

# A Hospital Based Comparative Study of Bedside Index for Severity in Acute Pancreatitis (BISAP) Score and CT Severity Index Score (CTSI) in Acute Pancreatitis Patients at Newly Established Tertiary Care Center

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## Abstract

**Background:** Severe acute pancreatitis (SAP) is a life-threatening condition with organ failure, pancreatic necrosis, infections, and death. Multiple factors scoring systems are used for triage decisions to manage acute pancreatitis according to severity. The aim of this study is to compare the prognostic value of Bedside Index for Severity in Acute Pancreatitis (BISAP) score and CT severity index (CTSI) score in estimating the clinical results and degree of acute pancreatitis in patients. **Material and Methods:** Forty patients at a tertiary care facility with acute pancreatitis were enrolled in this prospective observational study. CTSI was evaluated using contrast-enhanced CT scans conducted between days three and five, and BISAP scores were computed within twenty-four hours after admission. The two scoring systems' correlation and their relationship to clinical outcomes, including ICU admission, complications, and mortality, were examined using the proper statistical techniques. **Results:** Our study showed that the mean age of patients was 43.6 years and majority of patients were men, and the most prevalent cause was alcohol-induced pancreatitis. The average length of stay in the hospital was 6.7 days. ICU admissions, death, and severe pancreatitis were all substantially correlated with higher BISAP scores. 20% showed severe CT abnormalities, while the majority of patients had mild to moderate CTSI scores. BISAP and CTSI scores showed a substantial positive connection, suggesting that both scores rise as the severity of the disease increases. **Conclusion:** We conclude that BISAP score is a better predictor of severity and mortality in acute pancreatitis and can safely be utilized to predict severity of acute pancreatitis in situations where use of CT is limited due to cost factor or availability, especially in rural areas.

**Keywords:** Acute Pancreatitis, CT Severity index score, BISAP, Mortality.

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## INTRODUCTION

Acute pancreatitis (AP) is an inflammatory disease of the pancreas that results from intrapancreatic activation, release and digestion of the organ by its own enzymes.<sup>[1]</sup> The diagnosis of AP can be made when a patient presents with typical abdominal pain, threefold elevated serum levels of amylase or lipase, and typical imaging findings. Although in 75 % to 80 % of cases, AP is a mild disease, 20 % to 25 % of patients are likely to develop Severe Acute Pancreatitis (SAP) and may benefit from early intensive care monitoring and treatment.<sup>[2]</sup> AP, a common gastrointestinal condition, is a significant surgical challenge,<sup>[3]</sup> affecting approximately 2.29% of people.<sup>[4]</sup> Eighty percent of AP is caused by consumption of alcohol and gallstones together. AP has a variety of clinical manifestations. Most patients have a mild and self-limiting course, while 10-20% experience a quickly escalating inflammatory response linked to a considerable risk of morbidity and death. Acute edematous, acute persistent, or acute hemorrhagic necrotizing AP may be classified according to severity.<sup>[5]</sup> Organ failure, pancreatic necrosis, infections and even death are possible outcomes of SAP.<sup>[6]</sup> An important consideration after diagnosis is determining the severity and assessing the risk factors upon

admission.<sup>[7]</sup> The prognosis is excellent for individuals with mild inflammation. In extreme situations, however, patients may present with distant organ failure or pancreatic necrosis, necessitating intensive medical care or surgery with a 40% morbidity risk. There is a 5-10% chance of overall death.<sup>[8,9]</sup> Management of this disease is mainly conservative and usually includes resuscitation with intravenous fluids, adequate analgesia, nasogastric tube drainage in selected cases, enteral feeding or parenteral hyper-alimentation depending on severity of the disease, antibiotics in infections and ERCP in selected cases.

The decisions for triage and the use of an intensive care unit (ICU) are based on the presence of Systemic Inflammatory

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Response Syndrome (SIRS), organ failure and severe comorbid conditions. Multiple factor scoring systems are used for triage decisions to manage acute pancreatitis according to severity.

A number of scoring systems, such as the CT Severity Index (CTSI) and the Bedside Index for Severity in Acute Pancreatitis (BISAP) Score, have been created to evaluate the severity of acute pancreatitis. The BISAP score is a straightforward clinical assessment used at the bedside that assesses five factors: SIRS, age over 60, pleural effusion, blood urea nitrogen levels, and altered mental status. Research has indicated that BISAP is a useful tool for forecasting the severity and death of AP patients. The BISAP is a quick, easy, and economical technique that measures five factors within twenty-four hours of admission. Research has demonstrated that the BISAP score is a good predictor of morbidity and mortality.<sup>[10]</sup> This contrasts with the CTSI, a radiological scoring method that combines the degree of necrosis seen on contrast-enhanced computed tomography (CECT) with the Balthazar grading of pancreatic inflammation.<sup>[11]</sup> Although the CTSI is thought to be more accurate in evaluating pancreatic and peripancreatic problems, it is reliant on the availability of imaging and has concerns associated with radiation and contrast exposure.<sup>[12]</sup> This study compares the predictive efficacy of the CTSI and the BISAP score in predicting the clinical outcomes and severity of AP patients.

## MATERIALS AND METHODS

This was a hospital based prospective study done on 40 individuals in the general surgery department of Government Medical College, Pali, Rajasthan, India during one-year period who were diagnosed with AP based on their clinical presentation, radiographic evidence (USG or CT), and high serum amylase/lipase ( $\geq 3$  times the upper limit of normal)

### Inclusion Criteria:

- Age  $\geq 20$  years
- Individuals who have been diagnosed with acute pancreatitis
- The BISAP score parameters are available 24 hours after admission.
- Those who had contrast-enhanced CT (CECT) performed three to five days after being admitted

### Exclusion Criteria:

- Individuals suffering from persistent pancreatitis
- Individuals suffering from pancreatic cancer
- Women who are expecting
- Individuals with insufficient radiological or clinical

information

• Patients unwilling to provide their consent  
 Procedure: Patients reporting with epigastric discomfort were evaluated for acute pancreatitis by biochemical and radiological tests as above. After being clinically diagnosed with acute pancreatitis, the patients were considered for the study. An examination was conducted to identify signs of SIRS and blood samples were collected within 24 hours of symptom onset to test Blood Urea Nitrogen (BUN) levels. X-ray imaging was used to identify pleural effusion and then BISAP Scoring [Table 1] was conducted using the gathered parameters.

Within the first twenty-four hours of admission, the BISAP Score was determined using five criteria:

- BUN (blood urea nitrogen)  $>25$  mg/dL
- Mental impairment (GCS  $<15$ )
- SIRS
- Over-60 years of age
- Pleural effusion

A contrast-enhanced CT scan conducted between days three and five was used to compute the CTSI.

It featured the Balthazar grade system (A–E) for the degree of necrosis and pancreatic inflammation:

- 0: No necrosis
- 2:  $<30\%$  necrosis
- 4:  $30\text{--}50\%$  necrosis
- 6:  $>50\%$  necrosis

The final CTSI score is between 0 and 10.

**Statistical Analysis:** Data that showed normal distribution was analyzed using independent student t-test for comparison of methods. Results on continuous measurements are presented on Mean  $\pm$  SD (Min-Max) and results on categorical measurements are presented in number (%). The statistical software namely Statistical Package for Social Sciences (SPSS 25.0) was used for the analysis of the data.

## RESULTS

Our study showed that mean age of patients was 43.6 years and Alcohol-induced pancreatitis was the most common cause, with a mean hospital stay of 6.7 days, and the majority of patients were male [Table 1]. Mortality, intensive care unit admissions, and acute pancreatitis were all substantially correlated with higher BISAP scores [Table 2]. 20% of patients showed severe CT abnormalities, while the majority had mild to moderate CTSI scores [Table 3]. BISAP and CTSI scores showed a high positive connection, suggesting that both scores rise with the severity of the disease [Table 4].

**Table 1: Baseline Demographic and Clinical Characteristics of Study Population (n = 40)**

Variables	Value n/%
Mean Age (yrs)	43.6 $\pm$ 11.8
Gender (Male/Female)	27 (67.5%)/ 13 (32.5%)
Most common symptoms	Abdominal pain (100%)
Alcohol as etiology	24 (60%)
Gallstones	11 (27.5%)
Hypertriglyceridemia	3 (7.5%)
Idiopathic	2 (5%)
Mean hospital stay (days)	6.7 $\pm$ 2.8

**Table 2: Distribution of Patients by BISAP Score and Associated Outcomes**

BISAP Score	No. of patients (%)	Severe AP (%)	ICU Admission (%)	Mortality (%)
0-1	19 (47.5%)	1 (5.26%)	1 (5.26%)	0
2	10 (25%)	3 (30%)	2 (20%)	0
3-5	11 (27.5%)	7 (63.63%)	5 (45.45%)	2 (18.18%)

**Table 3: Distribution of Patients by CT Severity Index (CTSI)**

CTSI Score Range	No. of patients (%)	Severity Classification
0-3	18 (45%)	Mild
4-6	14 (35%)	Moderate
7-10	8 (20%)	Severe

**Table 4: Correlation Between BISAP Score and CT Severity Index**

Parameters	Mean BISAP Score	Mean CTSI Score
Mild (Atlanta Criteria)	1.18±0.4	2.3±1.2
Moderate	2.3±0.5	5.1±1.3
Severe	3.5±0.6	7.9±1.5

Pearson's correlation coefficient  $r = 0.67$ ,  $p < 0.001^*$

## DISCUSSION

Our results show a substantial correlation between radiological severity as measured by CTSI and clinical outcomes such as ICU stay, complications, and mortality and the BISAP score, which is based on bedside clinical and biochemical indicators. The study population's mean age was 43.6 years, most of whom were male, and the most prevalent cause was alcohol. This generational trend is in line with other Indian research that have shown alcohol to be a significant contributor of acute pancreatitis among younger men.<sup>[1,13]</sup> BISAP scores are easy to use and reasonably priced. Predicting how severe pancreatitis is and the ensuing patient triage at the earliest possible time is simple.

According to our research, severe illness and unfavorable clinical outcomes, such as ICU hospitalization and death, were substantially correlated with BISAP scores of  $\geq 3$ . Singh et al. and Papachristou et al. showed similar results, proving that BISAP is a good early predictor of severity and death in AP patients.<sup>[10,14]</sup> For radiologically assessing the severity of AP, CTSI has long been the accepted norm. A significant association was seen between BISAP scores and CTSI scores, with 20% of patients in our study having scores  $\geq 7$ , which indicate severe disease ( $r = 0.67$ ,  $p < 0.001$ ). This is in line with the results of Wu et al., who found that BISAP and CTSI performed similarly for early risk classification.<sup>[15]</sup> Although CTSI provides comprehensive imaging-based evaluation, its use is restricted by availability of contrast-enhanced CT, cost, and timing (preferably after 72 hours). BISAP can be utilized at the time of admission because it is straightforward and based on readily available variables, particularly in settings with limited resources.<sup>[16]</sup>

In study by Hagier et al AUC of BISAP and CTSI for predicting severity of acute pancreatitis were 0.87 and 0.65 respectively, sensitivity of BISAP and CTSI were 71.4 and 37.9, specificity of BISAP and CTSI were 95.7 and 90.3, PPV of BISAP and CTSI were 83.3 and 78.6 and NPV were 91.7 and 60.9 respectively. For predicting mortality in acute pancreatitis, AUC of BISAP and CTSI were 0.892 (95% CI 0.81-0.97) and 0.509 (95% CI 0.40-0.78) respectively, sensitivity of BISAP and CTSI were 85.7 and 17.2, specificity of BISAP and CTSI were 88.7 and 93.5, PPV of

BISAP and CTSI were 50.0 and 71.4 and NPV of BISAP and CTSI were 97.9 and 54.7 respectively.<sup>[17]</sup>

## CONCLUSION

The BISAP score and the CT Severity Index (CTSI) are both useful instruments for determining the severity of acute pancreatitis, as this study shows. Nonetheless, within the first 24 hours of admission, the BISAP score provides the benefit of early risk categorization based on straightforward clinical and laboratory criteria. It was substantially linked to unfavorable clinical outcomes like ICU hospitalization and death, and it shown a high positive association with CTSI.

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## Conflicts of interest

There are no conflicts of interest.

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