

## ORIGINAL ARTICLE

# EFFICACY OF BEDSIDE INDEX FOR SEVERITY IN ACUTE PANCREATITIS (BISAP) SCORE AS PREDICTOR OF IN-HOSPITAL OUTCOME IN ACUTE PANCREATITIS

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### Abstract:

**Background:** Acute pancreatitis is a potentially life-threatening condition characterized by inflammation of the pancreas. Early identification of patients at risk of severe disease is crucial for devising appropriate management strategies and improving outcomes. The aim of the study was to investigate the efficacy of BISAP score as predictor of in-hospital outcome in patients with acute pancreatitis. **Methods:** This was a longitudinal study conducted in Department of Medicine, Sir Salimullah Medical College Mitford Hospital, Dhaka from January 2023 to December 2023. After ethical approval, a total 107 subjects were included in this study based on inclusion and exclusion criteria. Severity of the disease was assessed by BISAP score. The outcome determinants were length of hospital stay, complete recovery, partial recovery with complication, transfer to ICU and mortality. Chi Square test, Binominal Regression analysis and Receiver operator characteristic (ROC) curve analysis were performed as applicable. *p* value <0.05 was considered as the level of significance.

**Results:** The mean BISAP score among 107 study participants was  $2.00 \pm 0.76$ . Patients with BISAP score  $\geq 3$  had significantly increased odds of prolonged hospital stay (OR: 11.226; 95% CI: 2.985-42.222; *p*<0.001), higher rate of partial recovery with complications (OR: 7.302; 95.325% CI: -20.997; *p*<0.001), and greater likelihood of intensive care unit (ICU) transfer (OR: 1.136; 95% CI: 0.968-1.333; *p*=0.004). A BISAP score cutoff value of  $\geq 3$  was associated with increased length of hospital stay (sensitivity 91.3%, specificity 97.6%, AUC=0.945), partial recovery with complications (sensitivity 83.3%, specificity 96.4%, AUC=0.899), and ICU transfer (sensitivity 75%, specificity 80.6%, AUC=0.778). **Conclusion:** It can be concluded that increased BISAP score can be served as an independent predictor of in-hospital in patients with acute pancreatitis (AP).

**Keywords:** Acute pancreatitis, Bedside index for severity in acute pancreatitis (BISAP) score, in-hospital outcome.

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### Introduction:

Acute pancreatitis (AP) is an acute inflammation of the pancreas due to auto-digestion of the gland by pancreatic digestive enzymes, leading to morphologic

changes and impairment of function or any<sup>1,2</sup>. It is a reversible process<sup>2</sup>. The incidence of acute pancreatitis varies from 5.4 to 79.8 per 1,00,000 population and it carries an overall mortality rate of 10-15%<sup>3</sup>. The

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mortality rate approaches 40% in severe cases<sup>3</sup>. It is a potentially life-threatening disease with variable presentation. In more than 90% of patients presented with abdominal pain<sup>4</sup>. Alcohol, gallstones and hypertriglyceridemia constitute the primary causes of acute pancreatitis in many countries<sup>5</sup>.

Numeric grading systems like Acute physiology and chronic health evaluation (APACHE) II, Ranson and Modified Glasgow scores are commonly used today as indicators of disease severity<sup>6</sup>. While Ranson and Modified Glasgow scores cannot be used for the first 48 hours and APACHE score is cumbersome to use<sup>6</sup>. Bedside index for severity in acute pancreatitis (BISAP) score has been proposed as an accurate method for early identification of patients at risk for in-hospital mortality<sup>7</sup>. BISAP scoring system is very simple, inexpensive, easy to remember and calculate<sup>8</sup>. It accurately predicts the outcome of patients with AP<sup>8</sup>. There is no need for additional computation. Each of the parameter can be easily obtained early in the course of admission. The BISAP score stratifies patients within the first 24 hours of admission according to the severity and is able to identify patients at increased risk of mortality prior to the onset of organ failure<sup>7,9</sup>. BISAP score also validated and practiced as a useful tool for classification of AP by American College of Gastroenterology (ACG)<sup>10</sup> because of its simplicity and found accurate to predicts the outcome of patients with AP but less published data are available in our country with this scoring scale. Therefore, present study has been designed to evaluate the efficacy of BISAP score as predictor of in-hospital outcome in acute pancreatitis.

#### Methods:

This was a longitudinal study conducted in Department of Medicine, Sir Salimullah Medical College Mitford Hospital, Dhaka, Bangladesh from January 2023 to December 2023. A total 107 acute pancreatitis patients were included by purposive sampling. Acute pancreatitis was diagnosed on the basis of revised Atlanta classification (2012)<sup>11</sup>. Sample size was calculated by using a statistical formula. Patients with chronic pancreatitis, relapsing pancreatitis, pancreatic malignancy, chronic kidney disease, diabetes ketoacidosis, chronic liver disease, hepatic encephalopathy were excluded from the study. Ethical approval was obtained from the ethical review board prior of study. The nature and purpose of the study was explained to each subject in details. Informed written consent was taken from the participants. The history of disease, habits, demographic variables, risk

factors, clinical examination, biochemical data, CT and MRI findings were recorded. With aseptic precaution, 5 ml of venous blood was collected from ante-cubital vein by a disposable plastic syringe from each participant for estimation of complete blood count, serum level of amylase, lipase, albumin, blood glucose, BUN, serum Ca<sup>2+</sup>, LDH, AST and ABG in the laboratory of SSMCH. Severity of the disease was assessed by bedside index for severity in acute pancreatitis (BISAP) score<sup>8</sup>. The outcome determinants was length of hospital stay, complete recovery, partial recovery with complication, transfer to ICU and mortality. All the information were recorded in a structured data collection. Data were expressed as mean  $\pm$  SD, frequency, percentage and presented in appropriate tables and figures. Chi Square test, Binominal Regression analysis and Receiver operator characteristic (ROC) curve analysis were performed as applicable by windows software using IBM SPSS (statistical package for social sciences) Statistics for Windows, Version 26.0. p value <0.05 was considered as the level of significance.

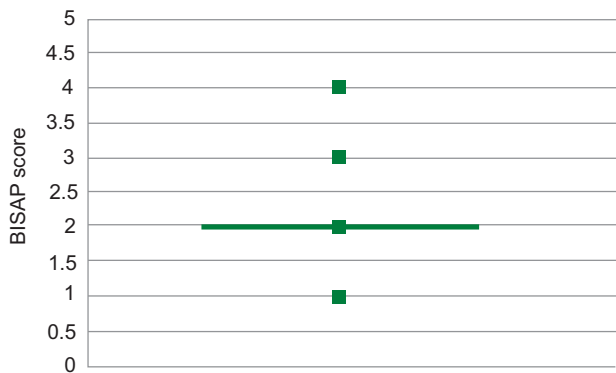
#### Results:

In this study, population had a mean age of 52.09 $\pm$ 14.94 years, with 66.4% being male and 33.6% being female (Table-I). The mean BISAP score was 2.00 $\pm$ 0.76 (Figure-1). Mean $\pm$ SD length of hospital stay was 6.77 $\pm$ 1.51 days. Among the admitted patients about 77.6% were discharged with complete recovery, 22.4% patients were discharged with partial recovery. About 3.7% patients were transfer to ICU for further management (Table-II). Our study revealed patients with a BISAP score  $\geq$ 3 was significantly higher odds of increased length of hospital stays (OR: 11.226; 95% CI: 2.985 to 42.222; p<0.001) partial recovery with complications (OR: 7.302; 95% CI: 2.539 to 20.997; p<0.001) and ICU transfer (OR: 1.136; 95% CI: 0.968 to 1.333; p=0.004) in acute pancreatitis patients (Figure 2).

**Table I**  
*Distribution of study subject according to age and gender (N=107)*

Variable	Study Subjects (N=107)
Age (Years)	52.09 $\pm$ 14.94
Gender	
Male	71 (66.4%)
Female	36 (33.6%)

Data were expressed as Mean $\pm$ SD, frequency and percentage



**Figure 1:** Box and Whisker plot showing BISAP score of the study subjects (N=107)

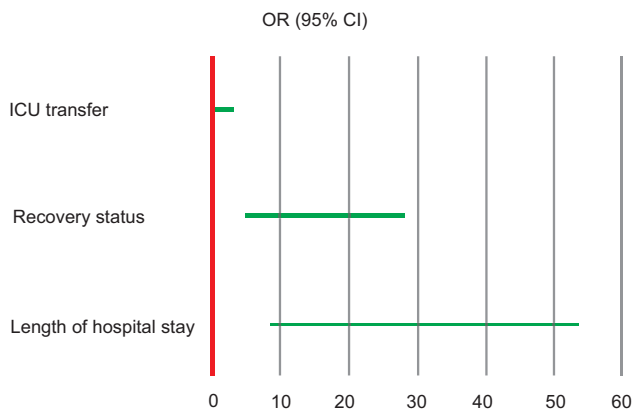
**Table II**

Distribution of the study subjects according to in-hospital outcome (N=107)

Outcome	Frequency	Percentage
Length of hospital stay (day)		
Mean ± SD	6.77±1.51	
Median (IQR)	7 (6-7)	
Complete recovery	83	77.6
Partial recovery with complication	24	22.4
Transfer to ICU	4	3.7
Death	0	0

Data were expressed as frequency, percentage, Mean ± SD, median and interquartile range (IQR)

ROC curve analysis revealed that a BISAP score cutoff value of  $\geq 3$  had high sensitivity and specificity in predicting increased length of hospital stay (91.3% and 97.6%, respectively), partial recovery with complications (83.3% and 96.4%, respectively), and ICU transfer (75% and 80.6%, respectively). {AUC = 0.945, 0.899 and 0.778;  $p < 0.05$ } (Table-III; Figure-3).



Binominal regression analysis was performed to calculate odds ratio (OR)

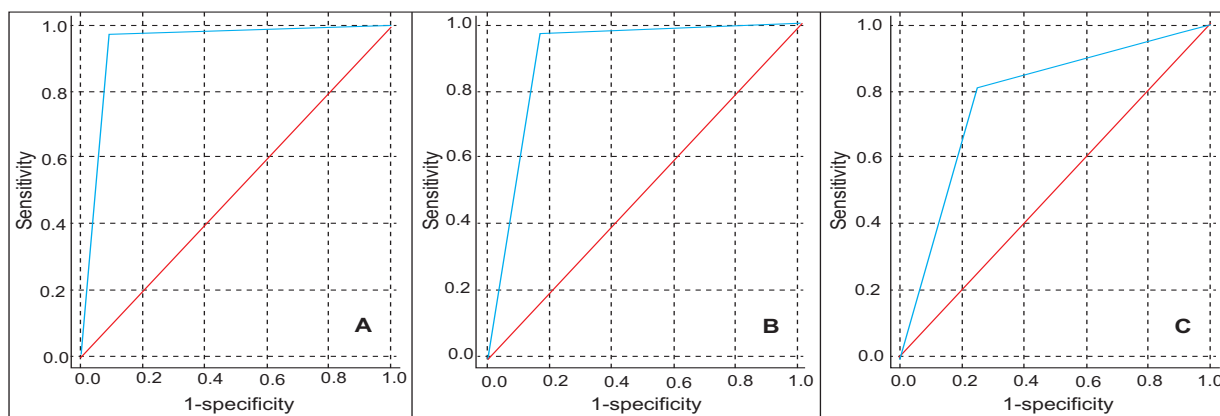
**Figure 2:** Forest plot showing Odds ratio of BISAP score for predicting in-hospital outcome in acute pancreatitis (N=107)

**Table III**

Diagnostic accuracy of BISAP score for predicting in-hospital outcome in acute pancreatitis (N=107)

Outcome	Sensitivity	Specificity	PPV	NPV	p values
Length of hospital stay	91.30%	97.60%	91.30%	97.60%	<0.001
Recovery	83.30%	96.40%	87.00%	95.20%	<0.001
ICU transfer	75%	80.60%	13%	98.80%	0.004

p value was obtained from Chi Square test



A=length of hospital stay, B=partial recovery with complication and C=ICU transfer

**Figure 3:** Receiver operating characteristic curve (ROC) of BISAP score in predicting in-hospital outcome in acute pancreatitis patients (N=107)

**Discussion:**

Early diagnosis and precise staging of disease severity are important goals in the preliminary evaluation and management of acute pancreatitis. Due to the risk of rapid worsening in severe acute pancreatitis, the assessment of severity becomes crucial to a clinician. Present study was undertaken to evaluate the efficacy of BISAP score as an independent predictor of in-hospital outcome of acute pancreatitis patients. Contemporary study observed mean BISAP score was  $2.00 \pm 0.76$ . Similar observation was observed by Cho, et al.<sup>12</sup> and Kuntoji and Karimulla<sup>8</sup>.

In current study, length of hospital stay was  $6.77 \pm 1.51$  days. Karim et al.<sup>13</sup> stated that the average hospital stay of patients was 9 days in mild pancreatitis and 13.5 days in severe pancreatitis. Gurleyik et al.<sup>14</sup> found mean hospital stay was 10 days in mild cases and a mean hospital stay was 21 days in severe cases. Karim et al.<sup>13</sup> informed that duration of hospital stay was significantly higher in severe acute pancreatitis probably due to increased tissue damage by inflammatory mediators.

In contemporary study, 22.4% patients were discharged with partial recovery and 3.7% patients were transfer to ICU for further management. Karim et al.<sup>13</sup> showed that 38.71% patients developed complication and 61.29% patients were discharged with complete recovery. Out of the 50 patients, 80% were discharged, 8% died, 10% were discharged against medical advice and 24% had to undergo ICU care observed by Manjunath et al.<sup>15</sup>.

Our study revealed, BISAP score  $\geq 3$  was 11 times risk for increased length of hospital stays, 7 times risk for increased rate of partial recovery with complication and 1 time risk for increase ICU transfer in acute pancreatitis patients. BISAP score had highly sensitivity and specific for predicting in-hospital outcome. The area of BISAP score under the ROC curve also considered as excellent for prediction of increased length of hospital stay, good for prediction of partial recovery with complication and moderate for prediction of ICU transfer when cutoff values  $\geq 3$  was taken as criteria for severe acute pancreatitis. These findings are parallel with other studies<sup>16,17,18</sup>. Chen et al.<sup>19</sup> recommended that BISAP has the advantages of simplicity and speed over traditional scoring systems. Park et al.<sup>20</sup> and Cho et al.<sup>12</sup> reported that BISAP requires data that are very easy to obtain at the time of admission which makes it much easier to calculate. Hagjer and Kumar<sup>21</sup> informed that BISAP is equivalent to the complex APACHE II in predicting hospital outcome.

**Conclusion:**

The study findings demonstrate that the BISAP score is an effective independent predictor of in-hospital outcomes in patients with acute pancreatitis. A higher BISAP score ( $\geq 3$ ) was associated with increased length of hospital stay, higher rates of partial recovery with complications, and a greater likelihood of ICU transfer.

The BISAP score offers several advantages, including its simplicity, ease of calculation within the first 24 hours of admission, and ability to stratify patients according to disease severity. Considering the BISAP score for predicting in-hospital outcomes in acute pancreatitis patients, while acknowledging the need for further prospective and multicenter studies to corroborate these findings and determine optimal cutoff values.

**Limitations:**

Small sample size and this single hospital based study did not reflect exact scenario of the whole community.

**Data Availability:**

The datasets analyzed during the current study are not publicly available due to the continuation of analyses but are available from the corresponding author on reasonable request.

**Conflict of Interest:**

The authors stated that there is no conflict of interest in this study

**Ethical consideration:**

The study was conducted after approval from the ethical review committee of Sir Salimullah Medical College, Mitford Hospital, Dhaka. The confidentiality and anonymity of the study participants were maintained.

**Acknowledgement:**

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