Original Article

Comparative Evaluation of BISAP Score and CT Severity Index in Predicting Severity and Outcome of Acute Pancreatitis

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Abstract

Background: Acute pancreatitis is a frequently encountered gastrointestinal emergency. Early recognition of potentially severe acute pancreatitis is critical and needs to be done to allow for prompt treatment and minimise morbidity and mortality. Several scoring systems, such as the Computed Tomography Severity Index (CTSI) and the Bedside Index for Severity in Acute Pancreatitis (BISAP) score, have been developed to predict clinical outcomes and prognosticate the severity of acute pancreatitis. The objective is to investigate the predictive power of the CT Severity Index and BISAP score for the clinical outcomes, complications, and severity of acute pancreatitis in patients. **Material and Methods:** This comparative observational study was done in Department of General Surgery for a period of one year. The study comprised sixty individuals with clinical characteristics, radiological data, and serum amylase/lipase suggestive of acute pancreatitis. BISAP assessment was completed within 24 hours of admission, and a contrast-enhanced computed tomography (CECT) was used to determine the CT Severity Index 72 hours after the onset of symptoms. The following were noted: severity grading, local complications, organ failure, hospital stay and mortality. Both scoring systems were evaluated for sensitivity, specificity, positive and negative predictive values. The p values are taken to be statistically significant when they are below 0.05. **Results:** Among the 60 patients studied, 42 (70.0%) were males and 18 (30.0%) were females. Alcohol was the most common etiological factor observed in 34 (56.7%) patients, followed by gallstone disease in 18 (30.0%) cases. Severe acute pancreatitis was identified in 16 (26.7%) patients based on clinical outcome assessment. BISAP score ≥3 was observed in 15 (25.0%) patients, while CTSI score ≥7 was identified in 17 (28.3%) patients. When it came to predicting severe pancreatitis, BISAP exhibited 87.5% sensitivity and 90.9% specificity, while CTSI showed 93.7% sensitivity and 88.6% specificity. CTSI demonstrated slightly higher sensitivity for detecting local complications, while BISAP was more convenient for early bedside assessment. **Conclusion:** BISAP provides rapid and reliable early prognostic assessment, whereas CTSI offers better evaluation of local pancreatic complications. Combined use of both scoring systems may improve risk stratification and facilitate timely management of patients with acute pancreatitis.

Keywords: Acute pancreatitis; BISAP score; Computed tomography severity index; Organ failure; Pancreatic necrosis; Prognosis; Severity assessment.

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Introduction

Acute pancreatitis, which represents an acute inflammatory condition of the pancreas, is classified into an extremely broad spectrum of clinical course ranging from mild interstitial edema to severe necrotizing pancreatitis, complicated by multiorgan dysfunction and mortality, and one of the most frequent gastrointestinal emergencies in need of hospitalization worldwide.[1] Acute pancreatitis has been rising gradually over the past few decades because of increasing alcohol consumption, gall stone, metabolic disorders, obesity and improvements in its diagnosis.[2,3]

While most of the time, the disease is mild and spontaneous, in about 15-25% of patients, the disease will become severe with development of systemic inflammatory response, pancreatic necrosis, sepsis, organ failure and mortality, which is why early recognition of severe disease is so important to ensure proper triage, intensive monitoring, aggressive fluid resuscitation and timely interventions to reduce complications and mortality.[4,5]

Acute pancreatitis is still most commonly caused by alcoholism and gallstone disease. Other causes involve hypertriglyceridemia, hypercalcemia, infection, drugs, trauma, endoscopic retrograde cholangiopancreatography and idiopathic factors.[6] The clinical presentation of the patient typically includes severe epigastric pain radiating to the back, nausea and vomiting, abdominal distention, and fever. Diagnosis is usually made by following the typical history of abdominal pain, high blood levels of amylase and lipase and imaging studies that indicate inflammation of the pancreas.[7]

There are several scoring systems to evaluate the severity and

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prognosis of acute pancreatitis. A relatively complex and time-consuming traditional scoring system, Ranson's and APACHE II have proved useful, However, within the first 24 hours following admission, the Bedside Index for Severity in Acute Pancreatitis (BISAP), a straightforward clinical grading system, can be calculated using five parameters: blood urea nitrogen, age, pleural effusion, poor mental status, and systemic inflammatory response syndrome. The simplicity, speed and accuracy of predicting serious disease and mortality have made BISAP a popular choice.[9,10]

Another important factor is radiologic assessment, which also is of paramount importance in determining the severity. Computed tomography scan is regarded as the most useful imaging modality for assessing the pancreatic inflammation, necrosis, and local complications in this regard. Because of its ability to identify local complications like necrosis, abscess, pseudocyst and fluid collections, for assessing the severity of the illness, Balthazar's Computed Tomography Severity Index (CTSI) is very helpful.[11] In general, however, CT is used after 72 hours since onset of symptoms, hence only a useful tool to the very early prognosis.

In clinical practice, both BISAP and CTSI are widely used, but there are some differences with respect to predictive accuracy, practicability, and utility in different clinical settings. Early bedside scores give a quick screening while imaging-based scores give detailed anatomic evaluation. These scoring systems should be compared and contrasted to assess their ability to predict severity, complications, need for intensive care, hospital stay length and death rate.

Aims and Objectives

To assess how well the BISAP score and CT Severity Index predict clinical outcomes, complications, and severity in patients with acute pancreatitis.

Materials and Methods

The Sree Mookambika Institute of Medical Sciences' Department of General Surgery carried out this comparative observational study during a 12-month period, from January 2025 to December 2025. Before being included in the trial, each patient provided written informed consent. During the study period, 60 patients with acute pancreatitis who were hospitalised to surgical wards and intensive care units were included.

Inclusion Criteria

- Patients aged more than 18 years.
- Individuals with acute pancreatitis who meet radiological, biochemical, and clinical criteria.
- Patients who are prepared to give informed consent and take part in the trial.

Exclusion Criteria

- Patients with chronic pancreatitis.
- Patients with pancreatic malignancy.
- Patients with traumatic pancreatitis.
- Patients with previous pancreatic surgery.
- Pregnant women.
- Patients unwilling to participate in the study.

Diagnosis of acute pancreatitis was established based on clinical presentation, elevated serum amylase and lipase levels, and radiological findings suggestive of pancreatic inflammation. A standardised proforma was used to record the complete clinical history, demographic profile, etiological variables, laboratory tests, and imaging results.

The severity of acute pancreatitis was assessed using both the BISAP score and CTSI. The BISAP score was determined within the first 24 hours of admission based on five factors: age over 60, presence of pleural effusion, poor mental status, blood urea nitrogen level greater than 25 mg/dL, and systemic inflammatory response syndrome. A BISAP score of 3 or more was considered indicative of severe acute pancreatitis.

Contrast-enhanced computed tomography of the abdomen was performed after 72 hours of onset of symptoms whenever clinically indicated. CTSI was calculated based on the degree of pancreatic inflammation and extent of pancreatic necrosis. Severity grading and presence of local complications such as pancreatic necrosis, pseudocyst, abscess, and peripancreatic fluid collection were documented. Clinical outcomes including organ failure, duration of hospital stay, intensive care requirement, need for intervention, and mortality were assessed and correlated with BISAP and CTSI scores.

The Statistical Package for Social Sciences (SPSS) software version 25 was used to evaluate the data once it had been imported into Microsoft Excel. Qualitative factors were expressed as frequency and percentage, whereas quantitative variables were expressed as mean ± standard deviation. Sensitivity, specificity, positive predictive value, and negative predictive value of BISAP and CTSI were calculated. When appropriate, the chi-square test and the student's t-test were employed for statistical comparison. Statistical significance was defined as a p-value of less than 0.05.

Results

Most patients belonged to the 31–40 years age group, and males constituted majority of cases. Alcohol was identified as the most common etiological factor, followed by gallstone disease, indicating alcohol-related pancreatitis as the predominant cause in the study population. [Table 1]

Table 1: Demographic profile and etiological distribution of study population

Variable	Category	Number of patients (n)	Percentage (%)
Age group	18–30 years	12	20.0
	31–40 years	18	30.0
	41–50 years	16	26.7
	51–60 years	9	15.0
	>60 years	5	8.3
Gender	Male	42	70.0
	Female	18	30.0
Etiology	Alcohol	34	56.7
	Gallstones	18	30.0

	Hypertriglyceridemia	4	6.7
	Idiopathic	3	5.0
	Drug induced	1	1.6

Majority of patients had BISAP scores below 3, suggesting mild disease severity in most cases. CTSI grading demonstrated that severe radiological pancreatitis was present in 28.3% of patients, indicating substantial local pancreatic involvement in a subset of cases. [Table 2]

Table 2: Distribution of BISAP score and CT Severity Index (CTSI)

Severity scoring system	Category	Number of patients (n)	Percentage (%)
BISAP score	0–2	45	75.0
	≥3	15	25.0
CTSI	Mild (0–3)	24	40.0
	Moderate (4–6)	19	31.7
	Severe (7–10)	17	28.3

Patients with BISAP score ≥3 had significantly higher incidence of organ failure compared to lower scores. Similarly, ICU admission increased progressively with increasing CTSI severity, demonstrating strong association between higher radiological severity and critical illness. [Table 3]

Table 3: Association of BISAP score and CTSI with organ failure and ICU admission

Parameter	Category	Complication present n (%)	Complication absent n (%)	p-value
BISAP score	0–2	4 (8.9%)	41 (91.1%)	<0.001
	≥3	11 (73.3%)	4 (26.7%)	
CTSI	Mild (0–3)	2 (8.3%)	22 (91.7%)	<0.001
	Moderate (4–6)	5 (26.3%)	14 (73.7%)	
	Severe (7–10)	12 (70.6%)	5 (29.4%)	

Pancreatic necrosis was significantly more common among patients with severe CTSI scores. The incidence of necrosis increased proportionately with increasing radiological severity, highlighting the importance of CTSI in identifying local pancreatic complications. [Table 4]

Table 4: Association between CTSI score and pancreatic necrosis

CTSI category	Necrosis present n (%)	Necrosis absent n (%)	p-value
Mild (0–3)	1 (4.2%)	23 (95.8%)	<0.001
Moderate (4–6)	6 (31.6%)	13 (68.4%)	
Severe (7–10)	13 (76.5%)	4 (23.5%)	

Higher BISAP scores were associated with significantly prolonged hospital stay, indicating greater disease severity and increased healthcare utilization. The BISAP and CTSI scores showed a significant positive association, suggesting good agreement between clinical and radiological severity assessment. [Table 5]

Table 5: Correlation of BISAP score with duration of hospital stay and CTSI score

Variables	Mean/Correlation value	p-value
BISAP score 0–2 vs hospital stays	6.8 ± 2.1 days	<0.001
BISAP score ≥3 vs hospital stays	13.4 ± 3.5 days	
BISAP score vs CTSI score (r)	0.74	<0.001

Both BISAP and CTSI demonstrated high diagnostic accuracy in predicting severe acute pancreatitis. CTSI showed slightly higher sensitivity for detecting severe disease and local complications, while BISAP provided rapid bedside assessment with high specificity and negative predictive value. [Table 6]

Table 6: Comparison of BISAP score and CTSI in predicting severe acute pancreatitis

Scoring system	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
BISAP	87.5	90.9	82.4	93.7
CTSI	93.7	88.6	78.9	96.2

Discussion

In the present study, majority of patients belonged to the 31–40 years age group (30.0%), followed by 41–50 years (26.7%). Male predominance was observed, with males constituting 70.0% of cases. Similar demographic patterns have been reported by Shams F et al,[13] where 74.3% of patients were males, and by Omair U et al,[14] who observed a male predominance of 55% among patients with acute pancreatitis. The higher incidence among males may be attributed to greater exposure to alcohol consumption and associated risk factors.

Alcohol was identified as the most common etiological factor in 56.7% of patients, followed by gallstone disease in 30.0% of cases. Hypertriglyceridemia, idiopathic causes, and drug-induced pancreatitis accounted for a smaller proportion of cases. These findings are consistent with the epidemiological pattern observed in several studies where alcohol and gallstones remain the leading causes of acute pancreatitis.

Assessment of disease severity using BISAP revealed that 75.0% of patients had scores between 0 and 2, indicating mild disease, whereas 25.0% had BISAP scores ≥3, suggestive of severe acute pancreatitis. CTSI grading demonstrated mild disease in 40.0%, moderate disease in 31.7%, and severe disease in 28.3% of patients. The ability of both scoring systems to stratify disease severity is supported by the meta-analysis conducted by Miko A et al,[15] which demonstrated comparable performance of BISAP and CTSI in predicting severe acute pancreatitis, with area under the curve (AUC) values of 0.79 and 0.80 respectively. Their findings confirmed that CTSI remains an informative and practical tool when radiological assessment is available.

In the present study, organ failure was significantly more common among patients with BISAP scores ≥3, occurring in 73.3% of patients compared to only 8.9% among those with lower scores. These findings were in comparable with Yadav J et al,[16] who reported excellent predictive ability of BISAP for severe acute pancreatitis and organ failure, with an AUC of 0.962. Similarly, Pandey R et al,[17] demonstrated that BISAP was the most accurate predictor of organ failure and ICU admission compared with other severity scoring systems. The usefulness of BISAP as an early bedside tool for identifying patients at higher risk of systemic problems is shown by these observations.

Those with severe CTSI scores were much more likely to have had admission to ICU, with 70.6% of patients being admitted to the ICU. In a similar study, Dalal AD et al.18 showed a strong correlation between modified CTSI scores and an increased length of stay in the ICU with higher scores associated with longer intensive care requirements. Similarly, Pandey R et al,[17] reported that higher the score of CTSI, more severe was the disease severity and dependence on critical care support.

In the present study, pancreatic necrosis was significantly related to the severity of CTSI as was present in 76.5% of the patients with severe CTSI and only 4.2% of the patients with mild CTSI scores. The results of this study underline the advantages of radiological scoring systems in the assessment of local pancreatic complications. The same results were obtained by Yadav J et al,[16] who reported CTSI being the best predictor of pancreatic necrosis (AUC 0.958). Similarly, Pandey R et al,[17] showed that there was high predictive value of modified CTSI for local complications and pancreatic necrosis with AUC above 0.90.

Patients with high BISAP scores experienced significantly longer hospital stays, 13.4 ± 3.5 days versus 6.8 ± 2.1 days for those with a lower score. This result is comparable to that of Chatterjee R et al,[19] who found a substantial relationship between BISAP scores, modified CTSI scores, and length of hospital stay. The same difference in mean MCTSI scores and the duration of hospital stay was also shown to exist between increased MCTSI scores and total length of hospital stay by Dalal AD et al.[18] A combination of clinical and radiological severity scores were shown to be reliable predictors for resource utilization and length of inpatient care.

In the present study, good agreement was observed between BISAP and CTSI scores with strong positive correlation ($r = 0.74$, $p<0.001$) between the two. Comparable significant correlations were noted between BISAP, modified CTSI and APACHE II scores and all three accurately predicted severe acute pancreatitis by Chatterjee R et al.[19] Their study has shown that although BISAP is simple, it is comparable to other, more complex scoring systems, and can be used as a powerful tool for screening patients with suspected acute pancreatitis for early risk stratification.

It is also supported by Shams F et al,[13] who found a sensitivity of 79.37%, a specificity of 83.56% and an overall predictive accuracy of 81.62% for CTSI in predicting the severity of the disease. Likewise, Omair U et al,[14] showed that CTSI had a very high sensitivity (91.9 %) and specificity (88.72 %), hence can be routinely utilised to predict the mortality and adverse outcome of AP, respectively.

Conclusion

It has been demonstrated that the BISAP score and the CT Severity Index are both accurate and useful tools for assessing the severity and prognosis of acute pancreatitis. Organ failure, pancreatic necrosis, ICU admission, length of hospital stay, and severe disease were all significantly correlated with higher BISAP and CTSI scores. CTSI showed better performance in terms of the assessment of local pancreatic complications, whereas BISAP showed a rapid bedside assessment with good prognostic accuracy. Both scoring systems had a good positive correlation indicating the usefulness of the scores for early risk stratification. If the severe acute pancreatitis can be detected early with these scoring systems, there may be better ways to manage the patient, which can decrease the complications and optimize the treatment outcome.

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Conflicts of interest

There are no conflicts of interest.

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