of peritonitis, and evidence of secondary source of peritoneal contamination from gastrointestinal (GI) tract confirmed intraoperatively. Patients with the history of trauma were excluded.

Sample size estimation: As this was a retrospective study the record of 111 patients were retrieved and analyzed.

Study protocol: Patients' demographic profile, clinical and laboratory findings were recorded on predesigned form. In addition, variables like duration of symptoms, vital signs at admission, past use of steroids or NSAIDs, smoking, alcohol consumption, history of malignancies, surgery time, nature of exudates and source of origin, sepsis, organ failure and other co morbid condition were also recorded. Criteria for organ failure were used as published in the literature.[7] MPI score of patients was calculated on 8-parameter scale and divided into groups as group1 (score <21), group 2 (score 21-29) and group 3 (score >30).

Statistical analysis: The recorded data were analyzed by using SPSS version 21. The significance of variables was calculated using Chi squire test and a p value < 0.05 considered significant. Receiver-operating characteristic (ROC) curve and AUC (area under the curve) analysis were used to estimate the predictive ability of MPI.

RESULTS:
The study included 111 patients. Majority of patients were males (n=81 – 73%) with M: F ratio of 2.7:1, and above 50-years(n=81-73.9%) of age. Most (n=101 - 91%) of the patients presented after 24-hours of onset of symptoms. A large number (n=104 - 93.7%) patients were in a status of shock at the time of presentation. Exploratory laparotomy revealed generalized secondary peritonitis in 91 (81.1%) patients. The source of peritonitis was perforated appendix in 37(33.3%), small bowel perforation 34 (30.6%) secondary to typhoid perforation, peptic ulcer perforation 19 (17.1%), colonic perforation 18 (16.2%) and miscellaneous 3 (2.7%).The nature of contamination was purulent in 69 (62.2%) patients followed by feculent in 22 (19.8%).

In majority of patients no known comorbid was found 87 (78.4 %). 18 (16.2%) patients developed post-operative renal failure, 7 (6.3%) liver failure and 6 (5.4%) had multi-organ failure. Fifty-one (45.9%) patients had MPI score <21, 34 (30.6%) score between 21 and 29 while only 26 (23.4%) patients scored >30. The overall mortality was 12.6% (n=14). Details are given in table I.

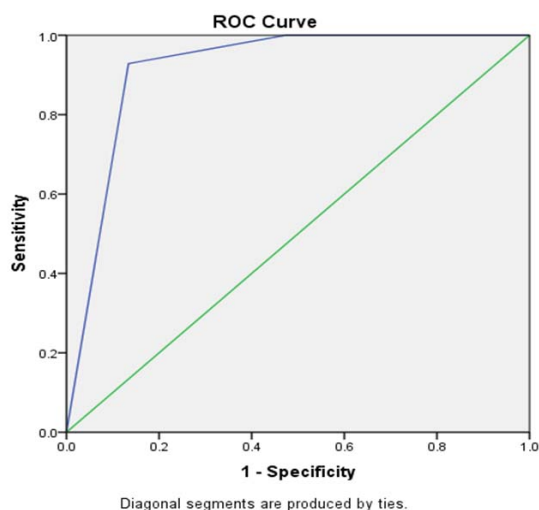Patient who scored <21 had no mortality and those with score between 21 and 29 had (2.3%) while in

Fig. I: ROC curve showing sensivity and specificity of MPI

Table I: Demographic Profile of the Patients (n=111)		
Demographic Variables	**Sub variables**	**Frequency n (%)**
Gender	Male	81 (73)
	Female	30 (27)
Age (years)	18-30	61 (55)
	31-50	21 (18.9)
	51-80	29 (26.1)
Duration of symptoms	<24 hours	10 (9)
	>24 hours	101 (91)
Preoperative Shock	No	07 (6.3)
	Yes	104 (93.7)
Peritonitis	Localized	21 (18.9)
	Generalized	90 (81.1)
Source of contamination Source	Appendix	37 (33.3)
	Small bowel	34 (30.6)
	Peptic ulcer	19 (17.1)
	Large bowel	18 (16.2)
	Others	03 (2.7)
Nature of contamination	Clear	20 (18)
	Purulent	69 (62.2)
	Feculent	22 (19.8)
Infections	None	40 (36)
	*SSSI	31 (27.9)
	**DSSI	09 (8.1)
	Others	31 (27.9)
Hospital Stay	<5 days	26 (23.4)
	6-14 days	63 (56.8)
	>15 days	22 (19.8)
MPI*** Score	<21	51 (45.9)
	21-29	34 (30.6)
	30-47	26 (23.4)
Outcome	Discharge	97 (87.4)
	Expired	14 (12.6)

*SSSI (Superficial surgical site infection)
**DSSI (Deep surgical site infection)
***MPI (Mannheim Peritonitis Index)

patients with score of >30 (n=26) 50% mortality (13 out of 26) noted. In this study 63 (56.8%) patients remained in hospital for 6-14 days while 22 (19.8%) had stayed more than 15- days. Mortality in the patient who presented with preoperative shock was 15.5% and with generalized peritonitis mortality was (14 out of 76) 18.42%. Details are given in table II. Receiver operating characteristic curve analysis of MPI asprediction of mortality is shown in Figure I.

DISCUSSION:
In the present study MPI score calculated showed relation with morbidity and mortality. Secondary peritonitis is still a common global issue with higher mortality and morbidity despite advanced surgical and ICU management.[7]Early recognition of severity of the condition can give valuable management guide to lessen the morbidity and mortality. In this study MPI was recorded in three categories with score > 30 being associated with significant mortality. MPI is a simple, quick and easy method to predict outcome in early peri-operative period. We recorded MPI score as an independent prognostic scoring system in predicting outcomes in secondary peritonitis.

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Table II: Significance of Mannheim Peritonitis Index (MPI) (n=111)				
Variables		**Outcome**		**Level of Significance**
		Discharge	**Expired**	
Age (years)	< 50	79	03	0.001*
	> 50	18	11	
Gender	Male	73	08	0.154
	Female	24	06	
Duration of symptoms	<24 hours	10	00	0.244
	>24 hours	87	14	
Nature of contamination	Clear	20	00	0.001*
	Purulent	63	06	
	Fecal	14	08	
Presence of malignancy	Yes	01	NIL	0.703
	No	96	14	
Peritonitis	Localized	21	00	0.043*
	Generalized	76	14	
Organ Failure	Nil	77	03	0.001*
	Renal	11	07	
	Liver	04	03	
	Others	05	01	
Source of Contamination (Perforation of)	Appendix	34	03	0.291
	Typhoid	30	04	
	Peptic	17	02	
	Colonic	13	05	
	Others	03	00	
MPI	< 21	51	00	0.001*
	21-29	33	01	
	>30	13	13	

*Significant

The pattern of patients presenting in emergency department in our study showed secondary peritonitis had male to female ratio of 2.7:1, which is similar to the studies conducted in this region.[5,6] In our study late presentation of patients was noted in 91% of the cases with 104 (93.7%) in preoperative shock.

The higher mortality was observed in patients above 50-years of age, and in cases of fecal contamination. Both were statistically significant irrespective of MPI score. Same findings are reported in other studies.[8-10] Shah et al also observed old age as a risk factor for patient outcome in generalized peritonitis.[11] The higher mortality in older age group may be due to multiple co-morbid conditions and limited physiological reserves.[12]

Our study revealed that renal failure followed by liver failure were important co morbid. Sharma et al in their study also revealed high mortality with different organ failure associated with secondary peritonitis.[13] In our study patients with MPI score of <21 developed no complication, while those who secured >30 MPI score had higher mortality (50%). Gaurav et al found similar mortality rates in patients who had 30 or more MPI score.[9] Sreedath et al observed mortality 87% in patient with >29 MPI points.[14] The difference may be due to varying sample size and age, as majority of their patients were above 50-years of age. This was also reported in another study.[15] However, van Ruler reported that none of the scoring systems including MPI has a predictive value.[16]

Limitations of the study: The study was retrospective and conducted in a single center without intensive care backup. Further studies with larger sample size are needed.

CONCLUSION:
Mannhiem Peritonitis Index is easy to apply as it is based upon clinical parameters with minimal laboratory investigation and operative findings. The MPI was able to predict morbidity and mortality in

patients with secondary peritonitis and the scores calculated showed relation with morbidity and mortality.

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All authors agreed to be accountable for the content of the article.

Ethics statement: Approval was taken from institution review board (IRB) before conducting the study.

Competing interest: Authors declare no competing interest.

How to cite this article?
Ahmed M, Iqbal M, Mehmood M, Mehboob M, Nasir SA, Panazai RA. Accuracy of Mannheim Peritonitis Index in predicting outcome of patients with secondary peritonitis.J Surg Pakistan. 2024; 29 (2):55-60.