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Prognostic Value of BISAP Score Combined with 48-Hour C-Reactive Protein for Early Prediction of Severe Acute Pancreatitis: A Retrospective Single-Center Study

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Abstract

Background: Early identification of severe acute pancreatitis (SAP) remains essential for reducing morbidity and mortality. The Bedside Index for Severity in Acute Pancreatitis (BISAP) score is a simple and validated prognostic tool, whereas C-reactive protein (CRP) measured at 48 hours is an accessible inflammatory biomarker associated with disease severity. This study aimed to evaluate the prognostic performance of BISAP combined with 48-hour CRP for predicting severe acute pancreatitis.

Methods: We conducted a retrospective single-center study including adult patients hospitalized for acute pancreatitis between January 2022 and January 2025. Acute pancreatitis was diagnosed according to the revised Atlanta 2012 criteria. BISAP score was calculated within the first 24 hours of admission, and CRP levels were measured at 48 hours. Severe acute pancreatitis was defined according to the revised Atlanta classification. Diagnostic performances were assessed using sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), receiver operating characteristic (ROC) curve analysis, and multivariate logistic regression.

Results: A total of 165 patients were included, of whom 45 (27%) developed severe acute pancreatitis. BISAP ≥3 demonstrated good prognostic accuracy with a sensitivity of 77%, specificity of 85%, PPV of 68%, NPV of 91%, and AUC of 0.85. CRP ≥150 mg/L showed a sensitivity of 77%, specificity of 71%, PPV of 50%, NPV of 89%, and AUC of 0.79. The combined BISAP–CRP model achieved the best discriminative performance with an AUC of 0.89. The strategy "BISAP ≥3 OR CRP ≥150 mg/L" improved sensitivity and NPV, whereas "BISAP ≥3 AND CRP ≥150 mg/L" improved specificity and PPV.

Conclusion: The BISAP score is a simple and reliable predictor of severe acute pancreatitis. Combining BISAP with 48-hour CRP significantly improves prognostic performance and may represent a clinically useful strategy for early risk stratification.

Keywords: Acute pancreatitis; BISAP score; C-reactive protein; Severity prediction; Prognostic model

1. Introduction

Acute pancreatitis (AP) is one of the most common gastrointestinal emergencies worldwide and represents a major cause of hospitalization and healthcare burden. Although most cases are mild and self-limited, approximately 20–30% of patients develop severe acute pancreatitis (SAP), which is associated with persistent organ failure, local complications, prolonged hospitalization, and increased mortality.

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Early identification of patients at risk of severe disease is therefore crucial for optimizing triage, guiding intensive monitoring, and improving clinical outcomes. Several prognostic scoring systems have been developed for this purpose, including Ranson's criteria, APACHE II, CTSI, and the Bedside Index for Severity in Acute Pancreatitis (BISAP).

Among these tools, BISAP has gained increasing interest because of its simplicity, rapid bedside applicability, and good prognostic accuracy. The score can be calculated within the first 24 hours of admission using five routinely available clinical parameters.

C-reactive protein (CRP) is an inexpensive inflammatory biomarker widely used in clinical practice. Elevated CRP levels, particularly at 48 hours after admission, have been associated with severe acute pancreatitis and adverse clinical outcomes.

While both BISAP and CRP individually demonstrate prognostic value, data regarding their combined use remain limited, particularly in North African populations. The present study aimed to evaluate the prognostic performance of BISAP combined with 48-hour CRP for early prediction of severe acute pancreatitis.

2. Materials and Methods

2.1. Study Design and Population

- This retrospective single-center study was conducted at Hassan II University Hospital, Fez, Morocco.
- Consecutive adult patients hospitalized for acute pancreatitis between January 2022 and January 2025 were included.
- Acute pancreatitis was diagnosed according to the revised Atlanta 2012 criteria requiring at least two of the following:
- characteristic abdominal pain;
- serum lipase level greater than three times the upper limit of normal;
- imaging findings consistent with acute pancreatitis.

2.2. Exclusion Criteria

Patients were excluded in cases of:

- Incomplete medical records;
- Chronic pancreatitis;
- Pancreatic malignancy;
- Transfer after initial management;
- Absence of CRP measurement at 48 hours;
- Age <18 years.

2.3. Data Collection

Clinical, biological, and radiological data were retrospectively extracted from electronic medical records.

Collected variables included:

- Age;
- Sex;
- Etiology of pancreatitis;
- BISAP score;
- CRP level at 48 hours;
- ICU admission;
- Organ failure;
- Local and systemic complications;
- Length of hospitalization;
- Mortality.

2.4. BISAP Score Assessment

BISAP score was calculated within the first 24 hours after admission using the following five variables:

- BUN >25 mg/dL;
- impaired mental status;
- SIRS;
- age >60 years;
- pleural effusion.
- Scores ranged from 0 to 5. A BISAP score ≥3 was considered predictive of severe disease.

2.5. CRP Assessment

CRP levels were measured at 48 hours after admission. A cutoff value ≥150 mg/L was used according to previous literature.

2.5.1. Definition of Severe Acute Pancreatitis

Severity was defined according to the revised Atlanta classification 2012. Severe AP was defined by persistent organ failure lasting more than 48 hours, ICU admission, systemic complications, or death.

2.5.2. Combined BISAP–CRP Model

A combined prognostic model integrating BISAP score and CRP level at 48 hours was evaluated using two complementary clinical strategies:

"BISAP ≥3 OR CRP ≥150 mg/L" strategy to maximize sensitivity for early identification of high-risk patients;

"BISAP ≥3 AND CRP ≥150 mg/L" strategy to maximize specificity for prediction of severe disease.

Receiver operating characteristic (ROC) analysis was additionally performed to evaluate the overall discriminative performance of the combined BISAP–CRP model.

2.6. Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics software.

Continuous variables were expressed as median and interquartile range (IQR), while categorical variables were expressed as frequencies and percentages.

Comparisons between severe and non-severe AP were performed using Chi-square or Fisher's exact tests for categorical variables and Student's t-test or Mann–Whitney U test for continuous variables.

Diagnostic performances were evaluated using:

- Sensitivity;
- Specificity;
- Positive predictive value (PPV);
- Negative predictive value (NPV);
- Receiver operating characteristic (ROC) analysis.
- A p-value <0.05 was considered statistically significant.

2.7. Ethics Approval

The study protocol was approved by the Institutional Ethics Committee of Hassan II University Hospital, Fez, Morocco. Due to the retrospective nature of the study and the use of anonymized clinical data, the requirement for informed consent was waived.

3. Results

3.1. Baseline Characteristics

A total of 165 patients were included during the study period. The median age was 61 years, with female predominance. Severe acute pancreatitis occurred in 45 patients (27%).

Patients with severe acute pancreatitis had significantly higher rates of ICU admission, systemic complications, and mortality.

Table 1 Baseline characteristics according to disease severity

Variables	Non-severe AP (n=120)	Severe AP (n=45)	p-value
Median age (years)	56	68	0.01
Female sex	72 (60.0%)	29 (64.4%)	0.65
Biliary etiology	78 (65.0%)	31 (68.9%)	0.72
BISAP ≥3	18 (15.0%)	35 (77.8%)	<0.001
CRP ≥150 mg/L	32 (26.7%)	35 (77.8%)	<0.001
ICU admission	5 (4.2%)	25 (55.6%)	<0.001
Mortality	1 (0.8%)	8 (17.8%)	0.001

3.2. Prognostic Performance of BISAP

A BISAP score ≥3 was significantly associated with severe acute pancreatitis (77.8% vs 15.0%, p<0.001), ICU admission, and mortality.

The ROC curve analysis demonstrated good discriminative performance of BISAP for prediction of SAP, with an AUC of 0.85.

3.3. Prognostic Performance of CRP

CRP ≥150 mg/L at 48 hours was significantly more frequent in severe AP compared with non-severe AP (77.8% vs 26.7%, p<0.001).

CRP showed acceptable prognostic performance with an AUC of 0.79.

3.4. Combined BISAP–CRP Assessment

The combination strategy "BISAP ≥3 OR CRP ≥150 mg/L" substantially improved sensitivity and negative predictive value, making it useful for early screening of high-risk patients.

Conversely, the strategy "BISAP ≥3 AND CRP ≥150 mg/L" improved specificity and positive predictive value, allowing identification of patients at particularly high risk for severe disease progression.

The prognostic performances of BISAP and CRP are summarized in Table 2.

Table 2 Diagnostic performance of BISAP and CRP

Predictor	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
BISAP ≥3	77	85	68	91
CRP ≥150 mg/L	77	71	50	89
BISAP ≥3 OR CRP ≥150 mg/L	91	65	52	95
BISAP ≥3 AND CRP ≥150 mg/L	60	91	74	84

Table 3 Area under the ROC curve analysis

Predictor	AUC	95% CI
BISAP score	0.85	0.78-0.91
CRP at 48 hours	0.79	0.71-0.87
Combined BISAP–CRP model	0.89	0.83-0.95

3.5. Multivariate Logistic Regression Analysis

Multivariate logistic regression analysis identified both BISAP score and CRP at 48 hours as independent predictors of severe acute pancreatitis.

BISAP score demonstrated a strong independent association with disease severity (OR 3.38, 95% CI 1.55–7.37; p=0.002), whereas CRP showed a modest but statistically significant independent association (OR 1.007, 95% CI 1.000–1.015; p=0.034).

Table 4 Multivariate analysis for prediction of severe acute pancreatitis

Variable	Odds Ratio (OR)	95% CI	p-value
BISAP score	3.38	1.55–7.37	0.002
CRP at 48 hours	1.007	1.000–1.015	0.034

Receiver operating characteristic analysis demonstrated that the combined BISAP–CRP model achieved the highest discriminative performance with an AUC of 0.89 (95% CI: 0.83–0.95), compared with 0.85 (95% CI: 0.78–0.91) for BISAP alone and 0.79 (95% CI: 0.71–0.87) for CRP alone.

4. Discussion

Early identification of severe acute pancreatitis remains a major clinical priority because delayed recognition is associated with increased morbidity, mortality, prolonged hospitalization, and inappropriate utilization of intensive care resources.

In the present study, BISAP demonstrated good prognostic accuracy for predicting severe acute pancreatitis, with a sensitivity of 77%, specificity of 85%, and AUC of 0.85. These findings are consistent with previous validation studies demonstrating the utility of BISAP as a rapid bedside prognostic tool [5–9].

One of the major advantages of BISAP lies in its simplicity and early applicability. Unlike APACHE II or Ranson's criteria, BISAP can be calculated within the first 24 hours using routinely available clinical variables. This characteristic is particularly valuable in emergency departments and resource-limited healthcare systems.

CRP remains one of the most accessible inflammatory biomarkers in acute pancreatitis. In our study, CRP ≥150 mg/L demonstrated acceptable sensitivity but lower specificity compared with BISAP alone. These findings are consistent with previous reports emphasizing the usefulness of CRP while highlighting its limited specificity when used as an isolated marker [10,11].

The most important finding of our study was the improved prognostic accuracy observed with combined BISAP–CRP assessment. The strategy "BISAP ≥3 OR CRP ≥150 mg/L" achieved excellent sensitivity and negative predictive value, making it useful as a screening tool to identify patients requiring close monitoring. Conversely, the "AND" strategy significantly improved specificity and PPV, thereby identifying patients at particularly high risk for severe disease progression.

This dual-strategy approach may have important clinical implications. Highly sensitive models are useful for early triage and prevention of delayed ICU management, whereas highly specific models may help reduce unnecessary ICU admissions and healthcare resource overutilization.

Our study provides valuable regional data regarding prognostic assessment of acute pancreatitis in North African populations, where published evidence remains limited.

Several limitations should nevertheless be acknowledged. First, the retrospective design may expose the study to selection and information bias. Second, the single-center nature and relatively limited sample size may reduce generalizability. Third, we did not compare BISAP–CRP assessment with other prognostic scores such as APACHE II or CTSI. Although multivariate analysis and ROC curve analyses were performed, external validation in larger prospective multicenter cohorts remains necessary.

Despite these limitations, our study highlights the potential utility of a simple, inexpensive, and reproducible prognostic strategy readily applicable in routine clinical practice.

5. Conclusion

The BISAP score is a simple, rapid, and reliable predictor of severe acute pancreatitis.

The addition of 48-hour CRP significantly improves prognostic performance and may constitute a clinically useful strategy for early risk stratification.

Combined BISAP–CRP assessment may facilitate optimized triage, earlier identification of high-risk patients, and more appropriate allocation of intensive care resources.

Large prospective multicenter studies are warranted to validate these findings and refine prognostic algorithms in acute pancreatitis.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

The requirement for informed consent was waived by the Institutional Ethics Committee due to the retrospective nature of the study and the use of anonymized clinical data.

Statement of Ethical Approval

The study protocol was approved by the Institutional Ethics Committee of Hassan II University Hospital, Fez, Morocco.

References

[1] Banks PA, Bollen TL, Dervenis C, Gooszen HG, Johnson CD, Sarr MG, et al. Classification of acute pancreatitis—2012 revision of the Atlanta classification and definitions by international consensus. Gut. 2013;62(1):102–11.

[2] Boxhoorn L, Voermans RP, Bouwense SA, Bruno MJ, Verdonk RC, Boermeester MA, et al. Acute pancreatitis. Lancet. 2020;396(10252):726–34.

[3] Petrov MS, Yadav D. Global epidemiology and holistic prevention of pancreatitis. Nat Rev Gastroenterol Hepatol. 2019;16(3):175–84.

[4] Crockett SD, Wani S, Gardner TB, Falck-Ytter Y, Barkun AN. American Gastroenterological Association Institute guideline on initial management of acute pancreatitis. Gastroenterology. 2018;154(4):1096–101.

[5] Papachristou GI, Muddana V, Yadav D, O'Connell M, Sanders MK, Slivka A, et al. Comparison of BISAP, Ranson's, APACHE-II, and CTSI scores in predicting organ failure, complications, and mortality in acute pancreatitis. Am J Gastroenterol. 2010;105(2):435–41.

[6] Wu BU, Johannes RS, Sun X, Tabak Y, Conwell DL, Banks PA. The early prediction of mortality in acute pancreatitis: a large population-based study. Gut. 2008;57(12):1698–703.

[7] Singh VK, Wu BU, Bollen TL, Repas K, Maurer R, Mortele KJ, et al. A prospective evaluation of the bedside index for severity in acute pancreatitis score in assessing mortality and intermediate markers of severity in acute pancreatitis. Am J Gastroenterol. 2009;104(4):966–71.

[8] Zhang J, Shahbaz M, Fang R, Liang B, Gao C, Gao H, et al. Comparison of the BISAP scores for predicting the severity of acute pancreatitis according to the revised Atlanta classification. Medicine (Baltimore). 2014;93(28):e216.

[9] Gao W, Yang HX, Ma CE. The value of BISAP score for predicting mortality and severity in acute pancreatitis: a systematic review and meta-analysis. PLoS One. 2015;10(6):e0130412.

[10] Cardoso FS, Ricardo LB, Oliveira AM, Canena JM, Horta DV, Papoila AL, et al. C-reactive protein prognostic accuracy in acute pancreatitis: timing of measurement and cutoff points. Eur J Gastroenterol Hepatol. 2013;25(7):784–9.

[11] Komolafe O, Pereira SP, Davidson BR, Gurusamy KS. Serum C-reactive protein, procalcitonin, and lactate dehydrogenase for predicting severe acute pancreatitis: systematic review and meta-analysis. Dig Surg. 2017;34(4):270–7.

[12] Cho JH, Kim TN, Chung HH, Kim KH. Comparison of scoring systems in predicting the severity of acute pancreatitis. World J Gastroenterol. 2015;21(8):2387–94.