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Assessment of Severity of Peritonitis Using Mannheim Peritonitis Index

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Abstract **Original Research Article**

Background: Despite advancement in diagnosis, management and critical care of patients with peritonitis due to various etiology, prognosis remain poor. Early assessment by scoring system will influence the management and prognosis. ***Aim*****:** Evaluation of Mannheim Peritonitis Index Score for predicting the outcome in patients with peritonitis. ***Material and Method*****:** Prospective study of 100 patient admitted and operated in National Institute of Medical Sciences & Hospital. The structured scoring system i.e. Mannheim Peritonitis index was applied along with other clinical and biochemical parameter recorded in pre-structured Performa. Data was analyzed for predicting mortality and morbidity. ***Results*****:** In present study the mortality was found to be 17% with mean MPI score 31.35 with a standard deviation of 5.2 while in cured group the mean MPI score was 17.78 with a standard deviation of 6.3. The p value is highly significant as it was < .0001. ***Conclusion*****:** MPI is disease specific, easy scoring system for predicting the mortality in patient with peritonitis. Increasing score are associated with poorer prognosis, needs intensive management and hence it should be routinely in clinical practice.

Keywords: etiology, peritonitis, Prospective study, diagnosis.

INTRODUCTION

Peritonitis, of whatever origin, still presents an extremely common and dreaded problem in emergency surgery. The incidence in the developing world is not very low and the delay in presentation due to various socioeconomical reasons enormously affects the outcome. In all age-groups it carries morbidity and mortality, but particularly it's high in middle & advanced years. Various diagnostic measures helped the clinician to institute treatment without delay but many time, the diagnosis is not so easy. Despite aggressive surgical approach the prognosis of peritonitis and intra-abdominal sepsis is still poor, especially when multiple organ failure develops. The intra-abdominal infection has grades of severity which varies from local response to generalized peritonitis. Generalized peritonitis has unacceptable high mortality, therefore objective criteria's are needed for grading severity of infection in time, which predicts prognosis, helps in selecting patients for aggressive surgical intervention and to evaluate and compare various treatment regimens. An effective predictive model of outcome of perforation peritonitis may be clinically useful in order to provide adequate care and optimal use of resources both in terms of surgical approach as well as intensive care unit admission. In general, routine laboratory and radiographic studies often add little specific information in the evaluation of peritonitis. In case of doubt, early surgical Intervention is to be preferred than wait and watch policy. Various scoring systems have been developed in the past few decades, like SEPSIS SEVERITY SCORE by Stevens [3], BIONOMIAL CLASSIFICATIONS by Meakins [4], APACHE-II SCORE by Kanus [5], MULTIPLE ORGAN FAILURE SCORE by Goris [6] & MANNHEIM PERITONITIS INDEX by Billing [7]. These scoring systems compare the effectiveness of different treatment regimens scientifically. The *Mannheim peritonitis index* developed by Billing [7] was based on data from 1253 patients with peritonitis who were treated, where discriminant analysis of 17 possible risk factors were considered by Wacha *et al*., [8]. Eight of these were found to be truly relevant to the prognosis with weightage according to predictive power. The score consists of information obtained during history, clinical examination and first laparotomy of the patient. It helps to establish an initial classification. The MPI score, defined as an "empirically deduced first risk score", considered age, general conditions, time from the onset of symptoms, type of surgery, type and extension of

peritonitis and presence of signs of organ dysfunction, each parameter is given a score and total score more than 26 identifies patients at risk of death from severe peritonitis.

The aim of our prospective study was to assess the severity of peritonitis using Mannheim peritonitis index and its predictive value is evaluated.

MATERIALS & METHOD

STUDY AREA: Indoor patients in Dept. of General Surgery at National Institute of Medical Sciences & Research, Jaipur.

STUDY DESIGN: Hospital based prospective observational study.

STUDY PERIOD: Study Period was from January 2018 to December 2018.

SAMPLE SIZE: 100 cases of peritonitis or time bound study from 1st January to 31thDecember 2018. The level of significance was at p-value of < 0.05.

Inclusion Criteria

Patients of both sexes of adult age groups having peritonitis of varied aetiology and who have undergone Laparotomy at National Institute of Medical Sciences Hospital & Research, Jaipur were taken.

Exclusion Criteria

Cases were managed conservatively.

All necessary preoperative data were recorded, blood samples were taken and relevant basic investigations were carried out. The patients were resuscitated with fluids and electrolytes and maintained within normal range. Urethral catheter was inserted to monitor output, nasogastric tube inserted to decompress the stomach. The MPI (Table-1) was applied along with other clinical and biochemical parameters recorded in pre-structural Performa. Further resuscitation and ICU care was given as and when necessary, patients were followed up post-operatively till the outcome i.e mortality, morbidity or discharge. Data obtained was analyzed for predicting mortality and morbidity.

STATICAL ANALYSIS

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean ± SD and median. Normality of data was tested by Kolmogorov-Smirnov test. If the normality was rejected then non-parametric test was used.

Statistical tests were applied as follows-

1. Quantitative variables were compared using Mann-Whitney Test (as the data sets were not normally distributed) between alive and expired.
2. Qualitative variables were correlated using Chi-Square test/Fisher's Exact test.
3. Receiver operating characteristic curve was used to find out cut off point of MPI score for predicting mortality.
4. Univariate and multivariate logistic regression was used to find out significant risk factors of mortality.
5. A p value of <0.05 was considered statistically significant.
6. Data analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0

Table-1: MPI

Risk factor	Weighting if present
Age >50 years	5
Female sex	5
Organ failure	7
Malignancy	4
Origin of sepsis not colonic	4
Diffuse generalized peritonitis	6
Preoperative duration of peritonitis >24 h	4
Intraperitoneal exudates	
Clear	0
Cloudy, purulent	6
Fecal	12

Total score is 47 Long Term survivors have an MPI score of about 20 nonsurvivors have a score of more than 33.

Table-2: Definition of organ failure

Organ	Criteria
Kidney	
Creatinine level	≥177 µmol/L (≥2.31 mg/dl)
Urea level	≥167 mmoL/L (≥467.78 mg/dl)
Oliguria	<20 ml/h
Lung (mmHg)	
PaO_2	<50
$PaCO_2$	>50
Shock	Hypodynamic or hyperdyanmic
Intestinal obstruction (only if profound)	With paralytic ileus >24 h, complete mechanical

RESULTS

- Majority pf patients belonged to age group of 21years to 60 years. The oldest patient was male of 79years old.
- There were 74 % male patients and 26% female patients with male to female ratio 2.8:1.
- Majority of patients (45%) presented within 24 hours on onset of illness, 24% within 48 hours and 15% in 72 hours and 16% after 96 hours.
- 32% patients had non-specific past history where 16% had history of NSAID use, 12% had blunt trauma to abdomen, 11% had fever, 9% presented with lump abdomen, 6% were diagnosed with abdominal tuberculosis, 5% presented with constipation and 3% with previous laparotomy and 3% had hysterectomy.
- 64% of patients presented in shock. 82% presented with normal blood urea level where 18% presented with elevated urea level (>167 mg/dl)
- X-ray flat plate abdomen as initial investigation in patients reveals 58% had gas under diaphragm 22% has multiple air fluid levels and 20 % had normal x-ray.10 % patients had widal positive test.
- 56% had perforation of hollow viscus where 13% presented with obstruction, 5% had burst appendix, 4% had adhesions & 4% had gangrene of gut, 3% had stricture and 2% had malignancy.
- Most common procedure was primary repair which was done in 48% of patients, followed by resection and anastomosis which was 22%, Primary repair with ileostomy was done in 10% of the patients.
- 94% patients had diffused peritonitis and 6% had localized and 3% of the patients with peritonitis had malignancy.
- The overall mortality in this study was 17 % due to severe peritonitis. Higher Mortality rates were seen with increasing age group, 44% mortality in age group of 71 to 80 years, 38% in group of 61 to 70 years, 29% in group of 51 to 60 years and 21% in group of 41 to 50 years. P value was0.007.
- Higher mortality was seen in female patients (19%) as compared to male populations (16%).
- Time between hospitalization and onset of illness had great impact on mortality, patients who were admitted >96 hours had mortality of 50%. Whereas patients who were admitted in 24 hours has only 9 % mortality rate.
- Past history is relevant factor in prediction of mortality, extra-intestinal has very significant mortality. Ruptured liver abscess 100% mortality, abdominal Koch and previous surgery has 33%, BTA has 25% mortality.
- 23% patients in our study had organ failure as given in criteria of MPI scoring where mortality 65% whereas in patients without organ failure mortality was only2.60%.
- Multiorgan dysfunction and myocardial infarction had 100% mortality, patients with secondary hemorrhage and ARF had 50% mortality rate, patients with shock had 25% mortality and wound sepsis had 7% mortality.
- Average age in cured patient was 40.54 years and range between 40.54+-17.87 years whereas in expired group the average age was 60.29 and range between 60.29+-13.01 years.
- Average hospital stays in cured patients 7.22 days and range between 7.2+-1.86 days and in expired group it was 8.47 days and range between 8.47+-2.5 days.
- Average ICU stay in cured group was 1.56 days with range between 1.56 +-0.72 days, whereas in expired group the average ICU stay was 2.18 days with range between 2.18+-1.07 days. P value was 0.025.
- Average MPI score in cured patient group was 17.78 and it ranges between 17.78 +- 6.3, in expired group the average MPI score was 31.35

and it ranges between 31.35 +- 5.2. The p value is highly significant < .0001.

- Mean age for cured was 40.54 years and in expired group it was 60.29 years. Average hospital stay in cured group was 7.22 days whereas in expired group it was 8.47 days. Average MPI score in cured group was 17.78 and in expired group it was 31.35. Mean spo2 in cured age group was 95.64 and expired group it was 88.47.

Table 3: Univariate Logistic Regression of MPI Score

Univariate logistic regression	B	S.E.	P value	Odds ratio	95% C.I.for Odds ratio	
					Lower	Upper
AGE	0.065	0.018	0.0003	1.068	1.030	1.107
HOSPITAL STAY	0.287	0.127	0.024	1.332	1.038	1.710
ICU STAY	0.816	0.368	0.027	2.261	1.098	4.653
SP02	-0.375	0.079	<.0001	0.687	0.589	0.802
MPI SCORE	0.478	0.118	0.0001	1.613	1.279	2.033

- As per table above shown age had p value 0.0003 with odds ratio more than 1, which indicate age to outcome had significant relation and with increasing age was a risk factor.
- Hospital stays and ICU stays had p value 0.024 and 0.027 respectively with odds ratio more than 1, it signifies longer hospital stays and ICU stays had significant correlation to outcome and was a risk factor.
- MPI score had p value 0.0001 with odds ratio more than 1 which signifies increasing score had significant correlation with outcome and was a risk factor.

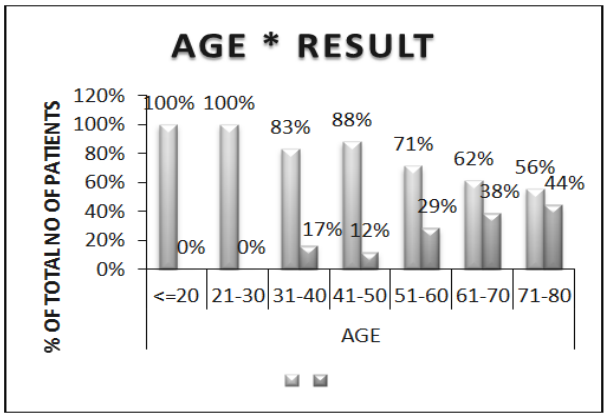

Fig-1: Relation of age and mortality

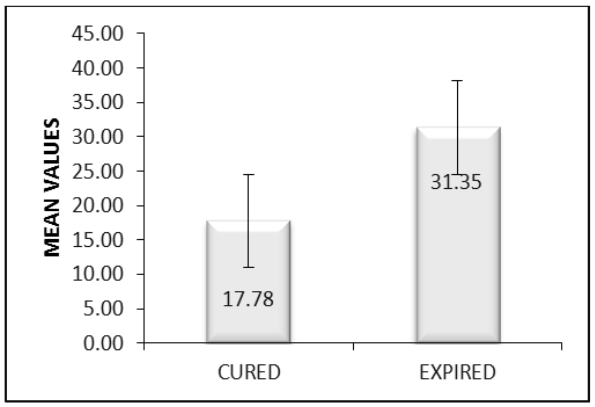

Fig-2: MPI Score of patients

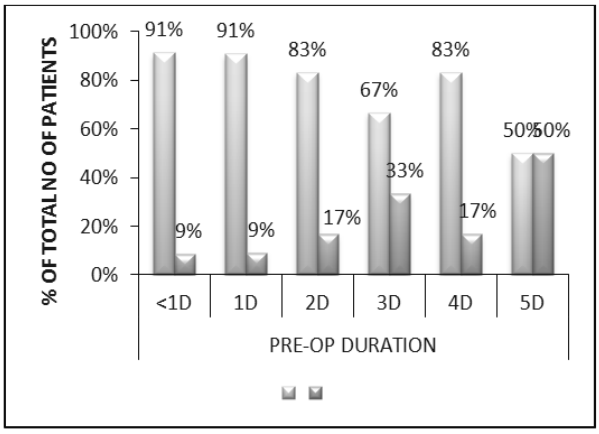

Fig-3: Pre op duration versus results

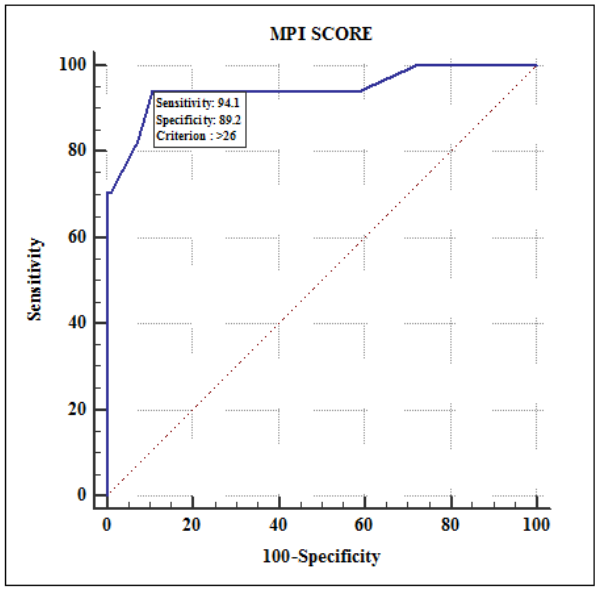

Fig-4: ROC and MPI Score

Table-3: ROC and MPI Score

	Area under the ROC curve (AUC)	Standard Error	95% Confidence interval	P value	Cut of f	Sensitivity	95 % CI	Specificity	95 % CI	+ LR	95 % CI	- LR	95 % CI	+ PV	95 % CI	- PV	95% CI
MPI SCORE	0.946	0.039	0.882 to 0.981	<0.0001	>26	94.12	71.3 - 99.9	89.16	80.4 - 94.9	8.68	4.6 - 16.3	0.066	0.010 - 0.4	64	42.5 - 82.0	98.7	92.8 - 100.0

DISCUSSION

Validation of Mannheim's peritonitis Index: Patients were divided into 3 groups according to the severity of peritonitis, as group I (score less than 21), group II (score 21-29) and group III (score more than 29), Billing *et al*., [7] reported that mortality in these groups were as 2.3%, 22.5% and 59.1% respectively. In the series of Winkeltan *et al*., [9], the mortality was 3%, 24 % and 33% respectively. In present study the mortality was found to be 17% with mean MPI score 31.35 and it ranges from +- 5.2 standard deviation and in cured group the mean MPI score was 17.78 and it ranges from +_ 6.3 standard deviation. The p value is highly significant as it was < .0001. So mortality steadily increased with increase in Mannheim's peritonitis Index score.

In series of Billing *et al.*, [7], the mean MPI score was 22 and it ranges from 14 -26. In present study the mean MPI was 20.09 +_ 7.96 standard deviation.

Leverani *et al.*, [10] reported mean mortality rate of 2% for patients with score less than 26 and 40.5% for patients with score greater than 26.

In present study based on ROC curve, the optimum cut off point is more than 26, this indicates the patients with score less than 26 were on low risk of mortality and the patients above MPI score 26 need more aggressive approach for treatment. To assess the predictive power of Mannheim's peritonitis Index the area under ROC curve was analyzed which was 0.946 with sensitivity of 94.1% and specificity of 89.2%. Positive predictive value is 64% and negative predictive value is 98.7% and 95% confidence interval is in range between 0.882 to 0.981.

Demmeln *et al.*, [11] worked on prognostic score of peritonitis, the MPI and APACHE II scores. Statistical validation showed a sensitivity of 89% and specificity of 25% for APACHE II score, while for threshold MPI score of 26 it was 88% and 78% respectively.

Accuracy of MPI was comparable or slightly superior to that of other sepsis classification system, including APACHE II.

Early evaluation of severity of illness using Mannheim's peritonitis Index allow us to estimate the probability of patient survival.

The MPI scoring system is one of the simplest scoring systems in use that allows the surgeon to easily determine the outcome risk during initial surgery and is ideal for use in hospitals of India.

This study reaffirms the value of Mannheim's peritonitis Index in identifying high risk patients with peritonitis. Of the present prognostic scoring system, the Mannheim's peritonitis index is on of the easiest to apply and determination of risk is readily available during initial surgery. The quality of prediction does not allow individual decision making or limitation of therapy

As compared to other scoring system like APACHE II, Mannheim's peritonitis Index is very useful predictor of outcome of peritonitis of any duration, in elderly man with compromised organ function. However, blood gas analysis as a parameter in MPI can well replaced by pulse oxymeter in our study.

Many prospective studies have confirmed that not only the MPI was efficient as APACHE II in predicting the short-term risk of mortality of a patient with peritonitis but as well, this is one of the easiest scoring systems to apply and it can be calculated during operation whereas APACHE II score requires 24 hours.

CONCLUSION

This study reaffirms the value of Mannheim's peritonitis Index in identifying high risk patients with peritonitis. Of the present prognostic scoring system, the Mannheim's peritonitis index is on of the easiest to apply and determination of risk is readily available during initial surgery. The quality of prediction does not allow individual decision making or limitation of therapy. As compared to other scoring system like APACHE II, Mannheim's peritonitis Index is very useful predictor of outcome of peritonitis of any duration, in elderly man with compromised organ function. However, blood gas analysis as a parameter in MPI can well replaced by pulse oxymeter in our study.

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