DIAGNOSTIC EVALUATION OF BISAP SCORING SYSTEM ON PREDICTING SEVERITY OF ACUTE PANCREATITIS

Dr. Muzammil Haneef[1], Dr. Manoj Kumar N.[2], Dr. Albin Jose[3], Dr. Randheer Saseendran[4*]

[1]Assistant Professor, Department of General Surgery, Government Medical College, Thiruvananthapuram, Kerala, India.
[2]Assistant Professor, Department of General Surgery, Government Medical College, Thiruvananthapuram, Kerala, India.
[3]Assistant Professor, Department of General Surgery, Government Medical College, Thiruvananthapuram, Kerala, India.
[4*]Assistant Professor, Department of General Surgery Government Medical College, Thiruvananthapuram, Kerala, India.

*Corresponding Author: Dr. Randheer Saseendran
* Assistant Professor, Department of General Surgery Government Medical College, Thiruvananthapuram, Kerala, India.

ABSTRACT

Background
Acute pancreatitis is a significant health concern requiring timely evaluation and management. It can lead to multi-organ dysfunction and increased mortality. The BISAP (Bedside Index of Severity in Acute Pancreatitis) is a simple scoring system that assesses severity at admission using routine clinical and laboratory parameters. This study evaluates the effectiveness of BISAP in predicting acute pancreatitis severity.

Methods
A cross-sectional study was conducted on acute pancreatitis cases admitted to the Department of General Surgery, Government Medical College, Thiruvananthapuram, over one year. Patients were assessed using the BISAP score at admission and followed up at seven days and six weeks. The BISAP score was compared with the Revised Atlanta Classification 2012 for severity grading. Statistical analysis was performed using appropriate software.

Results
Among 60 patients (49 males, 11 females; mean age 40.2 ± 15.8 years), 47 had mild, 4 had moderately severe, and 9 had severe acute pancreatitis based on the Revised Atlanta Classification. Thirteen patients had a BISAP score indicative of severe pancreatitis. The BISAP score showed 100% sensitivity, 92.2% specificity, and 93.3% overall accuracy in predicting severity. The positive predictive value was 69.2%, and the negative predictive value was 100%. Six early deaths occurred, all classified as severe by BISAP. The BISAP score also had 100% sensitivity and NPV in predicting mortality ($p < 0.01$).

Conclusion
The BISAP score is a reliable predictor of severity and mortality in acute pancreatitis. It enables early stratification of patients, facilitating appropriate management and improving outcomes.

Keywords: Acute Pancreatitis; BISAP; Severity Prediction.

INTRODUCTION

Acute pancreatitis is a common health condition that requires proper evaluation and timely management in higher centers. It is defined as an inflammatory process of the pancreas that may lead to multi-organ dysfunction and increased mortality rates. The incidence of acute pancreatitis in the United States varies from 5 to 50 cases per 100,000 individuals.[1,2] The incidence also varies depending on the underlying cause and geographical location. Acute pancreatitis is responsible for more than 250,000 hospitalizations annually, contributing significantly to morbidity, prolonged hospital stays, and increased healthcare burden.[3] The overall mortality rate associated with acute pancreatitis is approximately 5%.[3]

Acute pancreatitis is classified into mild and severe forms.[4] According to the Revised Atlanta Classification 2012,[1,5] severe acute pancreatitis is further categorized into moderately severe and severe acute pancreatitis. Mild acute pancreatitis is defined as pancreatitis without organ failure or local complications such as acute pseudocyst, pancreatic abscess, or pancreatic necrosis. Moderately severe acute pancreatitis is characterized by transient organ failure and the presence of local or systemic complications. Severe acute pancreatitis is defined by persistent organ failure or death, with a mortality rate of approximately 20%.[6]

Proper evaluation and early detection of acute pancreatitis are crucial for identifying patients who require referral to higher centers and intensive care management. Currently available scoring systems are costly and not readily accessible at primary healthcare levels. Therefore, there is a need for a cost-effective and easily available scoring system.

The BISAP scoring system is a relatively new tool that consists of five parameters: blood urea nitrogen, Glasgow Coma Scale, SIRS (Systemic Inflammatory Response Syndrome), age, and pleural effusion.[7] This scoring system can be easily implemented even at primary healthcare centers. This study aims to validate the role of the BISAP scoring system in predicting the severity of acute pancreatitis.

AIMS AND OBJECTIVES

The aim of this study is to evaluate the ability of the BISAP scoring system in assessing the severity of acute pancreatitis and to determine its association with early deaths in severe acute pancreatitis.

MATERIALS AND METHODS

This descriptive study was conducted in the Department of General Surgery, Government Medical College, Thiruvananthapuram, over a period of one year. Institutional Research Committee clearance and Institutional Ethical Committee Clearance was obtained. The study included all patients admitted to the Department of General Surgery with a diagnosis of acute pancreatitis based on clinical, biochemical, and ultrasound findings during the study period.

Inclusion and Exclusion Criteria

Patients admitted to the Department of General Surgery at Government Medical College, Thiruvananthapuram, with acute pancreatitis, diagnosed based on clinical, biochemical, and ultrasound findings, were included in the study. However, patients were excluded if they had pancreatitis following trauma or surgical intervention, present with complications of acute pancreatitis, had chronic recurrent pancreatitis, or had immune-compromised states that could alter immunological status. Additionally, patients with pancreatic tumors causing pancreatitis, those on beta blockers or pacemakers, and those unwilling to enroll were excluded. Furthermore, patients admitted with pancreatitis more than 24 hours after the onset of abdominal pain were included in the study.

Sample Size Calculation

Sample size is calculated using the **MEDCALC** software
Power = 1-β = 80%
α = Significance level 5%

AUC for BISAP = **0.80** (As per the study conducted in Banaras Hindu University, Varanasi, Uttar Pradesh)

Ratio of mild to moderate group is 5:1 Assumed.

Sample Size

Mild Acute pancreatitis cases - 45

Severe Acute pancreatitis cases – 9

Total case - 54.

Data Collection Tools

The study was conducted using proper diagnostic tools, a pre-tested Performa, clinical laboratory investigations, and imaging modalities. Acute pancreatitis is defined according to the Atlanta Classification 2012, and severity was assessed using the BISAP scoring system and Modified Marshall Scoring. All admitted patients were evaluated with BISAP scoring at the time of admission, followed by assessments at 7 days and 6 weeks, with results compared to the severity grading based on the Revised Atlanta Classification 2012. Routine investigations include a complete blood picture, blood urea nitrogen, ABG (Arterial Blood Gas) analysis, chest X-ray and/or USG (Ultrasound) of the thorax, abdominal ultrasound, and serum amylase and lipase levels. Additionally, CT (Computed Tomography) of the abdomen was performed when necessary for further assessment. Data was recorded in an Excel sheet and analyzed using appropriate statistical software.

Data Collection Procedure

This cross-sectional study was conducted over a period of one year on patients admitted with acute pancreatitis to the Department of General Surgery, Government Medical College, Thiruvananthapuram, who met the inclusion criteria. Prior consent was obtained from all participants. Data was collected systematically using a structured proforma, which includes history-taking, clinical examination, and investigations. Patients received standard management with intravenous fluids, supportive treatment, and, if necessary, ICU (Intensive Care Unit) admission and organ support according to established guidelines.

Statistical Analysis

Data were analyzed using SPSS software. Quantitative variables were summarized as means and standard deviations, while qualitative variables were expressed as frequencies and proportions. Chi-square tests were used to assess associations between categorical variables. The relationship between BISAP scores and the severity of acute pancreatitis was evaluated using 2×2 tables, assessing specificity, sensitivity, positive and negative predictive values (PPV, NPV), likelihood ratios, and overall accuracy. The study analyzed total cases, gender and age distribution, abdominal pain characteristics, etiology, early death predictions, and patient outcomes at 7 days and 6 weeks. The correlation between BISAP scores and severity grading based on the Revised Atlanta Classification 2012 was examined to determine the effectiveness of BISAP in predicting disease severity and early mortality.

RESULTS

Table 1 describes the age range and mean age of participants. The majority (78%) were between 20 and 60 years old, with a mean age of 40.2 years.

Age Group (in years)	Count	Percentage (%)
<20	4	6.7
20 – 39	27	45.0
40 – 59	21	35.0
≥60	8	13.3
Mean ± SD	**40.2 ± 15.8**	

Table 1: Age Distribution of Patients

Table 2 shows the male-to-female ratio. 81.7% of patients were male, and 18.3% were female.

Gender	Count	Percentage (%)
Male	49	81.7
Female	11	18.3
Table 2: Gender Distribution		

BISAP Score	Count	Percentage (%)
Severe	13	21.7
Mild	47	78.3
Table 3: BISAP Score Distribution		

Table 3 categorizes patients into mild and severe acute pancreatitis based on BISAP scores. 78.3% of patients had mild AP, and 21.7% had severe AP.

Table 4 classifies AP severity using the Revised Atlanta Classification 2012. 78.3% had mild AP, 6.7% had moderate, and 15% had severe AP.

AP Grade	Count	Percentage (%)
Mild	47	78.3
Moderate	4	6.7
Severe	9	15.0
Table 4: Severity of Acute Pancreatitis Based on Revised Atlanta Classification 2012		

Table 5 evaluates the diagnostic accuracy of BISAP in predicting early deaths. Sensitivity: 100%, Specificity: 87%, Accuracy: 88.3%.

BISAP Score	Early Death	No Death	Total
Severe	6	7	13
Mild	0	47	47
Total	**6**	**54**	**60**
Table 5: Prediction of Early Deaths by BISAP Score			

Diagnostic Accuracy

Sensitivity: 100%, Specificity: 87%, Accuracy: 88.3%.

Table 6 tracks patient status at one week. 73.3% were asymptomatic, 15% had local complications, 1.7% had organ failure, and 10% died.

Outcome at 7 Days	Count	Percentage (%)
Asymptomatic	44	73.3
Local Complications	9	15.0
Organ Failure	1	1.7
Death	6	10.0
Table 6: Outcome at 7 Days		

Table 7 assesses long-term recovery. 92.6% were asymptomatic, while 7.4% were lost to follow-up.

Outcome at 6 Weeks	Count	Percentage (%)
Asymptomatic	50	92.6
Lost to Follow-up	4	7.4
Table 7: Outcome at 6 Weeks		

DISCUSSION

This study was conducted between December 2016 and November 2017 over a period of one year, involving 60 patients diagnosed with acute pancreatitis. Of these, 47 had mild acute pancreatitis, 4 had moderately severe pancreatitis, and 9 had severe acute pancreatitis. Among the 9 patients with severe acute pancreatitis, 6 (10%) succumbed to the disease within 7 days of admission.

A study by Kumaravel et al. reported that severe acute pancreatitis developed in 20% of their 182 patients.[8] Similarly, a study by Vikesh K. Singh et al., which evaluated 397 patients with acute pancreatitis between June 2005 and December 2007, found a mortality rate of 3.5%, with an area under the receiver operating curve for BISAP score predicting mortality at 0.82.[9] Another study conducted by Ajay K. Khanna et al. at the Institute of Medical Sciences, Banaras Hindu University, found BISAP to have a sensitivity of 74.2%, specificity of 68.3%, PPV (Positive Predictive Value) of 63.4%, NPV (Negative Predictive Value) of 77.8%, and an overall accuracy of 70.8%, with an AUC of 0.80.[7]

In this study, 21.7% of patients had BISAP scores indicating severe acute pancreatitis at admission. BISAP showed high predictive accuracy, with a sensitivity of 100%, specificity of 92.2%, PPV of 69.2%, and NPV of 100%. The overall accuracy was 93.3%. Similar high accuracy for BISAP has been reported in multiple studies, confirming its role as an effective prognostic tool.[8] Mounzer et al. compared BISAP with other scoring systems such as APACHE-II and Ranson's criteria, concluding that BISAP performed comparably in predicting persistent organ failure while being simpler to use.[10] This study also analyzed BISAP's predictive power concerning age and gender. The accuracy in predicting severity was 91.8% in males, 100% in females, 96.8% for patients under 40, and 89.7% for those over 40. These findings suggest that BISAP can reliably predict severe acute pancreatitis irrespective of age and sex. The study by Singh et al. found that BISAP's accuracy is significantly influenced by early systemic inflammatory response syndrome (SIRS), reinforcing that BISAP is a good predictor when assessed early.[11]

All early deaths in this study occurred in patients with BISAP scores categorized as severe acute pancreatitis. BISAP had a sensitivity of 100% in predicting early deaths, with an NPV of 100%, indicating that patients with mild BISAP scores are unlikely to die from acute pancreatitis. The risk of death increased with higher BISAP scores-patients with a BISAP score of 3 had a 25% mortality rate, while those with a score of 5 had a 100% mortality rate. However, due to the limited number of deaths (n=6), this study could not analyze mortality trends across gender, etiology, and age groups.

At six weeks, 50 patients were asymptomatic, and four were lost to follow-up. A study by Mutinga et al. found that approximately half of acute pancreatitis-related deaths occurred early, which aligns with our study findings.[12] Larger studies are needed to assess late mortality in acute pancreatitis.

Previous research has shown a strong correlation between BISAP scores and acute pancreatitis severity, which was reaffirmed in this study. BISAP is particularly useful in resource-limited settings, where complex scoring systems may not be feasible.[13] The scoring system relies on basic laboratory parameters, making it applicable even in primary healthcare centers for early risk stratification and referral.[13]

While BISAP has high sensitivity and NPV, its specificity and PPV are moderate. Thus, it serves as a useful screening tool for severe acute pancreatitis, but additional diagnostic tests with higher specificity may be required for confirmatory diagnosis. Future research should explore integrating BISAP with other scoring systems to enhance diagnostic accuracy.[13]

LIMITATIONS

This study has several limitations. Important biomarkers with high PPV, such as CRP, IL-6, and procalcitonin, were not evaluated due to cost constraints and resource limitations. The study was conducted in an adult hospital, preventing the assessment of BISAP score effectiveness in pediatric patients. Pregnant patients with acute pancreatitis were also excluded. Additionally, comorbid factors like smoking and metabolic parameters, which contribute to acute pancreatitis, were not considered in the analysis.

CONCLUSION

The BISAP score is a good predictor tool in evaluating the severity of acute pancreatitis. It can also be used to predict deaths in severe acute pancreatitis. BISAP is a simple scoring system that can be considered even in primary health centers in order to help in the timely referring of patients based on stratification to higher centers, which can help reduce mortality and morbidity.

Conflict of Interest – Nil

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