Section: General Surgery

Original Research Article

A COMPARATIVE ANALYSIS BETWEEN ACUTE PHYSIOLOGICAL AND CHRONIC HEALTH EVALUATION 2 AND MANNHEIM PERITONITIS SCORE (MPI) IN PREDICTING PROGNOSIS OF PERFORATION PERITONITIS

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Abstract

Background: Peritonitis must be evaluated and recognised immediately in a surgical emergency. Numerous grading systems have been developed to evaluate the prognosis and outcomes of peritonitis. **Aim:** To evaluate the usefulness and severity of acute physiological and chronic health evaluation 2 in comparison with the Mannheim peritonitis score in predicting the outcome in patients with perforation peritonitis and thus decision-making in perforation peritonitis. **Material & Methods:** This prospective observational study was conducted at Govt Mohan Kumaramanagalam Medical College Hospital, Salem, between November 2020 and November 2022 in patients diagnosed with perforation peritonitis. The APACHE II score and Mannheim peritonitis index were determined, and the expected and actual results were compared among the 50 patients admitted for the study. **Results:** In our study, the majority of patients (88%) had an APACHE II score of 10 < and 60% had a score of < 21 ($p<0.05$). Postoperative wound infections showed statistically significant postoperative complications with APACHE II scores. In contrast, postoperative wound infection and dehiscence, respiratory complications, ventilatory support, and mortality were significantly associated with the MPI scores. The mean post-hospital stay duration was 6.9 days in the APACHE II ($p=0.026$) and 5.54 days in MPI scoring ($p=0.036$), indicating statistical significance with both scoring systems. MPI scored better as a predictor of death than APACHE II. **Conclusion:** MPI is a practical and straightforward approach for estimating the prognosis of perforation peritonitis and is comparable to APACHE II. MPI is an effective tool for predicting mortality and morbidity in patients with perforation peritonitis.

INTRODUCTION

Inflammation of the peritoneum, which protects abdominal organs and forms the inner wall of the abdomen, is known as peritonitis. One of the surgical situations that is thought to be life-threatening is peritonitis caused by hollow viscus perforation.[1] Most instances of peritonitis result from gut bacteria invading the peritoneal cavity. To identify high-risk patients for more aggressive treatment approaches and to offer an objective categorisation of the disease's severity, early prognostic evaluation of abdominal sepsis is therefore desirable.[2] The mainstay of treatment is surgery, and early surgical intervention is always preferred, particularly in cases where the patient was previously healthy and in cases where postoperative peritonitis has developed.[3]

The mortality rate associated with typical surgically treatable peritonitis cases, such as perforated peptic ulcers, appendicitis, and diverticulitis, is approximately 10% in otherwise healthy individuals. Patients with underlying renal insufficiency and comorbidities have a greater mortality risk, and those with peritonitis who develop sepsis have a mortality rate that increases to 35%. Early assessment using a grading system affects prognosis and therapy.[4] Despite surgical treatment, advanced critical care facilities, the most recent generation of antibiotics, and a better underwriting environment, the prognosis for

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perforation peritonitis remains poor, and fatality rates are significant.[5] Selecting patients for an aggressive surgical approach may be aided by early detection of individuals with severe peritonitis, exact recognition of the seriousness of the illnesses, and an accurate assessment classification of the patient's risks. To identify high-risk patients for more aggressive treatment operations such as debridement, lavage system, open management, and planned relaparotomy, early prognostic diagnosis of peritonitis is preferred.[6]

Numerous grading methods have been developed to evaluate the course and outcome of peritonitis. The outcomes of patients with peritonitis can be predicted using several grading systems.[7] These score systems can be effective tools for anticipating and tracking the order of importance of therapy for improved peritonitis care. Furthermore, prognosis prediction may be aided by carrying out a risk analysis for patients by identifying prognostic variables that influence morbidity and death. Scoring systems with characteristics comprising demographic and clinical aspects have also been created, in addition to the predictive variables impacting the morbidity and mortality of patients.[8]

Acute Physiology and Chronic Health Evaluation (APACHE II) score, Mannheim peritonitis index (MPI), POSSUM score, simplified acute physiology score (SAPS), sepsis severity score (SSS), Ranson score, and Imrite score are just a few scoring systems that have been developed to gauge the severity of hollow viscous perforation peritonitis. The APACHE II is the ICU's most frequently used disease-independent scoring system. On the other hand, MPI is a scoring system that is disease-specific.[9] Compared to MPI, which is relatively simple to compute and takes less time, APACHE II has more variables, making it more time-consuming and laborious. In emergency and intensive care settings, choosing the course of treatment can be challenging based on the clinical, biochemical, and radiological evaluations needed for better results and prognosis. Time is a key consideration during emergencies. Therefore, a scoring method that is simple, quick, and accurate in determining the prognosis of perforation peritonitis is needed.[10]

Aim

The current study evaluated the usefulness and severity of acute physiological and chronic health evaluations compared to the Mannheim peritonitis score in predicting the outcome in patients with perforation peritonitis and, thus, decision-making in perforation peritonitis.

MATERIALS AND METHODS

This prospective observational study was conducted in Govt Mohan Kumaramanagalam Medical College Hospital, Salem, between November 2020 and 2022, in patients admitted to the general surgical and trauma wards with a clinical diagnosis of perforation peritonitis. After obtaining clearance from the institutional ethical committee, the demographic data of 50 patients meeting the following inclusion criteria with a clinical diagnosis of perforation peritonitis were obtained.

Inclusion Criteria

All 12 patients with a clinical diagnosis of perforation that manifested within 72 hours of the start of treatment were included in the study.

Exclusion Criteria

Patients diagnosed with perforation peritonitis of age < 12 or > 70 years, presenting after 72 h and not undergoing surgery, and colonic perforations were excluded from the study.

After obtaining written informed consent from patients who met the inclusion criteria, data regarding age, demographic characteristics, socioeconomic status, and detailed history, including patient complaints and duration, were collected along with a detailed general and systemic examination.

Scoring system evaluation

In each case, the Manheim peritonitis index scoring system and the APACHE II were used to quantify the risk of death. The final results were compared with the predictions made by the scoring systems. The MPI score was determined for every patient and individual. The primary outcome measure used to compare the MPI scores was death. Three groups were created from the MPI scores: <15 (Category 1), 16–25 (Category 2), and >25 (Category 3). Statistical analyses were performed on the patient's data. Age, chronic health, and 12 acute physiological variables were measured to determine the APACHE II scores.

Statistical Analysis

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 21.0. Values are presented as number (%) and mean ± SD.

RESULTS

Of the 50 cases of perforation peritonitis admitted to our institute for two years, with perforation peritonitis assessed by two grading systems, APACHE II and MPI, the majority of patients (88%) had APACHE II scores of < 10. The mean and standard deviation of the APACHE II score of patients were (4.70+3.278) respectively (Table 1). The majority of patients (60%) had an MPI score < 21, and the mean and standard deviation of the MPI score were (20.7+6.431) respectively (Table 1). The calculated independent t-test value of t =15.6 shows a statistically significant difference in comparing the patients' APACHE II AND MPI scores. [Table 1]

There was an evident Pearson chi-square test for postoperative complications and postoperative wound infections, with statistical significance for APACHE II scores among the patients. [Table 2] The remaining postoperative complications did not

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significantly correlate with the APACHE II score. Evidence of Pearson's chi-square test for postoperative complications with MPI scores was found. Postoperative wound infection, wound dehiscence, respiratory complications, ventilatory support, and mortality showed statistically significant postoperative complications with MPI scores. [Table 3]

Our study showed evidence of Karl Pearson's "r" correlation of APACHE II scores with hospital stay duration among the patients. There was a statistically significant and positive correlation between APACHE II score and hospital stay duration among the patients (r= 0.315, p=0.026). The mean duration of post-hospital stay was 6.9 days (range, 5–14 days). [Figure 1]

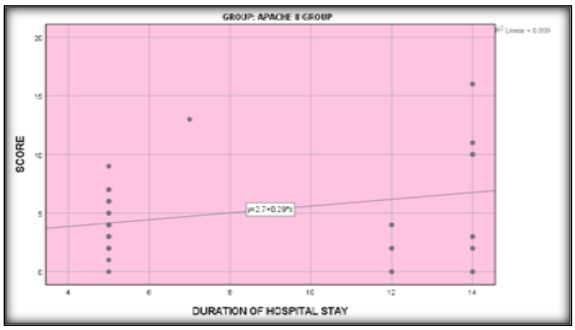

Figure 1: Correlation of APACHE II scoring with hospital stay duration among the patients (N=50)

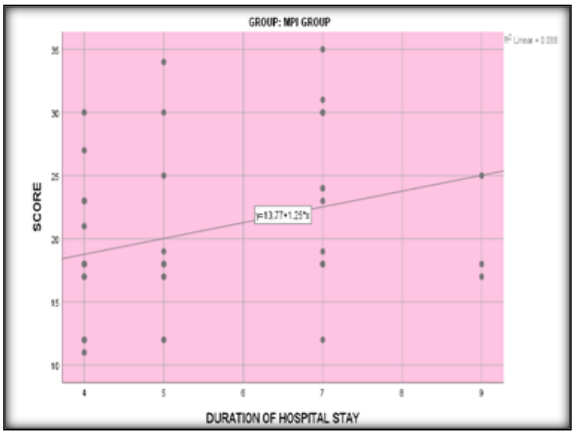

Figure 2: Correlation of MP1 scoring with hospital stay duration among the patients (N=50)

Our study shows evidence of Karl Pearson's "r" correlation of MPI scoring with hospital stay duration among patients. There was a statistically significant positive correlation between MPI score and hospital stay duration among the patients (r= 0.297, p=0.036). The mean post-hospital stay duration was 5.54 days, ranging from 4 to 9 days. [Figure 2]

Table 1: Patient scores – APACHE II and MPI

Score		N	%	Mean ± SD
APACHE II	<10	44	88	4.70±3.278
	>10-20	6	12	
	>20	0	0	
	Total	50	100	
MPI	<21	30	60	20.7+6.431
	>21-29	10	20	
	>29	10	20	
	Total	50	100	
P value	<0.001**			

Table 2: Association between postoperative complications and APACHE II scores (N=50)

Postoperative complications		APACHE II scoring		P value
		<10	>10-20	
Postoperative Wound Infection	Yes	21 (47.7)	0	0.026
	No	23 (52.3)	6 (100)	
Wound dehiscence	Yes	6 (13.6)	0	0.335
	No	38 (86.4)	6 (100)	
Respiratory complication	Yes	8 (18.2)	0	0.254
	No	36 (81.8)	6 (100)	
Ventilatory support	Yes	4 (9.1)	0	0.441
	No	40 (90.9)	6 (100)	
Anastomotic leak	Yes	2 (4.5)	0	0.594
	No	42 (95.5)	6 (100)	
Mortality	Yes	3 (6.8)	0	0.509
	No	41 (93.2)	6 (100)	

Table 3: Association between postoperative complications and MPI scoring among patients (N=50)

Postoperative complications		MPI scoring			P-value
		<21	>21-29	>29	
Postoperative Wound Infection	Yes	30 (100)	4 (40)	0	0.001**
	No	0	6 (60)	10 (100)	
Wound dehiscence	Yes	17 (56.7)	0	0	0.001**
	No	13 (43.3)	10 (100)	10 (100)	

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Respiratory complication	Yes	15 (50)	0	0	0.001**
	No	15 (50)	10 (100)	10 (100)	
Ventilatory support	Yes	12 (40)	0	0	0.05*
	No	18 (60)	10 (100)	10 (100)	
Anastomotic leak	Yes	7 (23.3)	0	0	0.066
	No	23 (76.7)	10 (100)	10 (100)	
Mortality	Yes	9 (30)	0	0	0.026*
	No	21 (70)	10 (100)	10 (100)	

DISCUSSION

Perforation-related peritonitis is still a common surgical emergency condition worldwide, with higher rates in tropical countries such as India. The prognosis of these patients depends on several factors, including the patient's age and gender, disease, co-occurring conditions, presentation time, therapeutic intervention, and postoperative complications.[11] The approximations of mortality risk provided by pre-operative assessment by various scoring systems have not been demonstrated to be sufficiently specific and easy to use on emergency patients because they require a large number of variables to be collected, and some variables, such as the diagnosis of malignancy, are not possible everywhere in the emergency setup. Scoring systems are generated and validated for specific populations, which may differ significantly from patients scored in a different hospital. Scoring systems also aid in risk categorisation, evaluating new diagnostic modalities and therapeutic advancements, and comparing treatment outcomes from various clinics.[12]

In the present study, 50 patients with a clinical diagnosis of perforation peritonitis were admitted during the study period. Patients' APACHE II scores were distributed frequently and percentage-wise. The majority of patients in this study (88%) had an APACHE II score of < 10, with a mean and standard deviation of (4.70+3.278) for the. In 2011, encouraging findings similar to those of the present study were reported. Of the patients, 71 (88.8%) scored less than 10, and their mean Apache II score was 7.5±5.3.[13] Patients' MPI scores were distributed frequently and proportionally. According to the current study, most patients (60%) had an MPI score of less than 21; the MPI scores had a mean of 20.7±6.431 and a standard deviation of 6.431. Comparable findings with an MPI score of < 21 (0.8%) in a 2019 study.[14] A comparison between the patients' MPI and APACHE II scores through the independent "t" test result of t = 15.6 in our study indicated a statistically significant difference between the patients' MPI and APACHE II scores. This is also following the results reported by Agarwal et al.[10]

Our study found a correlation between the APACHE II scores and postoperative problems. According to the APACHE II score system, postoperative wound infection was the most common postoperative complication among patients in our study. In a 2017 study, wound infection was also demonstrated to be the most prevalent postoperative complication, identical to the current findings.[15] Our study also discovered a relationship between patients' MPI scores and postoperative problems. Postoperative wound infection, wound dehiscence, respiratory complications, ventilatory support, and mortality were found to be statistically significant postoperative complications in MPI scoring among the patients in the current study. Our study is congruent with a previous study that discovered a p-value of <0.001 between MPI scores and the need for mechanical ventilation.16 According to Mishra et al., there was a substantial ($p<0.001$) correlation between APACHE II scores and death.[8]

In the present study, Karl Pearson's "r" correlation between patients' hospital stays and their APACHE II scores revealed a positive and statistically significant correlation ($r=0.315$, $p=0.026$), with a range of 5 to 14 days, the average length of stay following hospitalisation was 6.9 days. In line with the study of Agrawal et al., our study discovered that the link between APACHE II and hospital stay duration is significant at the 0.05 level, and the mean post-hospital duration was 9.4 days, with a range of 1 to 30 days.[8] The current study found a clear correlation between patients' hospital stays and their MPI scores, as the Karl Pearson "r" correlation indicates. There was a positive and statistically significant correlation between patients' MPI scores and length of hospital stay ($r = 0.297$, $p = 0.036$). With a range of 4 to 9 days, the average length of stay following hospitalisation was 5.54 days. Our study, which is consistent with that of Kumar et al. study, reported that hospital stays were statistically significant, with a p-value of 0.024.[17]

CONCLUSION

MPI is a practical and straightforward approach for estimating the prognosis of perforation peritonitis and is comparable to APACHE II. It can be used instead of the APACHE II score when predicting a patient's prognosis for perforation peritonitis. MPI outperformed APACHE II as a predictor of death. The MPI score was useful for predicting death and morbidities, such as postoperative wound infection, wound dehiscence, respiratory complications, and ventilator support. The MPI had fewer variables and was simpler to use.

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