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The Efficacy of the Jabalpur Scoring System in Predicting the Mortality and Morbidity in Patients with Peritonitis Due to Peptic Ulcer Perforation

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ABSTRACT
Despite advances in diagnosis, management and critical care of patients with peritonitis due to hollow viscus perforation and others, prognosis-remain poor. Many prognostic systems have developed to increase evaluation, monitoring and care of the patients including specific adjustments to bring about successful surgical outcome thereby reducing the morbidity and mortality of patients. Aim of the study is to assess and predict morbidity and mortality among patients who got operated for peptic ulcer perforation. This study was a prospective cohort study in which 50 patients presenting with symptoms of peritonitis secondary to hollow viscus perforation in the Department of General Surgery, from August 2022 to November 2023 were taken for the study. The results were recorded and analysed with standard statistical tools. The Jabalpur score is a straightforward, yet powerful scoring system designed to predict mortality and morbidity in patients with peptic ulcer perforations. This system's simplicity allows for easy application in clinical settings, providing healthcare professionals with a reliable tool to assess patient prognosis and guide treatment decisions effectively.

INTRODUCTION

Peptic ulcer disease is associated with life-threatening complications, including bleeding, perforation, penetration and obstruction. Perforation is the second most common complication following bleeding[1]. The lifetime prevalence of perforation in patients with PUD is about 5%[2]. Despite the widespread use of gastric anti secretory agents and eradication therapy, the incidence of perforated peptic ulcer has changed little. However, there has been a steady increase in the age of the patients with this complication and an increase in the number of females, such that perforations now occur most commonly in elderly female patients[3]. Infections with Helicobacter pylori and the use of non-asteroidal anti inflammatory drugs (NSAIDs) are each identified as risk factors for the development of peptic ulcer perforation[4]. Patients with perforated peptic ulcer (PPU) often have a varied clinical presentation. Although some may experience non-specific symptoms, most exhibit clear and unmistakable signs of peritonitis. This generally includes intense abdominal pain, tenderness and muscle rigidity, suggesting an acute abdominal condition. Other symptoms like fever, rapid heart rate and low blood pressure may also occur, indicating a systemic inflammatory response. Variation in clinical presentation as well as delay in diagnosis and workup at admission to the hospital, may potentially cause worsening of symptoms and deterioration of the clinical condition with a detrimental outcome. Still, a high risk for morbidity (20-50%) and mortality (27%) is encountered in surgically treated PPU patients[5]. Many time it is difficult to decide the direction of treatment, based on clinical, biochemical and radiological evaluation required for better outcome and prognosis, particularly in emergency and intensive care settings. Hence multiple scoring systems and indices have been put forth by numerous investigators over period of time, but most of them fall short in aim by requiring lab investigations that are far too complex to obtain in the stipulated period of critical time[6]. Jabalpur scoring system is one another that prove to be distinct and efficient in predictions of prognosis of patients using easily obtainable parameters. It incorporates easily obtainable parameters that includes age, perforation operation interval, mean systolic blood pressure, serum creatinine and heart rate that is evaluated in bedside manner. Its reliability is tested in this study.

MATERIALS AND METHODS

Study Design: Prospective cohort study.

Source of Data: Patients admitted and treated in the General Surgery department of hospitals.

Study Period: August 2022 to November 2023.

Inclusion Criteria: Patients willing to give informed consent

- Patients of either sex aged between 18 and 80 years.
- Patients admitted for peptic ulcer perforation peritonitis.

Exclusion Criteria: Patient not willing to give informed consent.

- Patient less than 18 or more than 80 years of age.
- Histopathology suggestive of malignant ulcer.

Preoperative Evaluation: Patients admitted to the emergency department with acute abdominal pain underwent a comprehensive clinical examination. Detailed medical history, including the duration of pain and any previous history of gastritis, was obtained. Blood tests, including a complete blood count, renal function tests, random blood sugar levels and serum electrolytes, were conducted. An electrocardiogram was performed, along with radiological investigations such as abdominal and chest X-rays.

RESULTS AND DISCUSSIONS

The Jabalpur score is calculated by summing the points assigned to various factors, including age, comorbid conditions, heart rate, mean systolic blood pressure, serum creatinine levels and the perforation -to-operation interval. In our study, 60% of patients had a Jabalpur score of 4 or less, 10% had a score ranging from 5 to 9 and 30% had a score greater than 9. No patients with scores between 0 and 4 died, while those with scores above 9 had a mortality rate of 33.33% (Table 1).

Table 1: Jabalpur Score for Mortality

Jabalpur Score	Cured	Expired	Total
0-4	30	0	30
5-9	5	0	5
10-14	10	5	15
15-21	0	0	0

In our study of 50 patients, 15 developed complications, with some experiencing multiple issues. Of the 15 patients with a Jabalpur score greater than 9, 5 developed complications. In contrast, 10 out of 35 patients with a score below 9 experienced complications. The complications included superficial wound infection in 7 patients, multiple organ dysfunction syndrome in 5 patients, acute kidney injury in 8 patients and ARDS in 3 patients (Table 2).

Table 2: Jabalpur Score for Morbidity

Jabalpur Score	No Morbidity	Morbidity	Total
0-4	0	5	30
5-9	0	5	5
10-14	10	5	15
15-21	0	0	0

Among the 30 patients with a Jabalpur score between 0 and 4, only 5 experienced morbidities and there were

no deaths. All 5 patients with scores ranging from 5 to 9 developed morbidity. Of the 15 patients with scores between 10 and 14, 5 developed morbidity and 5 died. No patients had a score exceeding 14 (Table 3).

Table 3: Relationship of Jabalpur Scoring System with Morbidity and Mortality

Score (Range)	No. of Patients	Morbidity (n{%})	Mortality (n{%})
0-4	30	5	0
5-9	5	5	0
10-14	15	5	5
15-21	0	0	0

Sensitivity: Sensitivity refers to the ability to accurately detect all true positives. For calculating sensitivity and specificity, a cut off score of 9 is used (Table 4).

Table 4: Sensitivity and Specificity of Jabalpur Prognostic Score 9 for Mortality

Jabalpur Prognostic Score	Expired	Cured	Total
>9	5	10	15
<9	0	35	35

- Sensitivity=True Positive/True Positive+False Negative x100=5/5+0x100=100%.
- Sensitivity of Jabalpur score in predicting the mortality is 100%.

Specificity:
- Specificity is the capacity to accurately identify all true negatives.
- Specificity=True Negative/True Negative+False Positive x 100=35/35 + 10x100=77%.
- Specificity of Jabalpur score in predicting the mortality is 77%.

Positive Predictive Value:
- The Jabalpur score's ability to accurately identify all patients who died among those with elevated scores.
- Positive Predictive Value=True Positive/True Positive+False Positivex100=5/5+10x100=33%.
- Positive Predictive Value of Jabalpur score is 33%.

Negative Predictive Value:
- The Jabalpur score's effectiveness in correctly identifying all patients who died among those with low scores.
- Negative Predictive Value=True Negative/True Negative+False Negativex100=35/35+0x100= 00%.
- Negative Predictive Value of Jabalpur score is 100%.

Percentage of False Positive:
- % False Positive=False Positive/False Positive+ True Negative x100=10/10+35x100=2.22%.
- % False Positive of Jabalpur score is 22.2%.

Percentage of False Negative:
- % False Negative=False Negative/True Positive+ False Negative x100=0/5+0x100=0%.
- % False Negative of Jabalpur score is 0%.

In this study, all patients were diagnosed with perforative peritonitis using reliable radiological and clinical evidence. The research confirmed that the proposed scoring system enhances clinical management efficiency. While numerous scoring systems have been developed to assess the severity of perforative peritonitis, none are fully comprehensive, and many are overly complex. The parameters used in this study's scoring system are simple, quickly obtainable and can be assessed without delay, facilitating rapid and accurate scoring. This approach ensures that critical management decisions can be made swiftly, improving patient outcomes in this urgent medical scenario. The study group consisted of 50 patients diagnosed with perforative peritonitis, all of whom were assigned scores and subsequently underwent emergency laparotomy. Among patients with scores above 9, the mortality rate was 33.33% and the morbidity rate was also 33.33%. In contrast, patients with scores below 9 had a mortality rate of 0% and a morbidity rate of 28.57%. The scoring system demonstrated a sensitivity of 100%, a specificity of 77%, a positive predictive value of 33% and a negative predictive value of 100%. No deaths occurred in patients with a perforation-to-operation interval of more than 24 hours, whereas there was a 100% mortality rate for those with a P-O interval of less than 24 hours. Similarly, no deaths were observed when the Jabalpur score was below 9, but there was a 100% mortality rate for scores between 10 and 14. Factors such as age, perforation-to-operation interval, mean systolic blood pressure, serum creatinine and heart rate were all found to be independently and statistically significant predictors of mortality and morbidity in patients with perforative[7,8]. This scoring system allows for better management planning and anticipation of potential complications, ultimately enhancing overall survival rates. A low score should not lead to neglect or compromise in care. A significant increase in the score indicates a poor prognosis and serves as an early marker for prioritizing active intervention for those patients. Mishar studied 140 patients with perforative peritonitis and found that their scoring system had a sensitivity of 87% and specificity of 85%, surpassing other scoring systems used in the study. When compared to other systems, the Jabalpur scoring system proved to be highly effective. In a country like India, where sophisticated diagnostic tools may not always be readily available, the success of this study is attributed to the use of easily obtainable parameters, making it a practical and reliable tool in clinical settings[4,9].

CONCLUSION

The Jabalpur scoring system allows for effective triaging of patients, enabling healthcare providers to prioritize those who need immediate and intensive

care, thereby improving overall outcomes and prognoses. The simplicity, reliability, speed and ease of use of the Jabalpur score make it a valuable tool for predicting outcomes in cases of peritonitis, even in smaller hospitals in developing countries where sophisticated diagnostic tools may not be available.

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