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Diagnostic Accuracy and Inter-Score Agreement Between BISAP and Ranson's Scoring Systems in Predicting Severity of Acute Pancreatitis: A Cross-Sectional Study

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A B S T R A C T

Background: Early prediction of severity in acute pancreatitis (AP) is essential for timely intervention and resource allocation. The Ranson scoring system is widely used but requires 48-hour data, whereas the BISAP score offers a simplified and earlier alternative.

Objective: To compare the diagnostic accuracy and inter-score agreement between BISAP and Ranson scoring systems in predicting the severity of acute pancreatitis.

Methods: A prospective observational study was conducted over two years on 50 patients with acute pancreatitis at a tertiary care hospital. Severity was classified using both BISAP (within 24 hours) and Ranson (over 48 hours) scores. Outcomes including ICU admission, length of hospital stay, and mortality were recorded. Sensitivity, specificity, predictive values, and agreement between scores were analyzed using standard statistical methods.

Results: Out of 50 patients, Ranson score identified 8 (16%) as having severe AP, while BISAP identified 7 (14%) as severe. The sensitivity and specificity of BISAP in comparison to Ranson were 87.5% and 100%, respectively. The positive predictive value was 100%, and the negative predictive value was 97.67%. BISAP showed strong agreement with Ranson scoring in severity classification.

Conclusion: BISAP is a simple, early, and reliable tool for predicting severity in acute pancreatitis. Its comparable accuracy to Ranson scoring, combined with ease of bedside application, supports its use as a practical alternative for early triage and risk stratification in emergency and resource-constrained settings.

Keywords: Acute pancreatitis, BISAP score, Ranson score, severity prediction, diagnostic accuracy.

INTRODUCTION

Acute pancreatitis (AP) is an acute inflammatory condition of the pancreas characterized by sudden onset of upper abdominal pain, often radiating to the back, accompanied by elevated pancreatic enzyme levels and systemic inflammation. While the majority of patients experience a mild, self-limiting disease course, approximately 15–20% develop severe acute pancreatitis, which can be life-threatening due to complications such as pancreatic necrosis, organ failure, and sepsis [1]. Globally, the incidence of acute pancreatitis is rising, with pooled estimates from recent meta-analyses reporting rates of 13 to 45 cases per 100,000 population annually [2]. This rise has been attributed to increasing alcohol consumption, gallstone disease, obesity, and improved diagnostic capabilities. In India, similar trends have been observed, with hospital-based studies indicating that alcohol and gallstones remain the leading etiological factors, contributing to over 80% of AP cases [3]. Moreover, the increasing incidence among younger adults and the wide variability in clinical outcomes emphasize the need for effective early risk stratification tools. One of the most important aspects in the management of AP is early prediction of severity, as timely identification of high-risk patients enables aggressive supportive care, ICU admission, and close monitoring, which can significantly reduce morbidity and mortality. However, clinical features at presentation are often nonspecific and unreliable predictors of progression to

severe disease. Therefore, several scoring systems have been developed to predict disease severity and outcomes, the most established being the Ranson's criteria, developed in 1974, which evaluates 11 parameters assessed at admission and within 48 hours [4]. While it has demonstrated good predictive value, it requires two separate time points for completion and includes laboratory tests not always available in resource-limited settings, which restricts its utility in early triage.

To address these limitations, the Bedside Index for Severity in Acute Pancreatitis (BISAP) was introduced by Wu et al. in 2008 as a simplified scoring system that uses five variables readily available within the first 24 hours: Blood urea nitrogen (BUN) >25 mg/dL, Impaired mental status (GCS <15), Systemic inflammatory response syndrome (SIRS), Age >60 years, and Presence of pleural effusion [5]. The BISAP score has since been validated in multiple populations and has shown comparable sensitivity and specificity to Ranson and APACHE II scores in predicting severity, organ failure, and mortality [6]. While the BISAP score offers advantages in terms of early applicability, simplicity, and lower cost, there is limited evidence from Indian clinical settings evaluating its performance in comparison to the more established Ranson score. A few tertiary care studies from India have begun exploring this comparison, but findings remain inconclusive, particularly with respect to predicting outcomes like ICU admission, duration of hospital stay, and in-hospital mortality [7].

Given the epidemiological burden of Acute Pancreatitis in India and the necessity for timely, practical prognostic tools, this study aims to compare the clinical utility of BISAP and Ranson scoring systems in predicting severity and short-term outcomes in acute pancreatitis. Such a comparison can help clinicians identify the most efficient and context-appropriate tool for early triage and management, especially in resource-constrained health systems.

AIM

To compare the clinical utility of BISAP and Ranson scoring systems in predicting disease severity and short-term outcomes in patients with acute pancreatitis.

OBJECTIVES

1. To assess and compare the severity of acute pancreatitis as determined by BISAP and Ranson scores.
2. To evaluate the association of BISAP and Ranson scores with short-term clinical outcomes, including ICU admission, duration of hospital stay, and in-hospital mortality.

MATERIALS AND METHODS

Study Design and Setting

A prospective observational study was conducted at the Department of General Surgery, over a period of two years, from January 2021 to December 2022. The study was carried out in a tertiary care hospital, catering to both emergency and referred cases of acute pancreatitis.

Study Population

The study included patients aged >18 years diagnosed with acute pancreatitis based on Revised Atlanta Classification criteria, which requires at least two of the following three features:

- Abdominal pain consistent with acute pancreatitis
- Serum amylase and/or lipase levels at least three times the upper limit of normal
- Imaging findings consistent with acute pancreatitis (e.g., CT abdomen)

Inclusion Criteria

- Adults (>18 years) with a confirmed diagnosis of acute pancreatitis
- Admission within 24 hours of symptom onset
- Consent to participate in the study

Exclusion Criteria

- Patients with chronic pancreatitis
- History of pancreatic malignancy
- Patients discharged within 48 hours
- Incomplete clinical or laboratory data

Sample Size
A total of 100 patients fulfilling the inclusion criteria were enrolled using consecutive sampling. The sample size was based on similar previous Indian studies assessing BISAP and Ranson scoring systems [8].

Data Collection and Parameters
After obtaining informed consent, relevant demographic, clinical, laboratory, and radiological information was recorded in a pre-designed case record form.
The following variables were documented:

- Age, sex, history of alcohol use, gallstone disease
- Vital signs, Glasgow Coma Scale (GCS), pleural effusion on imaging
- Serum amylase, lipase, BUN, hematocrit, calcium, LDH, WBC, and glucose levels
- Length of hospital stay, ICU admission, need for ventilatory support, and in-hospital mortality

Scoring Systems Used

1. BISAP Score (within 24 hours of admission):
One point each was assigned for:

- BUN >25 mg/dL
- Impaired mental status (GCS <15)
- SIRS present
- Age >60 years
- Presence of pleural effusion

2. Ranson Score:

- Calculated at admission and after 48 hours, based on 11 variables including age, WBC, glucose, AST, LDH, HCT fall, BUN rise, calcium, arterial PO_2, base deficit, and fluid sequestration.

Severity was categorized as:

- Mild pancreatitis: <3 Ranson or ≤2 BISAP points
- Severe pancreatitis: ≥3 Ranson or ≥3 BISAP points

Outcome Measures

The study assessed:

- Severity classification based on each score
- ICU admission
- Length of hospital stay
- In-hospital mortality

Statistical Analysis
Data were entered into Microsoft Excel and analyzed using SPSS.

- Categorical variables: presented as frequencies and percentages
- Continuous variables: expressed as mean ± SD
- Chi-square test used to assess association between scores and outcomes
- Independent t-test for comparing means
- p-value <0.05 considered statistically significant

Ethical Considerations
Approval was obtained from the Institutional Ethics Committee before commencing the study. All participants provided written informed consent, and confidentiality of patient data was strictly maintained.

RESULTS

Table No. 1 - Laboratory findings observed in the study population

LABORATORY FINDINGS	NO. OF PATIENTS	PERCENTAGE
AT ADMISSION		
WBC COUNT>16000/mm^3	7	14%
LDH>350IU/L	12	24%

AST>250IU/L	1	2%
RBS>200MG/DL	4	8%
WITHIN 24 HOURS		
BUN>25mg/dl	9	18%
WBC COUNT >12000/mm^3	9	18%
Chest Xray (S/O Pleural Effusion)	2	4%
AT 48 HOURS		
Haematocrit Fall >10pts	5	10%
BUN increase>5mg/dl	8	16%
Calcium<8mg/Dl	2	4%
PO_2<60mmhg	4	8%
Base Deficit>5meq/L	3	6%
CT Abdomen And Pelvis S/O Fluid Loss >6 Litres	0	0%

Laboratory investigations were done at the time of admission, within 24 hours and at 48 hours. At the time of admission, WBC count more than 16,000, was seen in 7 patients(14%), LDH >350IU/L was seen in 12 patients and AST >250 IU/L, was seen in 1 patient. Elevated random blood sugar levels >200 mg/dl was observed in 4 patients. Within 24 hours, 18% patients showed a BUN >25mg/dl, 18% had leukocytosis (WBC count of >12000/mm^3, and 2 patients had pleural effusion on chest Xray. After 48 hours, there was a drop in hematocrit by >10points in 5 patients, elevated BUN in 8 patients, PO_2<60mmhg in 4 patients, with a base deficit >5 meq/l in 3 patients.

Table No. 2: Outcome of RANSON scoring system

RANSON scoring system	**No of patients**	**% of patients**
Not severe	42	84.00
MALE	39	78.00
FEMALE	3	6.00
Severe	8	16.00
MALE	8	16.00
FEMALE	0	0.00
Total	50	100.00

Out of the total study population of 50 patients, 84%(n=42), were diagnosed as not having severe pancreatitis as per the Ranson Scoring System. 16% (n=8) of the patients were diagnosed as severe and were hence referred to higher centers for further evaluation and management.

Table No.3: Outcome of BISAP scoring system

BISAP scoring system	**No of patients**	**% of patients**
Not severe	43	86.00
MALE	40	80.00
FEMALE	3	6.00
Severe	7	14.00
MALE	7	14.00
FEMALE	0	0.00
Total	50	100.00

As per the BISAP Scoring System, 14% (n=7) of the patients were suffering from severe acute pancreatitis while 86%(n=43), were not having severe pancreatitis.

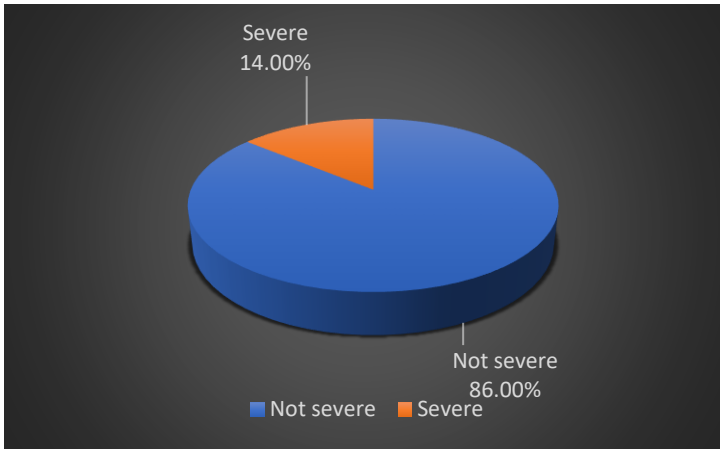

Figure 1: Outcome of BISAP scoring system

Table No 4: Association between RANSON scoring system vs BISAP scoring system

		RANSON system			
		Severe	**Not severe**	**Total**	**%**
BISAP scoring system	**Severe**	7	0	7	14.00
	Not severe	1	42	43	86.00
	Total	8	42	50	100.00
	%	16.00	84.00	100.00	

As per the table, it is observed that the BISAP scoring system and Ranson scoring system are almost comparable in their findings and outcome and there lies a significant association between the two scoring systems.

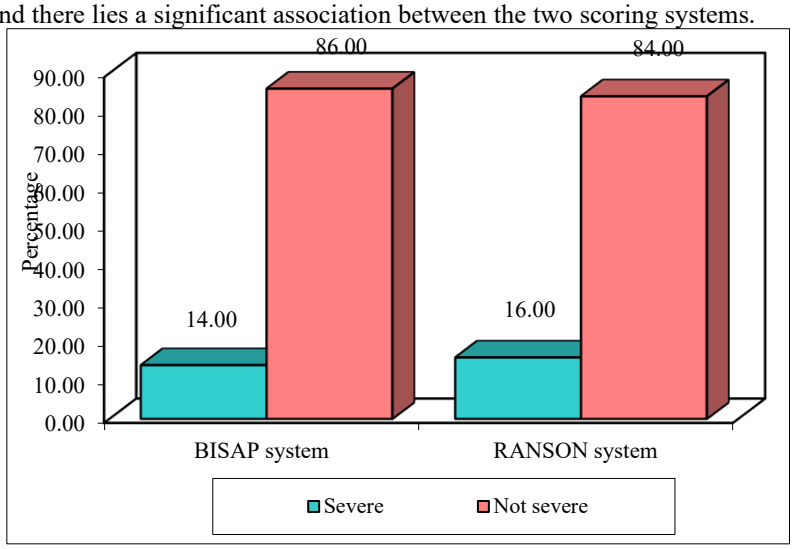

Figure 2: Association between RANSON scoring system vs BISAP scoring system

Table No. 5: Sensitivity and specificity of BISAP scoring system over RANSON scoring system

Statistics	**Values**	**95% CI**
Sensitivity	87.50%	47.35% to 99.68%
Specificity	100.00%	91.59% to 100.00%
Positive Predictive Value	100.00%	59.04% to 100.00%
Negative Predictive Value	97.67%	87.04% to 99.62%
Accuracy	98.00%	89.35% to 99.95

The sensitivity of 87.50% (95%CI- 47.35% to 99.68%) is observed in BISAP Scoring System over the Ranson's Scoring System, with 100% (95%CI-91.59% to 100.0%) specificity. BISAP Scoring System shows a Positive Predictive Value of 100% (95% CI- 59.04% to 100.0%) and Negative Predictive Value of 97.67% (95%CI- 87.04% TO 99.62%) as

compared to the Ranson's Scoring System. Accuracy of 98% (95%CI- 89.35% to 99.95%) noted in BISAP Scoring System.

DISCUSSION

Early and accurate prediction of severity in acute pancreatitis (AP) is crucial for initiating timely interventions, allocating critical care resources, and improving patient outcomes. In this study, we compared the clinical performance of two widely used prognostic scoring systems—BISAP and Ranson—in terms of severity classification and short-term outcomes.

The present study showed that BISAP and Ranson scores were comparable in stratifying patients into severe and non-severe categories. As per Ranson scoring, 16% of patients had severe AP, while BISAP identified 14% as severe. This is in line with prior studies such as those by Singh et al. and Wu et al., where BISAP identified severe pancreatitis in approximately 12–18% of patients and demonstrated similar classification efficacy to Ranson criteria [9,10]. Importantly, our results show a strong association between BISAP and Ranson scores in identifying severe cases, supporting the idea that BISAP is not only a practical alternative but also statistically consistent with traditional models. Table 4 of our results demonstrated near-perfect concordance in patient classification, with only one discordant case, reflecting a sensitivity of 87.5% and specificity of 100% for BISAP in comparison with Ranson. These findings echo the results of the study by Cho et al., which highlighted BISAP's high specificity (over 90%) and substantial diagnostic accuracy [11].
One of the major limitations of Ranson scoring is the need for 48-hour data, which delays clinical decision-making. In contrast, BISAP can be computed within 24 hours of admission, allowing for earlier triage and ICU admission planning. Given that early intervention is known to reduce the risk of systemic complications and mortality in AP, this temporal advantage is clinically significant [12]. Our study also found that laboratory parameters used in BISAP—such as elevated BUN, leukocytosis, and pleural effusion—were present in a meaningful proportion of patients. This further validates the rationale behind BISAP's component selection. Similar observations were made in studies conducted by Papachristou et al. and Simons-Linares et al., who showed that BUN and SIRS were the strongest individual predictors of mortality in acute pancreatitis [13,14].

In terms of mortality prediction, BISAP has also been shown to correlate well with in-hospital mortality. Although our study observed a low mortality rate, which limited statistical conclusions on that front, other large-scale Indian studies, such as that by Nair et al., confirm that a BISAP score ≥3 is associated with a significantly higher risk of ICU admission and death [15]. Another notable advantage of BISAP is its simplicity and bedside applicability, especially in resource-limited settings. While Ranson scoring requires multiple biochemical tests and imaging at two time points, BISAP can be employed swiftly using routinely available clinical data. This makes it ideal for use in primary and secondary care settings, especially in rural India where access to advanced investigations may be delayed [16].

However, limitations of this study include its single-center design, relatively small sample size, and low event rate (mortality and ICU admission), which may have underpowered some associations. Additionally, although BISAP performed well in terms of accuracy and agreement with Ranson, external validation in larger cohorts with long-term outcomes is warranted. Other newer scoring systems like the Revised Atlanta Classification, APACHE II, and imaging-based scores may be considered in future comparative studies [17].

In summary, this study adds to the growing body of evidence that BISAP is a reliable, early, and practical scoring tool for predicting severity in acute pancreatitis. It offers comparable accuracy to Ranson scoring with the added advantage of earlier application, making it particularly relevant in emergency and resource-constrained settings.

CONCLUSION

In this prospective study, both BISAP and Ranson scoring systems demonstrated comparable accuracy in predicting the severity of acute pancreatitis. BISAP showed a high sensitivity (87.5%) and perfect specificity (100%) when compared with Ranson's scoring. The agreement between both systems was strong, highlighting BISAP as a reliable early predictor. Importantly, BISAP can be calculated within 24 hours using simple clinical and laboratory parameters, offering significant advantages in time-sensitive and resource-limited clinical settings. Given its ease of use, early applicability, and diagnostic performance, BISAP can serve as an effective alternative to traditional scoring systems like Ranson for the early risk stratification of acute pancreatitis patients. However, larger multicentric studies are warranted to validate these findings across diverse populations.

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