



Comparative Evaluation of BISAP, Haps, Ranson's, and PANC3 Scoring Systems for Predicting Severity in Acute Pancreatitis: A 5-Year Prospective Study

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Abstract

In evaluating the severity of acute pancreatitis over a five-year period with 310 cases, this prospective study evaluates the clinical value and predicted accuracy of four scoring systems: BISAP, HAPS, Ranson's, and PANC3. Analysis was done on sensitivity, specificity, accuracy, area under the curve (AUC), positive predictive value (PPV), negative predictive value (NPV), and specificity. HAPS had the highest PPV (95.1%), whereas BISAP and PANC3 had superior discrimination (AUC 0.82 and 0.883) and greater sensitivity (90.9% and 100%). Ranson's demonstrated superior sensitivity (100%) but poorer PPV (21%), and specificity (56%). According to our research, HAPS and Ranson's offer supplementary clinical insights, while BISAP and PANC3 are effective for early bedside severity prediction. The application of these metrics can enhance clinical results and enable prompt action.

Keywords: Acute Pancreatitis (AP); Prospective Study; BISAP Score; HAPS; Ranson's Score; PANC3; Positive Predictive Value (PPV); Negative Predictive Value (NPV); Bedside Scoring Systems; Risk Stratification; Revised Atlanta Classification

Introduction

An inflammatory condition, acute pancreatitis is a common gastrointestinal emergency that can have a substantial psychological and financial impact. While 80% of cases typically have positive outcomes, 20% may develop acute necrotizing pancreatitis. It is a systemic disease with two phases. A Systemic Inflammatory Response Syndrome (SIRS) that may result in Multiple Organ Dysfunction Syndrome (MODS) follows the first phase's widespread pancreatic inflammation and/or necrosis, whereas the second phase features infected pancreatic necrosis or fluid accumulation. Severe acute pancreatitis (SAP) develops in about 25% of patients which may require intensive care.

The severity of acute pancreatitis can be predicted using a number of scoring systems, including the Glasgow score, SIRS, Ranson score, and Acute Physiology and Chronic Health Evaluation (APACHE). The CTSI score is based on clinical, laboratory, and radiological variables [3]. For patients at risk of severe acute pancreatitis, the serum indicators can only be employed 24–48 hours after the disease onset. The validity of these scores for mortality prediction is insufficient.

Two of the three characteristics listed below must be present for AP to be diagnosed: Serum lipase activity (or amylase activity) at least three times higher than the upper limit of normal; (a)

abdominal pain consistent with AP (acute onset of severe, persistent, epigastric pain that frequently radiates to the back); and (b) distinctive radiological imaging findings of AP (contrast-enhanced computed tomography, or CECT, and less frequently magnetic resonance imaging or transabdominal ultrasonography).

Clinicians must assess the severity of AP after the diagnosis in order to guide future treatment. According to severity, AP is divided into three categories by the 2012 revision of the Atlanta classification: mild, moderate, and severe [1]. Based on the Harmless AP Score (HAPS) and the Ranson score (RS), patients were split into two groups: those with severe AP (SAP) and those without (non-SAP). In all acute cases, the death rate ranged from 3% to 10%.

This rate rises to 36–50% in SAP patients. Mild inflammation to severe, perhaps fatal organ failure are all possible outcomes of acute pancreatitis. Clinicians are guided in management and outcome prediction by early severity scoring. There are many different scoring systems, but their predictive power and level of complexity vary. Among these, HAPS stands out for being user-friendly in emergency situations, PANC3 is becoming a popular, quick predictor, and BISAP and Ranson’s are extensively verified [3]. Using contemporary clinical data and confirmed research, this study directly analyses the accuracy of severity prediction for all four scoring systems in a cohort of 310 patients over a five-year period.

Score	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)	AUC
BISAP	90.9	83.9	29.4	99.2	85.2	0.82
HAPS	58.2	75	95.1	17.6	-	0.67
Ranson’s	100	56	21	100	61.2	-
PANC3	100	76.5	23.9	100	62	0.883

Table 1

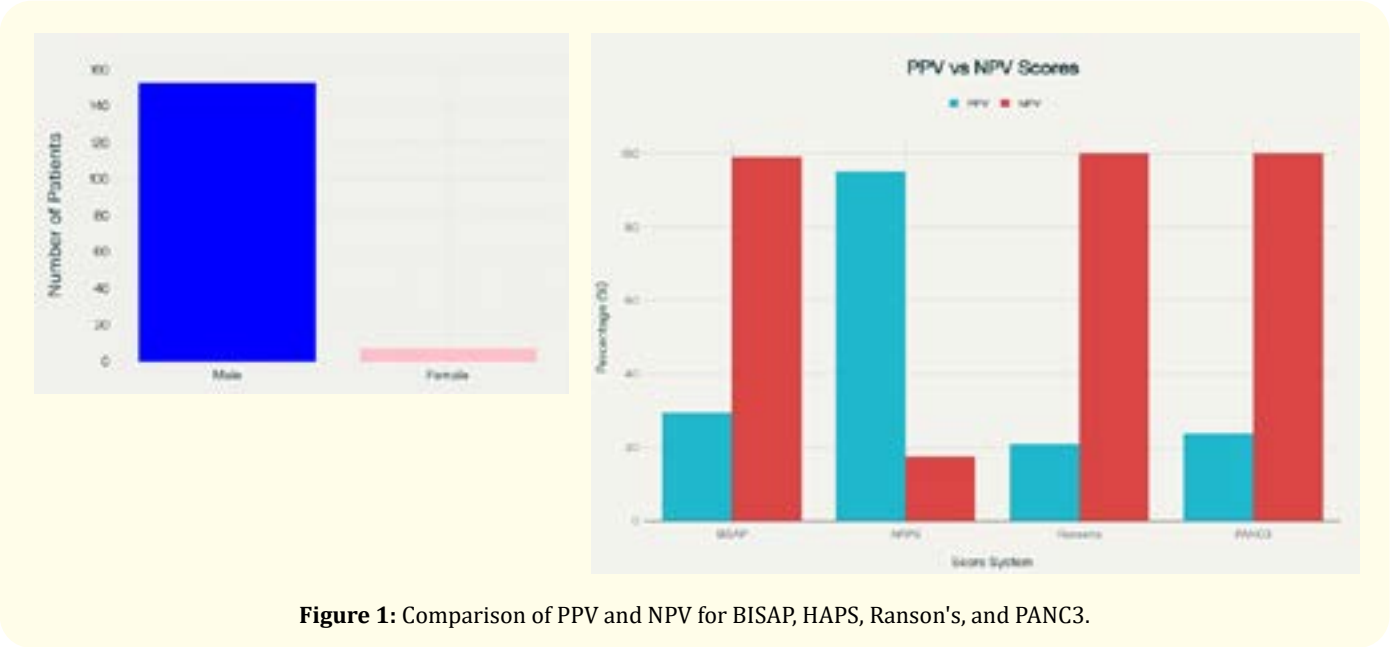


Figure 1: Comparison of PPV and NPV for BISAP, HAPS, Ranson's, and PANC3.

Materials and Methods

Study design and patient selection

This prospective observational study enrolled 310 patients from 2018 to 2023 diagnosed with acute pancreatitis in a tertiary care centre.

Inclusion criteria

- Patients aged 18 years and above.
- Acute onset of persistent severe epigastric pain.
- Elevated serum amylase or lipase levels.



Figure 2

- Diagnosed acute pancreatitis (initial or recurrent).
- Radiological evidence confirming pancreatitis.

Exclusion criteria

- Chronic pancreatitis.
- Pancreatic abscess, pseudocyst, or necrosis.
- Comorbidities: COPD, tuberculosis, diabetes mellitus, hypertension.
- Chronic kidney disease, renal failure, cerebrovascular accident.
- Salivary gland diseases, myocardial infarction, cholecystitis.
- Bowel obstruction or perforation.

Data collection and scoring

Patients were scored using BISAP, HAPS, Ranson's, and PANC3 within 24 hours as per standard definitions. Severity classification followed the Revised Atlanta Classification. Data were collected on demographics, clinical parameters, imaging, and outcomes like organ failure and mortality.

Statistical analysis

SPSS (IBM Corp., released in 2013) was used to analyse the data. Version 22.0 of IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp. The mean $\pm$ standard deviation is used to express continuous variables. Numbers and percentages are used to represent categorical data. Continuous variables that were not normally distributed were compared using the Mann-Whitney U test, whereas categorical variables were compared using the chi-square test. To compare HAPS, PANC3 RS, and BISAP and to indicate a bad prognosis, logistic regression analysis, receiver operating characteristics (ROC), analysis curves, and area under the curves (AUC) were employed. The threshold for statistical significance was $p < 0.05$.

Results

In line with previous research demonstrating a male propensity in pancreatitis, men made up the majority of the 310 cases. Alcohol was the main cause, and most of them were between the ages of 31 and 50. The incidence of severe pancreatitis varied from 10.7 to 20% based on the scoring criteria.

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Table 2

BISAP and PANC3 are shown to be balanced predictors in the comparison of sensitivity and specificity. Ranson's sacrifices specificity in order to obtain maximum sensitivity. HAPS demonstrated the highest PPV, indicating a confident positive prediction in moderate cases, while being less sensitive. PANC3 helped in the early exclusion of severe disease by demonstrating high negative predictive value.

Discussion

One common gastrointestinal condition that presents a major surgical challenge to general surgeons worldwide is acute pancreatitis. This complex process can vary from a mild, self-limiting inflammation to a rapidly progressing, perhaps lethal infection. If people with acute pancreatitis who are at risk of having a severe episode are recognized and classified early, effective therapeutic regimens can be implemented at the appropriate time to improve outcomes. The BISAP score is a valid and accurate method for classifying patients with acute pancreatitis in clinical therapy and research [9,10]. In order to examine the efficacies of BISAP and Ranson's in predicting the severity of acute pancreatitis, this study sought to compare their predictive accuracy [4,5].

With a mean BMI of 30.867 kg/m², obesity was primarily observed in instances with severe acute pancreatitis. The mild and moderate groups had mean BMIs of 25.076 and 26.093 kg/m², respectively [6]. These results are corroborated by research showing that a patient's BMI affects how severe an attack is. In our study, 84% of cases with severe acute pancreatitis had pleural effusions visible on X-rays. In their investigation, Heller, *et al.* discovered abnormal chest radiographs in 84.2% of their patients, which was comparable to these findings.

It has been demonstrated that a hematocrit of greater than 44% and a failure to decrease in this metric after 24 hours are associated with the onset of pancreatic necrosis and are predictive of organ failure [7]. Patients with mild, moderate, and severe pancreatitis in our study had mean hematocrits of 34.5%, 42.63%, and 46.81%, respectively. Therefore, the hemoconcentration can be utilized as a predictor of severity, as noted by Brown, *et al.* In the current study, the severity at admission was predicted by combining these three factors: a hematocrit of >44%, pleural effusion, and a BMI >30 kg/m².

To determine whether the patient truly fell into the appropriate expected category, the predictions were contrasted with the modified Marshall Score observations [18]. In retrospective research involving 393 participants, Brown, *et al.* developed the PANC3 score. They discovered that the post-test likelihood ratio of developing severe acute pancreatitis was 99% when all three factors were taken into account [19].

Alcohol was the most common etiological factor for pancreatitis in men in our study because alcoholism is quite common in our society and affects every aspect of it [8,11]. Of the patients, 52% were alcoholics, 30% had gallstones, 10% had a cholecystectomy, 4% had idiopathic conditions, 2% had ERCP, and 2% experienced trauma. Acute pancreatitis was most frequently caused by drinking (50%) and biliary disorders (72%), according to other research like Prasad, *et al.* Negi, *et al.* and Panda, *et al.* [7].

According to the research, BISAP and PANC3 are very sensitive and specific early bedside methods for triaging acute pancreatitis. BISAP is a recommended instrument in clinical practice because of its simplicity and validation [9]. With just three characteristics, PANC3 offers quick evaluation, particularly in environments with limited resources. HAPS is excellent at determining severity early on, reducing needless hospital stays. Despite being crucial historically, Ranson's is less useful because of its intricacy and delayed computation. BISAP, when taken as a whole, these scores help with complex clinical judgment. The retrospective analysis of several data sources is one of the limitations, although the results are consistent with established pathophysiology and clinical consequences.

Conclusion

With an AUC of 0.82 and statistical significance, the BISAP score exhibits strong discriminatory ability in detecting severe acute pancreatitis (AP). The PPV and NPV values are 29.4% and 99.2%, respectively, whereas the sensitivity and specificity values are 90.9% and 83.9%. With a statistically significant AUC of 0.883, the PANC3 score exhibits strong discriminatory ability in detecting severe acute pancreatitis (AP). The PPV and NPV values are 23.9% and 100%, respectively, whereas the sensitivity and specificity values are 100% and 76.5%.

In the early stages, BISAP and PANC3 are reliable and effective indicators of the severity of acute pancreatitis [20]. Despite practical limitations, Ranson's remains a benchmark, and HAPS helps quickly rule out serious disease. Implementing these scoring systems can enhance resource allocation and outcome stratification. Every surgeon should initially consider using the BISAP score and HAPS to rapidly stratify the severity of acute pancreatitis and start the right treatment [13,14]. By doing this, the mortality rate associated with severe acute pancreatitis will be reduced.

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