International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

A Descriptive Study on the Evaluation Mannheim Peritonitis Index to Predict the Outcome of Patients with Peritonitis

Dr. K V Arpitha Nayaka[1], Dr Ashwini C[2], Dr Nanda Kumar Loganathan[3]

[1]Post Graduate Student, Department of General Surgery, Akash Institute of Medical Sciences and Research Centre, Devanahalli, Bengaluru Rural
Email: glitzarpi[at]gmail.com
[2]Assistant Professor, Department of General Surgery, Akash Institute of Medical Sciences and Research Centre, Devanahalli, Bengaluru Rural
Email: ashwinicgr[at]gmail.com
[3]Post Graduate Student, Department of General Surgery, Akash Institute of Medical Sciences and Research Centre, Devanahalli, Bengaluru Rural
Email: nandhakumar923[at]gmail.com

Abstract: ***This study evaluates the Mannheim Peritonitis Index MPI as a predictive tool for determining patient prognosis in peritonitis cases. Peritonitis, often caused by gastrointestinal perforations, poses a high mortality risk. The MPI is designed to help clinicians estimate the likelihood of mortality and to guide patient management. The study was conducted at Akash Hospital from July 2023 to July 2024, involving 49 patients diagnosed with peritonitis. Data collection included clinical assessments and lab evaluations, with statistical analysis performed to explore the relationship between MPI scores and patient outcomes. The results demonstrated a strong correlation between higher MPI scores and increased mortality rates, indicating that MPI is a valuable instrument in clinical practice for risk assessment and therapeutic decision-making.***

Keywords: Mannheim Peritonitis Index, peritonitis prognosis, mortality prediction, clinical tool, risk assessment

1. Introduction

This quantitative descriptive study aims to evaluate the use of the Mannheim Peritonitis Index (MPI) in determining the prognosis of peritonitis patients. Peritonitis is an inflammation of the peritoneum most commonly due to perforations in the gastrointestinal tract wherein the condition poses high mortality rates. The Mannheim Peritonitis Index was therefore formulated to help clinicians make better predictions as to the chances of mortality among the affected patients and in equal measure provide a more structured approach to the determination of such. In this paper, it has been attempted to include minute details of the study concerning the research work done as well as further analysis. The purpose of the present work is to present the goals, methods and findings of the study, and to offer a critical assessment of the MPI and its possible application in the clinical setting.

2. Literature Review

According to the study of **Špička et. al[1]**, the term diffuse peritonitis refers to generalized peritonitis, a serious condition that may mandate early intervention, and it involves source control, peritoneal lavage, or other measures, and critical care. The goal of the work was to assess the effectiveness of three simple scoring systems for outcome prediction in patients with diffuse peritonitis. The mortality in a series of 274 between 2015 and 2019 was 22.6%, morbidity 73.4% and hospital stays were an average of 25.2 days. The accuracy of simpler scores of ASA and ECOG was similar to that of MPI, qSOFA and other more complex scores for mortality and morbidity, and they can therefore be used routinely in clinical practice because of their simplicity.

Using a retrospective examination of 68 patients, **EN Dimitrov et. al[2]** assessed the performance of multiple scoring systems in estimating mortality in patients with local peritonitis (LP). With an AUROC of 0.805, the Mannheim Peritonitis Index (MPI) had the greatest predictive performance among the scoring systems examined. With 66.7% sensitivity and 80.6% specificity, an MPI score above 25 substantially predicted negative results. The only measure linked to patient outcomes was the MPI.

The MPI, POSSUM and Sepsis Score of Stoner and Elebute were used in this study of **M Suhalka et. al[3]**, to assess 150 patients with perforation peritonitis to compare their ability to predict mortality. The Sepsis Score was the most accurate of the models to predict sepsis with a listed sensitivity of 100% for both datasets with a specificity of 100%. A meta - analysis of MPI and POSSUM revealed high sensitivity which was 91.70% and specificity was 88.90% and 90.50% respectively. All three scoring systems were therefore established as reliable prognostic instruments, intended for use in defining a high - risk cohort.

The Mannheim Peritonitis Index (MPI) was applied in assessing 64 patients with perforation peritonitis in the study of **C Tenny et. al[4]**. Of the variables that were found significant on the risk model analysis for mortality, age of more than fifty years, organ dysfunction, duration of surgery before the onset of peritonitis of more than twenty - four hours, and presence of generalized peritonitis were other important considerations. A higher MPI score was associated with higher mortality and thus the work aimed to show that MPI can be utilised for evaluating patient severity and therapy.

Accordingly, the study of **RN Iranya et. al**[5] aimed to compare the discriminative power of the qSOFA score and PIPAS severity score for in - hospital mortality in peritonitis cases in a low - resource centre. A prospective study that was done on 136 patients in Uganda showed that the PIPAS score had better discriminative capability as compared to the qSOFA score concerning the mRCCCA; the AUCs achieved were 0.893 for the PIPAS and 0.770 for the qSOFA, the former had a better sensitivity of 76.5% while the latter had a better specificity of In emergency settings, the authors propose PIPAS score for the first specific prognostic instrument in the case of peritonitis.

Based on data from 1, 351 patients who underwent open abdominal surgery, to design the MPPM, **S Petersen et. al**[6] included four domains, including preoperative variables, intraoperative variables, postoperative variables, and microbiological variables. The MPPM which used demographic, physiological, and surgical predictors had high predictive accuracy (AUC=0.87). The model was superior to individual predictors with the best three predictors for survival in the study being skin closure, SAPS - II and MPI.

MF Aftab et. al[7] aimed to analyse the use of the predictor Mannheim Peritonitis Index (MPI) in predicting the prognosis of patients with perforation peritonitis. A cross - sectional study including 103 patients of Nishtar Hospital revealed such factors as age of more than 60 years, female patients, colonic perforation, organ failure, and faecal peritonitis as significant predictors of increased mortality. In patients, who had MPI scores of 26 or higher, it was found that these patients had a risk of mortality two and a half times higher than the patients in the low score group. It was therefore found that MPI is a valuable method for patient classification and therapeutical management according to organisms' seriousness levels.

3. Research Methodology

The research used descriptive research design to assess the MPI for prognosis results in patients with peritonitis. This research took place at Akash Hospital where only patients in the general surgery ward with a clinical diagnosis of peritonitis were included. The study time frame was from July 2023 to July 2024, and 49 patients were eventually incorporated according to disease inclusion and exclusion criteria.

Data Collection

In the course of the study, data collection formed the core part of the exercise, which comprised both clinical and lab evaluations. Clinical case Histories were obtained before proceeding to physical examination of the patients. Some of the tests that were performed included haematological, renal and liver profiles, and serum electrolyte estimations. Additional diagnostic and staging investigations included X - ray, and Computerised Tomography scans, to establish the degree of peritoneal involvement.

Inclusion and Exclusion Criteria

The participants selected for the study had to be 18 years old and above and had to have been confirmed to suffer from peritonitis. Patients with chronic renal failure, chronic liver disease or other conditions that could have complicated the results of the study were excluded. Such a strict selection was used to avoid the inclusion of only atypical peritonitis cases that are rarely seen in clinical practice.

Data Analysis

The MPI was calculated for each patient using the clinical data collected. Statistical analysis was then conducted to determine the correlation between MPI scores and patient outcomes, specifically focusing on mortality rates. The analysis employed descriptive statistics and inferential methods to assess the predictive value of the MPI.

4. Analysis

Table 1: Descriptive

Descriptive Statistics								
	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Age	49	20	80	53.10	16.495	272.094	- .324	.340
IP Number	49	202231	294567	260788.12	24083.730	580026035.151	- .758	.340
DOA	49	23 - JUL - 22	18 - NOV - 22	01 - OCT - 22	27 03: 26: 07.218	5499809280001.989	- .204	.340
DOS	49	23 - JUL - 20	18 - NOV - 22	16 - SEP - 22	117 05: 53: 29.461	102617091683251.670	- 6.510	.340
Valid N (listwise)	49							

(Source: SPSS)

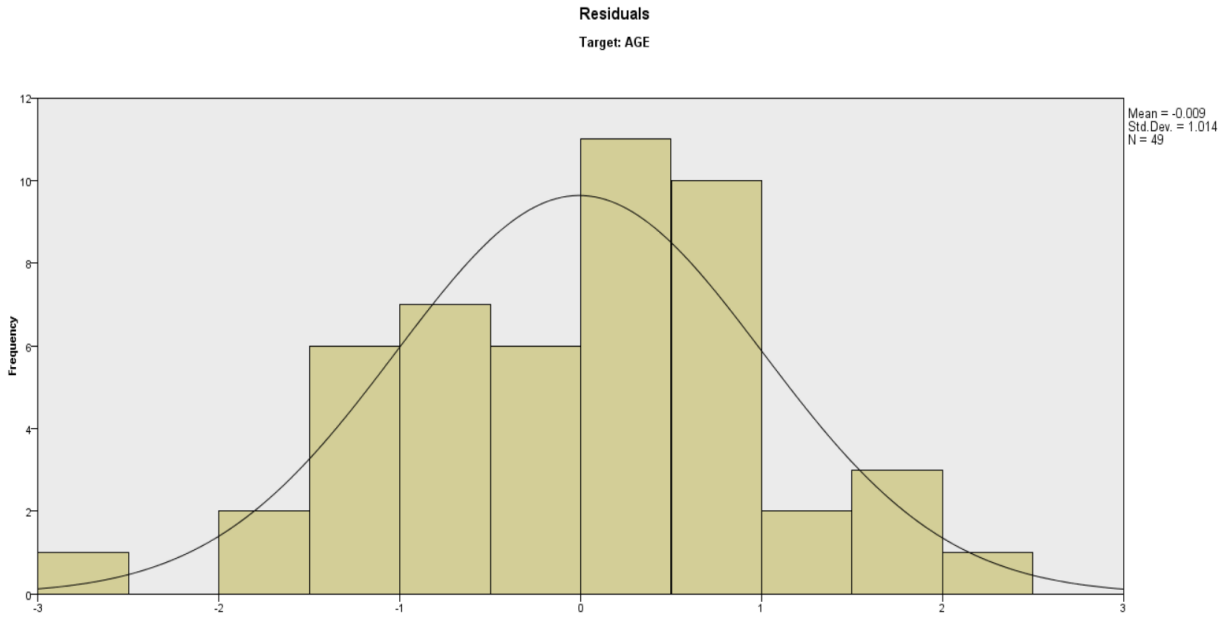

Figure 1: Automatic Linear Modelling_Histogram
(Source: SPSS)

Target: AGE

Model Term	Coefficient	Std.Error	t	Sig.	95% Confidence Interval		Importance
					Lower	Upper	
Intercept	53.537	2.342	22.858	.000	48.828	58.246	

Display coefficients with sig. values less than...
.0001 .0005 .001 .005 .01 .05 .10 .20 1.00

Figure 2: Coefficients
(Source: SPSS)

Table 2: Frequencies

Statistics						
		S. No	AGE	IP NUMBER	DOA	DOS
N	Valid	49	49	49	49	49
	Missing	0	0	0	0	0
Mean		25.00	53.10	260788.12	01 - OCT - 22	16 - SEP - 22
Median		25.00	59.00	265921.00	02 - OCT - 22	02 - OCT - 22
Std. Deviation		14.289	16.495	24083.730	27 03: 26: 07.218	117 05: 53: 29.461
Range		48	60	92336	118 00: 00: 00	848 00: 00: 00
Minimum		1	20	202231	23 - JUL - 22	23 - JUL - 20
Maximum		49	80	294567	18 - NOV - 22	18 - NOV - 22

(Source: SPSS)

Table 3: Age across Organ Failure

Independent - Samples Mann - Whitney U Test Summary	
Total N	49
Mann - Whitney U	348.500
Wilcoxon W	439.500
Test Statistic	348.500
Standard Error	44.089
Standardized Test Statistic	2.597
Asymptotic Sig. (2 - sided test)	.009

(Source: SPSS)

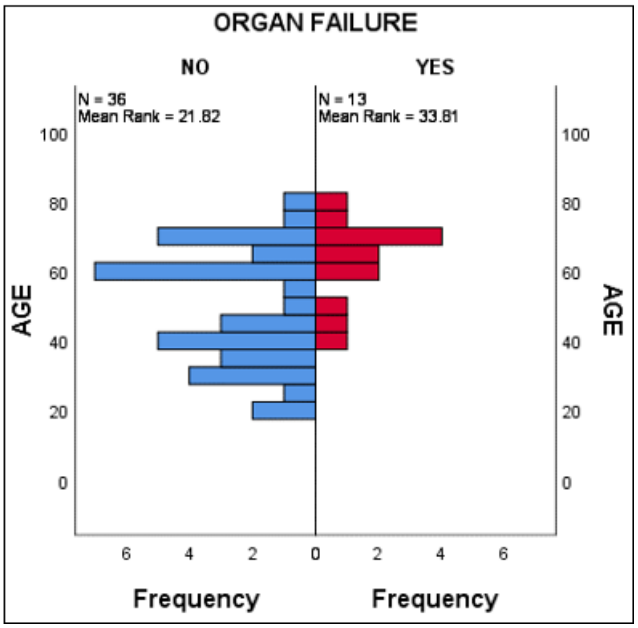

Figure 3: Independent - Samples Mann - Whitney U Test (Source: SPSS)

Table 4: Age across Outcome

Independent - Samples Kruskal - Wallis Test Summary	
Total N	49
Test Statistic	7.119[a]
Degree Of Freedom	2
Asymptotic Sig. (2 - sided test)	.028

(Source: SPSS)

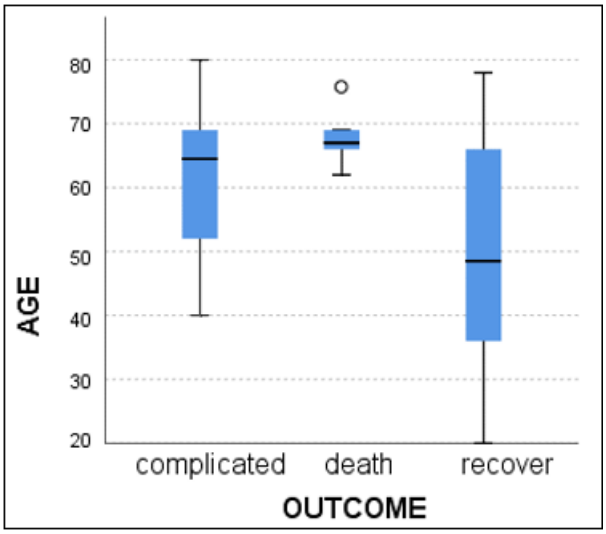

Figure 4: Independent - Samples Kruskal - Wallis Test (Source: SPSS)

5. Findings

The descriptive statistics of the 49 study participants offer insightful analysis of their clinical and demographic traits. With a mean age of 53.10 years and a standard deviation of 16.495, suggesting some considerable variation, the patients' ages varied from 20 to 80 years. With a little left tilt (skewness = - 0.324), the age distribution indicated that more of the patients were younger than the mean age.

Representing patient IDs, the IP numbers ranged greatly from 202, 231 to 294, 567. With a standard deviation of 24, 083.730, the mean IP number was 260, 788.12, suggesting a noteworthy dispersion in patient identities. With a skewness of - 0.758, most patients had smaller IP values, therefore reflecting a left - skewed distribution.

With a mean admission date of October 1, 2022, the dates of admission (DOA) stretched from July 23, 2022, until November 18, 2022. With a little left skew (skewness = - 0.204), the standard deviation of about 27 days shows modest variation in admission dates, suggesting that more patients were hospitalised early in the timeframe.

Surgery (DOS) dates ranged more broadly, from July 23, 2020, to November 18, 2022. With a significant standard deviation of about 117 days, the mean surgery date was September 16, 2022, indicating great variation in the timing of operations. With a skewness of - 6.510, most operations were carried out significantly sooner, with a few outliers occurring far later. This suggests a notable left skew. This great variation in operation highlights the several surgical schedules, which could significantly affect the results for patients.

The Independent - Samples Mann - Whitney U Test yields important new perspectives on the comparison between two independent groups within the dataset of 49 patients. Together with the Wilcoxon W value of 439.500, the Mann - Whitney U statistic of 348.500 produced by the test shows variations in the rank distributions among the groups. Reflecting the fluctuations in the U statistic, the standard error connected with this test is 44.089.

Calculated was a standardised test statistic (Z score) of 2.597, which gauges the distance the U statistic is from the mean under the null hypothesis. Above all, the asymptotic significance (2 - sided test) produced a p - value of 0.009. This p - value indicates that the variations between the two groups are statistically significant since it is well below the accepted level of 0.05. As a result, the test findings show clear proof to disprove the null hypothesis, therefore suggesting a significant variation among the examined groups.

Examining the variations in outcomes—recovery, complications, and death—among the groups, the Kruskal - Wallis Test was carried out on a sample of 49 patients. With 2 degrees of freedom, the test yielded a statistic of 7.119 and an asymptotic significance (p - value) of 0.2800, therefore suggesting a statistically significant variation in results at the 0.05 level. Subsequently, pairwise analyses of the outcome groups were conducted.

The test statistic was 10.175 with a standard error of 6.267 when comparing recovery and complication outcomes, therefore obtaining a standard test statistic of 1.624. Although the uncorrected p - value was 0.104, the Bonferroni correction produced an adjusted significance of 0.313, thereby showing no appreciable change. With a standard test statistic of 2.305, the comparison of recovery to death outcomes revealed a test statistic of 15.642 and a standard error of 6.787. After normalisation, the first p - value of 0.021 changed to 0.064, somewhat over the 0.05 level. Comparing complication and mortality outcomes produced a test statistic of - 5.467 with a standard error of 8.639 and a standard test statistic of - 0.633,

therefore obtaining an adjusted p - value of 1.000. After normalisation, this study shows a general quite notable difference in results but no appreciable pairwise variations.

6. Recommendations and Conclusions

Based on the findings of this study, it is advisable to incorporate the Mannheim Peritonitis Index MPI into daily clinical practice for the evaluation of peritonitis since it well predicts the mortality of the patients. Education and counselling of healthcare personnel in the application of MPI is crucial to enhance risk assessment and patient management. Moreover, more studies are required to confirm the MPI using the alternative patient populations and to evaluate the use of the MPI together with other predictive indexes, including the APACHE II and the SOFA scores. The integration of the MPI into clinical practice may enhance the guidelines used in the treatment of peritonitis hence resulting in better results.

A strong evidence base has therefore been established for the Mannheim Peritonitis Index as a marker for mortality in peritonitis patients. If infused into the practice of healthcare facilities, the MPI will boost the level of assessment for risky patients and later treatment options. Nevertheless, further studies and updates on the index are required to get the most out of it and to check its suitability in various clinical contexts. In conclusion, the result of this study brings out more positive supporting arguments and effects to the MPI; moreover, it notes the significance of the MPI in enhancing outcomes for seriously ill peritonitis patients.

References

[1] Špička P, Chudáček J, Řezáč T, Starý L, Horáček R, Klos D. Prognostic significance of simple scoring systems in the prediction of diffuse peritonitis morbidity and mortality. Life.2022 Mar 28; 12 (4): 487.
[2] Dimitrov EN, Minkov GA, Enchev ET, Halacheva KS, Yovtchev YP. Can we predict death using scoring systems in patients with local peritonitis? A retrospective study. Folia medica.2023 Feb 28; 65 (1): 73 - 9.
[3] Suhalka M, Soni RK, Khatri MK, Jenaw RK. Comparison of Various Scoring Systems to Predict Outcome of Perforation Peritonitis. Azerbaijan Pharmaceutical and Pharmacotherapy Journal.2024 Aug 3; 23: 1 - 6.
[4] Tenny C, Perumbilavil G. Evaluation of Prognosis in Patients with Perforation Peritonitis Using Mannheim Peritonitis Index. Saudi Journal of Medicine.2020 Mar; 5 (3): 138 - 44.
[5] Iranya RN, Mbiine R, Semulimi AW, Nasige J, Makumbi T, Galukande M. Comparison of the PIPAS severity score tool and the QSOFA criteria for predicting in - hospital mortality of peritonitis in a tertiary hospital in Uganda: a prospective cohort study. BMC surgery.2022 Jul 28; 22 (1): 291.
[6] Petersen S, Huber M, Storni F, Puhl G, Deder A, Prause A, Schefold JC, Doll D, Schober P, Luedi MM. Outcome in patients with open abdomen treatment for peritonitis: a multidomain approach outperforms single domain predictions. Journal of clinical monitoring and computing.2021 Jul 10: 1 - 1.
[7] Aftab MF, Niaz K, Bukhari MT, Kareem T, Akram AM, Rabbani MA. Analysis of Manheim Peritonitis Index Scoring in Predicting Outcome in Patients with Perforation Peritonitis: Manheim Peritonitis Index Scoring in Patients with Perforation Peritonitis. Pakistan Journal of Health Sciences.2023 Jan 31: 166 - 70.