Etiological Profile and Clinical Predictors of Severity in Acute Pancreatitis: A Comparative Evaluation Using BISAP and Ranson Scores

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Abstract

Background:

Acute pancreatitis (AP) is a potentially life-threatening inflammatory condition of the pancreas with varied etiologies and clinical presentations. Accurate early prediction of disease severity is crucial for effective management and triage. This study aimed to assess the etiological profile of AP and evaluate the predictive performance of BISAP and Ranson scoring systems in a tertiary care center.

Methods:

This prospective observational study included 50 patients diagnosed with acute pancreatitis between January 2021 and December 2022. Data were collected on demographics, clinical presentation, laboratory parameters, and outcomes. Etiology was documented, and severity was assessed using BISAP (within 24 hours) and Ranson (over 48 hours) scores. Statistical analysis included sensitivity, specificity, and diagnostic accuracy calculations, using Ranson score as the reference standard.

Results:

The most common etiology was alcohol-related (92%), with a predominance of young males (mean age 34.3 ± 8.7 years; 94% male). Abdominal pain and vomiting were universal presenting symptoms. BISAP score demonstrated a sensitivity of 87.5%, specificity of 100%,

PPV of 100%, and NPV of 97.67% in predicting severe AP, with an overall diagnostic accuracy of 98%. Both BISAP and Ranson scores showed a significant association with disease severity and short-term clinical outcomes.

Conclusion:

In the Indian clinical context, alcohol remains the predominant cause of AP. BISAP is a reliable and efficient early predictor of disease severity and can serve as a valuable triage tool in emergency settings, offering comparable accuracy to Ranson score with better feasibility.

Keywords: Acute pancreatitis, BISAP, Ranson, severity prediction, alcohol-induced pancreatitis.

Introduction

Acute pancreatitis (AP) is an acute inflammatory disorder of the pancreas that presents with a spectrum of clinical manifestations ranging from mild self-limiting illness to severe, life-threatening systemic inflammation with multi-organ dysfunction. It represents a major cause of gastrointestinal-related hospitalization worldwide, and its incidence has steadily increased over the past few decades [1]. According to recent global epidemiological data, the incidence of AP ranges from 13 to 45 cases per 100,000 population per year, with mortality reaching up to 30% in severe cases [2]. In India, the rising burden of acute pancreatitis has been attributed to increased alcohol consumption and gallstone disease, with hospital-based studies indicating these two as the leading etiological factors [3]. The prevalence pattern is regionally variable, with alcohol-related pancreatitis more common in males and gallstone-associated cases frequently seen among females [4]. Furthermore, nutritional transitions, metabolic syndrome, and increasing accessibility to imaging have also contributed to earlier and more frequent diagnoses.

Early assessment of etiological factors and clinical predictors of severity is essential to guide management, reduce complications, and predict the likelihood of ICU admission, prolonged hospital stay, and mortality. While the Revised Atlanta Classification (2012) provides a standardized framework to define severity, it does not offer an early, quantitative predictive score [5]. For this reason, prognostic scoring systems such as the Ranson criteria and the Bedside Index of Severity in Acute Pancreatitis (BISAP) have gained importance in clinical practice. The Ranson scoring system, developed in 1974, incorporates 11 parameters evaluated at admission and at 48 hours. Though widely used, it requires laboratory values not always available at presentation, and the delay in completing the score limits its usefulness in early triage [6]. The BISAP score, introduced in 2008, was designed as a simpler alternative. It uses five variables—blood urea nitrogen >25 mg/dL, impaired mental status, systemic inflammatory response syndrome (SIRS), age >60 years, and pleural effusion—to estimate severity within 24 hours of admission [7]. While several international studies have compared these scores in predicting clinical outcomes, Indian data remains sparse. Given regional variations in etiology, nutritional status, and healthcare access, it is vital to explore the clinical predictors and validate prognostic scores in the Indian setting. A better understanding of the etiological profile and its impact on severity, in conjunction with early scoring systems like BISAP and Ranson, can help in effective patient stratification and evidence-based resource allocation.

This study aims to analyze the etiological profile and identify clinical predictors of severity in patients with acute pancreatitis, using a comparative evaluation of BISAP and Ranson scores in an Indian tertiary care center.

Aim

To analyze the etiological spectrum and identify clinical predictors of severity in acute pancreatitis using a comparative evaluation of BISAP and Ranson scoring systems.

Objectives

1. To determine the etiological profile of patients diagnosed with acute pancreatitis.

2. To compare the diagnostic accuracy of BISAP and Ranson scoring systems in predicting the severity of acute pancreatitis and their association with short-term clinical outcomes.

Materials and Methods

Study Design and Setting

This was a prospective observational study conducted in the Department of General Surgery at a tertiary care hospital in India over a two-year period, from January 2021 to December 2022. The hospital caters to a mixed population of both direct and referred cases, offering advanced emergency and critical care services.

Study Population

The study population included all adult patients diagnosed with acute pancreatitis (AP) admitted to the general surgery department during the study period.

Diagnostic Criteria for Acute Pancreatitis

The diagnosis was established based on the Revised Atlanta Classification, requiring at least two of the following three criteria:

- Acute upper abdominal pain characteristic of pancreatitis

- Serum amylase and/or lipase levels ≥3 times the upper limit of normal

- Radiological findings suggestive of AP (e.g., CT, ultrasound)

Inclusion Criteria

- Adults aged ≥18 years

- Confirmed diagnosis of acute pancreatitis

- Admission within 24 hours of symptom onset

- Patients consenting to participate in the study

Exclusion Criteria

- Patients with chronic pancreatitis or pancreatic malignancy

- Patients discharged or transferred within 48 hours of admission

- Patients with incomplete clinical/laboratory data

- Pregnant women

Sample Size and Sampling Technique

A total of 100 patients were enrolled using consecutive sampling. The sample size was derived based on previous Indian literature comparing BISAP and Ranson scores for severity prediction in AP [8].

Data Collection Tool

Data were recorded using a pre-tested case record form which included:

- **Demographic details** (age, sex)

- **Etiological factors** (alcohol, gallstones, idiopathic, hyperlipidemia, post-ERCP, etc.)

- **Clinical signs** at presentation (vital signs, Glasgow Coma Scale, systemic inflammatory response)

- **Laboratory investigations**: WBC count, BUN, glucose, AST, LDH, calcium, hematocrit, arterial PO_2, and imaging results

- **Outcomes**: Length of hospital stay, ICU admission, need for ventilatory support, and in-hospital mortality

Scoring Systems Applied

1. BISAP Score

Calculated within 24 hours of admission using five variables:

- BUN >25 mg/dL

- Impaired mental status (GCS <15)

- Systemic inflammatory response syndrome (SIRS)

- Age >60 years

- Presence of pleural effusion

Severity Classification:

- **BISAP <3** → Mild

- **BISAP ≥3** → Severe

2. Ranson Score

Assessed using 11 parameters — five at admission and six at 48 hours. Parameters included: age, WBC, glucose, AST, LDH (at admission); hematocrit fall, BUN rise, calcium level, arterial PO_2, base deficit, and fluid sequestration (after 48 hours).

Severity Classification:

- **Ranson <3** → Mild

- **Ranson ≥3** → Severe

Outcome Measures

- Primary outcome: Severity classification based on BISAP and Ranson scores

- Secondary outcomes:

    o Etiology of acute pancreatitis

   o   Length of hospital stay

   o   ICU admission requirement

   o   In-hospital mortality

Statistical Analysis

Data were entered and analyzed using IBM SPSS version.

- Categorical variables were expressed as percentages

- Continuous variables were expressed as mean ± standard deviation (SD)

- Chi-square test was used to assess the association between scoring systems and severity outcomes

- Independent t-test was used for comparing mean values between groups

- A p-value <0.05 was considered statistically significant

- Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy of BISAP were calculated using Ranson score as reference standard

Ethical Considerations

The study was approved by the Institutional Ethics Committee, and written informed consent was obtained from all participants. Patient confidentiality and data privacy were strictly maintained throughout the study.
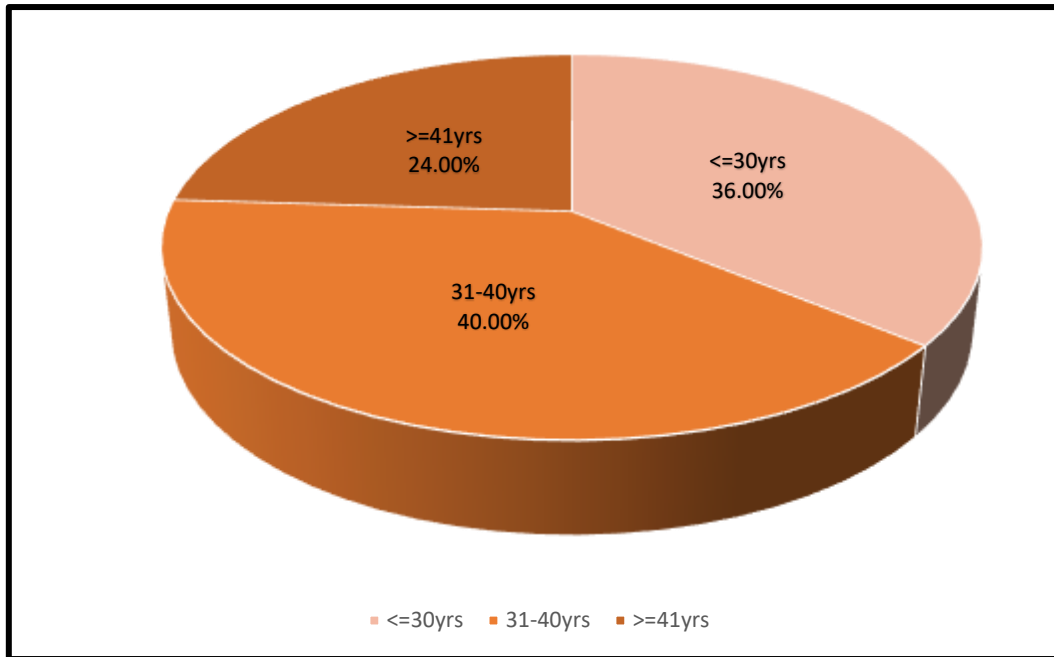
RESULTS

Table No.1: Age wise distribution of patients

Age groups	No of patients	% of patients	Gender

			Male		Female	
			No. of patients	% of patients	No. of patients	% of patients
<=30yrs	18	36.00	17	34%	1	2%
31-40yrs	20	40.00	19	38%	1	2%
>=41yrs	12	24.00	11	22%	1	2%
Total	50	100.00	47	94%	3	6%
Mean	34.34					
SD	8.74					

This study was done on 50 individuals with an average age of 34.34 +/- 8.74 years. The minimum age was 17 years and maximum age was 59 years. The age group of 31-40 years formed the most common group in this study. This was closely followed by the <=30 years group and >=41 years group. There were 3 female patients in this study, out of which 1 was 17yrs old, one was 35 years old and one was 42 years old.

Figure 1: Age wise distribution of patients

Table no.2.: Gender wise distribution of patients

Gender	No of patients	% of patients
Male	47	94.00
Female	3	6.00
Total	50	100.00

Figure 2 :Gender wise distribution of patients
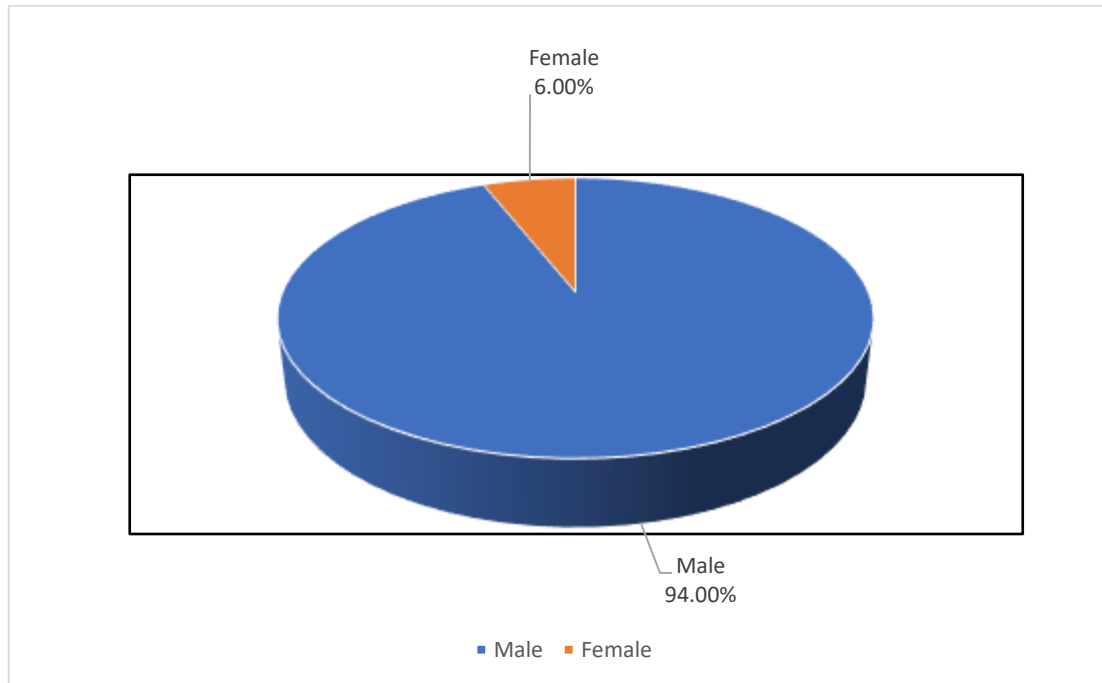
There were 3 females and 47 males in the study population.

Table no. 3- Etiology of acute pancreatitis

ETIOLOGY	No. Of Patients	Percentage
Alcohol-induced	46	92%
Biliary	4	8%
Idiopathic	0	0%

Most common cause of pancreatitis in this study was observed to be alcohol with 92%

patients suffering from alcohol induced pancreatitis. A small no. of patients were having

biliary pancreatitis.

Table No. 4- Different clinical presentations seen in the study.

PRESENTATION	NO. OF PATIENTS	PERCENTAGE

Pain In Abdomen	50	100%
-Radiating	48	96%
-Non-Radiating	2	4%
Vomiting	48	96%
Constipation	10	20%
Fever	9	18%
Abdominal Distension	8	16%

All patients came with complaints of pain in abdomen, with 96%, having radiating pain. Around 48 patients (96%), had complains of vomiting, with 10 patients having constipation. Fever was observed in 18% patients and 8 patients presented with abdominal distension.

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

This prospective observational study evaluated the etiological spectrum and compared the clinical utility of BISAP and Ranson scoring systems in predicting the severity and outcomes of acute pancreatitis (AP) in a tertiary care setting in India. The results reinforce existing evidence regarding the predominance of alcohol-related pancreatitis in India, the high male prevalence, and the effectiveness of BISAP as a reliable early predictor of disease severity. In our study, alcohol consumption was the most frequent etiological factor, seen in 92% of patients, while biliary etiology accounted for 8%. This finding aligns with previous Indian studies that have consistently reported alcohol as the leading cause of AP, particularly in males from lower socio-economic backgrounds with a history of chronic alcohol abuse [9,10]. In contrast, studies from Western countries often identify biliary tract disease, especially gallstones, as the predominant cause [11]. The low incidence of idiopathic pancreatitis in our sample may be attributed to the availability of basic imaging and enzyme assays, which improved diagnostic accuracy.

The mean age of patients was 34.34 years, with 94% being male, which is again consistent with national trends [12]. Several studies in India have found similar age and gender distributions, emphasizing the rising burden of pancreatitis among young adult males, primarily due to alcohol abuse. A study by Verma et al. observed that over 70% of AP cases in their cohort were alcohol-related and occurred in the 30–45 year age group [13]. These demographic findings are significant, as younger patients with severe forms of AP face prolonged morbidity, economic loss, and decreased quality of life. Clinically, pain abdomen (100%) and vomiting (96%) were the most common presenting symptoms in our cohort.

Fever and abdominal distension were present in fewer cases. These results reflect the well-documented clinical pattern of AP, where epigastric pain radiating to the back and vomiting are nearly universal [14]. Fever and distension, though less common, may be indicators of systemic inflammatory response or local complications such as infected necrosis or ileus.

When comparing prognostic tools, the BISAP score, calculated within the first 24 hours of admission, demonstrated high specificity (100%), sensitivity (87.5%), and a diagnostic accuracy of 98% when compared against the Ranson scoring system. These results are consistent with studies conducted by Wu et al. and Papachristou et al., who validated BISAP as an early, reliable predictor of severe AP with comparable accuracy to more complex systems such as APACHE-II and Ranson's score [15,16]. One of the major advantages of BISAP is its simplicity and early applicability, requiring only five clinical/laboratory parameters that are readily available within the first 24 hours of admission. This is especially relevant in resource-limited settings like many Indian hospitals, where delays in diagnostic workup or patient transfers can hamper the timely calculation of more complex scores like Ranson, which needs reassessment at 48 hours [17]. Our study demonstrated that BISAP not only mirrors the performance of Ranson in predicting severity but also offers a quicker and more feasible alternative for early risk stratification.

Importantly, the positive predictive value (PPV) of BISAP in our study was 100%, indicating that patients who scored ≥3 on BISAP were highly likely to have severe AP. The negative predictive value (NPV) was 97.67%, meaning that a low BISAP score reliably ruled out severe disease in most cases. This is critical in triaging patients, especially when ICU beds and monitoring resources are limited. Early identification of low-risk patients helps prevent unnecessary escalation of care, while high-risk patients can be prioritized for

aggressive treatment and close monitoring. Although both Ranson and BISAP were useful in predicting severity and clinical outcomes, BISAP's utility in early triage, simplicity of use, and high diagnostic performance make it a strong candidate for routine use in emergency and general surgery units. These findings underscore the need to incorporate BISAP scoring as a standard part of initial assessment protocols for AP, particularly in high-burden, resource-limited environments such as district hospitals and primary care centers.

The study's strength lies in its real-world applicability and relevance to the Indian clinical context. However, limitations include the single-center design and a moderate sample size (n=50), which may restrict generalizability. Larger multicentric studies are needed to further validate the findings and to explore additional parameters that may enhance predictive accuracy when integrated with BISAP.

Conclusion

This study highlights the predominance of alcohol as the primary etiological factor for acute pancreatitis in a predominantly young male Indian population. BISAP and Ranson scoring systems both showed strong agreement in identifying patients with severe acute pancreatitis; however, BISAP offered greater practical advantages due to its simplicity, early applicability, and high predictive accuracy. With a sensitivity of 87.5%, specificity of 100%, and diagnostic accuracy of 98%, BISAP is a reliable tool for early triage and management of acute pancreatitis, especially in resource-limited settings. Integrating BISAP into initial assessment protocols may facilitate timely interventions, optimize ICU utilization, and improve patient outcomes.

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