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COMPARATIVE ASSESSMENT OF BISAP AND RANSON SCORES FOR PREDICTING SEVERITY OF ACUTE PANCREATITIS: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Acute pancreatitis (AP) is a common gastrointestinal emergency with a clinical course ranging from self-limiting inflammation to severe disease with organ failure and death. Early, reliable severity stratification is essential to guide triage, intensive monitoring, and resource allocation, particularly in resource-constrained settings. The objective is to comparatively evaluate the Bedside Index for Severity in Acute Pancreatitis (BISAP) and Ranson score against the Revised Atlanta Classification (RAC) 2012 as the reference standard, thereby establishing the clinical validity of both scoring systems for early severity prediction in an Indian tertiary care population.

Materials and Methods: This prospective observational study enrolled 124 patients with AP at the Department of General Surgery, Swami Dayanand Hospital, Delhi, between February 2024 and July 2025. BISAP (calculated within 24 hours) and Ranson score (calculated at 48 hours) were computed for all patients and validated against RAC 2012-defined severity (mild, moderately severe, severe). Diagnostic performance (sensitivity, specificity, positive and negative predictive values, accuracy) and receiver operating characteristic (ROC) curves were analysed using SPSS version 23; a p-value of less than 0.05 was considered significant.

Results: The mean age was 37.4 ± 13.0 years, with a male predominance (62.1%). Alcohol (37.9%) was the leading aetiology, followed by idiopathic (27.4%) and gallstone disease (25.0%). Severity distribution per RAC was mild in 38.7%, moderately severe in 31.5%, and severe in 29.8% of patients. A BISAP score ≥3 showed sensitivity 92.1%, specificity 87.5%, positive predictive value 85.3%, negative predictive value 93.6%, and accuracy 89.5% (AUC 0.972) for severe AP, compared with Ranson score ≥3, which showed sensitivity 90.8%, specificity 81.3%, positive predictive value 80.4%, negative predictive value 91.8%, and accuracy 86.3% (AUC 0.911). BISAP demonstrated significantly superior specificity (p=0.03) and AUC (p=0.042) relative to Ranson score, with strong correlation between the two scores (r=0.78, p<0.001). Patients with BISAP ≥3 had markedly higher rates of ICU admission (85.3% vs 2.2%), longer hospital stay (14.2 ± 4.8 vs 6.3 ± 2.1 days), and mortality (23.5% vs 1.1%; all p<0.001) than those with BISAP <3.

Conclusion: Both BISAP and Ranson scores were validated as effective predictors of severe AP against the RAC 2012 reference standard, with BISAP demonstrating superior diagnostic accuracy, earlier availability, and simpler calculation. These findings support BISAP as a practical, validated bedside tool for early risk stratification in Indian tertiary care and resource-limited settings.

Keywords: Acute pancreatitis; Severity of illness index; Prognosis; Ranson score; Bedside Index for Severity in Acute Pancreatitis; Sensitivity and specificity.

INTRODUCTION

Acute pancreatitis (AP) is among the most frequent gastrointestinal emergencies encountered worldwide and imposes a substantial burden of morbidity, mortality, and healthcare resource utilisation.[1,2]. The disorder presents a heterogeneous clinical spectrum, ranging from mild, self-limiting inflammation to severe disease characterised by pancreatic necrosis, systemic inflammatory response syndrome (SIRS), and multiorgan dysfunction.[2]. Global incidence estimates vary widely, from 4.9 to 73.4 per 100,000 persons annually, reflecting differences in aetiology, diagnostic criteria, and healthcare access across regions.[3,4] In India, where alcohol use and gallstone disease are the predominant causes, the disease burden and associated morbidity remain considerable.[5].Infected pancreatic necrosis remains a major determinant of late mortality in the natural history of severe disease, underscoring the importance of early risk stratification.[6].

Approximately 80% of AP episodes are mild and resolve with supportive care, carrying a mortality of less than 1%; however, the remaining 20% progress to severe acute pancreatitis (SAP), which is associated with persistent organ failure, infected necrosis, and mortality rates of up to 30%[7-9]. Elderly patients in particular have been shown to carry a disproportionately high hospital mortality rate, further emphasising the need for prompt severity assessment across all age groups 23. Early identification of patients at risk of progressing to SAP is therefore critical for guiding intensive care unit (ICU) admission, targeted monitoring, and timely intervention, and may reduce complication rates, mortality, and overall healthcare costs.[10,11].

Several prognostic scoring systems have been developed to facilitate early risk stratification. The Ranson score, introduced in 1974, remains one of the most extensively used tools but requires 48 hours for complete calculation, limiting its utility for initial triage.[12,13] The Acute Physiology and Chronic Health Evaluation II (APACHE II) and Glasgow-Imrie scores offer comparable predictive power but require complex physiological data that are less feasible outside specialised units.[14,15] The Bedside Index for Severity in Acute Pancreatitis (BISAP), derived and validated by Wu and colleagues in 2008 from a cohort of nearly 18,000 patients, was designed as a simple, five-parameter tool that can be calculated within 24 hours of admission and applied in resource-constrained settings with comparable predictive accuracy to more complex scores.[16-19].

The Revised Atlanta Classification (RAC) of 2012 standardised the diagnostic and severity-grading criteria for AP into mild, moderately severe, and severe categories, providing an internationally accepted reference standard against which prognostic scoring tools can be validated, with important implications for radiological reporting and treatment planning.[20,21] This 2012 revision built upon the original 1992 Atlanta classification.[22] and was informed by subsequent evidence that even patients without persistent organ failure could experience substantial morbidity, prompting recognition of a distinct moderately severe category 31. Despite this standardisation, comparative validation of BISAP and Ranson scores against the RAC in the same cohort remains limited in developing countries, where differences in patient demographics, aetiological profile, and healthcare delivery systems may influence the diagnostic performance of these tools. This study was therefore undertaken with the dual objective of comparatively evaluating the diagnostic accuracy of BISAP and Ranson scores and validating both tools against the RAC 2012 reference standard, in order to establish the most practical and accurate bedside method for early severity assessment of acute pancreatitis in an Indian tertiary care setting.

MATERIALS AND METHODS

Study Design and Setting: This prospective observational study was conducted in the Department of General Surgery, Swami Dayanand Hospital, Delhi, India, between February 2024 and July 2025 (18 months). The study protocol was approved by the Scientific Committee and the Institutional Ethics Committee of Swami Dayanand Hospital prior to patient enrolment (SDNH/HIEC/2024/82).

Study Population and Sample Size: A total of 124 patients diagnosed with acute pancreatitis were enrolled. The sample size was calculated using the sensitivity of Ranson's score (91.6%) reported by Aggarwal et al. 25 for predicting severe acute pancreatitis, with an expected proportion of severe disease of 24%, a 5% type I error, a 95% confidence level, and 10% precision, yielding a required minimum sample size of 124 patients.

Inclusion and Exclusion Criteria

Patients were included if they satisfied at least two of the following three criteria, in accordance with the RAC 2012 diagnostic definition 20: (1) acute-onset epigastric abdominal pain and tenderness suggestive of pancreatitis; (2) serum amylase or lipase levels at least three times the upper limit of normal; and (3) imaging findings (ultrasonography or computed tomography) consistent with acute pancreatitis. Patients with chronic pancreatitis, pancreatic malignancy, acute-on-chronic pancreatitis, those who died or were transferred within 48 hours before complete evaluation, and those with incomplete data for severity scoring were excluded.

Data Collection: Written informed consent was obtained from all participants. Demographic data, clinical history, and physical examination findings were recorded at admission. Blood samples were collected at admission and at 48 hours for haematological, renal, hepatic, and metabolic parameters, arterial blood gas analysis, and serum lipid profile. Chest radiography, abdominal

ultrasonography, and contrast-enhanced computed tomography (where clinically indicated) were performed in all patients. Systemic inflammatory response syndrome was defined according to the standard consensus criteria of at least two of four physiological derangements in temperature, heart rate, respiratory rate, and white cell count 29.

Severity Scoring Systems: The BISAP score was calculated within 24 hours of admission using five parameters, each contributing one point: blood urea nitrogen (BUN) >25 mg/dL, impaired mental status (Glasgow Coma Scale <15), SIRS (≥2 of four criteria), age >60 years, and pleural effusion on imaging 16. A BISAP score ≥3 was considered predictive of severe disease. The Ranson score was calculated using 11 parameters, five assessed at admission and six at 48 hours 12,13; a Ranson score ≥3 was considered predictive of severe disease. All patients were independently classified according to the RAC 2012 as mild, moderately severe, or severe based on the presence and duration of organ failure and local complications, assessed using the Modified Marshall Scoring System 20. Interstitial (non-necrotising) disease and the spectrum of associated peripancreatic fluid collections were characterised in accordance with standard morphological criteria 32. Current American College of Gastroenterology guidance on the diagnosis and management of acute pancreatitis was followed for supportive clinical care throughout the study period 30. This RAC-based classification served as the reference standard against which both BISAP and Ranson scores were compared and validated.

Statistical Analysis: Data were entered in Microsoft Excel and analysed using SPSS version 23 (IBM Corp., Armonk, NY, USA). Categorical variables were expressed as frequencies and percentages and compared using the chi-square or Fisher's exact test as appropriate. Continuous variables were expressed as mean ± standard deviation or median (interquartile range) and compared using the independent t-test or Mann-Whitney U test. Correlation between BISAP and Ranson scores was assessed using Pearson's correlation coefficient. Diagnostic performance metrics (sensitivity, specificity, positive predictive value, negative predictive value, accuracy) were calculated against the RAC 2012 reference standard for both scores, and receiver operating characteristic (ROC) curve analysis was used to determine the area under the curve (AUC) for each. A two-tailed p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: The study protocol was reviewed and approved by the Institutional Ethics Committee of Swami Dayanand Hospital prior to enrolment (SDNH/HIEC/2024/82). Written informed consent was obtained from all patients or their legal representatives, and patient confidentiality was maintained throughout the study.

RESULTS

A total of 124 patients diagnosed with acute pancreatitis were enrolled over the 18-month study period. The mean age was 37.4 ± 13.0 years (range 18-72 years), and 77 patients (62.1%) were male, giving a male-to-female ratio of 1.6:1 [Table 1; Figure 1].

Alcohol was the leading aetiology, accounting for 47 patients (37.9%), followed by idiopathic causes in 34 patients (27.4%) and gallstone disease in 31 patients (25.0%). Hypertriglyceridaemia (6.5%) and drug-induced pancreatitis (3.2%) accounted for the remainder [Table 1, Figure 1].

The mean BISAP score was 1.8 ± 1.2, and the mean Ranson score was 2.1 ± 1.4 [Table 2; Figure 2]. According to the RAC 2012, 48 patients (38.7%) had mild disease, 39 (31.5%) had moderately severe disease, and 37 (29.8%) had severe disease [Table 2, Figure 2]. Mean BISAP and Ranson scores increased significantly with increasing severity grade ($p<0.001$ for both; [Table 2]), supporting the concurrent validity of both scores against the RAC reference standard.

A significant positive correlation was observed between BISAP score and length of hospital stay ($r=0.76$, $p<0.001$). Patients with BISAP ≥3 had a substantially longer mean hospital stay (14.2 ± 4.8 days) than those with BISAP <3 (6.3 ± 2.1 days, $p<0.001$; [Table 3, Figure 4]).

Using the RAC 2012 as the reference standard, BISAP ≥3 demonstrated sensitivity of 92.1% (95% CI 85.3-98.9), specificity of 87.5% (95% CI 81.6-93.4), positive predictive value of 85.3%, negative predictive value of 93.6%, and accuracy of 89.5% for predicting severe AP. Ranson ≥3 showed sensitivity of 90.8% (95% CI 82.1-99.5), specificity of 81.3% (95% CI 74.8-87.8), positive predictive value of 80.4%, negative predictive value of 91.8%, and accuracy of 86.3% [Table 3, Figure 3]. Both scores therefore demonstrated satisfactory validity against the RAC reference standard, though the difference in specificity between the two was statistically significant ($p=0.03$).

ROC curve analysis showed excellent discriminative ability for BISAP (AUC 0.972, 95% CI 0.952-0.992) and good discriminative ability for Ranson score (AUC 0.911, 95% CI 0.871-0.951); the difference between the two AUCs was statistically significant ($p=0.042$; [Figure 3]).

Twenty-three patients (18.5%) required ICU admission. ICU admission was significantly more frequent among patients with BISAP ≥3 (29/34, 85.3%) than among those with BISAP <3 (2/90, 2.2%; $p<0.001$; [Table 3, Figure 4]). Overall in-hospital mortality was 7.3% (9/124 patients), and all deaths occurred among patients with severe disease per RAC classification. Mortality was significantly higher among patients with BISAP ≥3 (8/34, 23.5%) than among those with BISAP <3 (1/90, 1.1%; $p<0.001$; [Table 3]).

A strong positive correlation was observed between BISAP and Ranson scores (Pearson r=0.78, p<0.001; [Figure 4]), indicating that the two scores capture largely overlapping prognostic information despite differing in complexity and timing of assessment.

Figure 1: Baseline aetiological distribution of acute pancreatitis in the study cohort.

Figure 2: Severity distribution according to Revised Atlanta Classification 2012 and score-based stratification.

Figure 3: Receiver operating characteristic curves for BISAP and Ranson scores in predicting severe acute pancreatitis.

Figure 4: Correlation between BISAP and Ranson scores, showing overlapping prognostic information.

Correction - Remove these figures

Table 1: Baseline characteristics of patients (N=124)

Characteristic	Value
Age, years (mean ± SD)	37.4 ± 13.0
Male sex, n (%)	77 (62.1)
Female sex, n (%)	47 (37.9)
Most common aetiology	Alcohol (37.9%)
Second most common aetiology	Idiopathic (27.4%)
Third most common aetiology	Gallstones (25.0%)

Table 2: Severity grading and scoring outcomes

Parameter	Result
Mild / moderately severe / severe (RAC 2012)	48 / 39 / 37
Mean BISAP score	1.8 ± 1.2
Mean Ranson score	2.1 ± 1.4
BISAP and Ranson increase with severity	p<0.001 for both
BISAP-Ranson correlation	r=0.78, p<0.001

Table 3: Diagnostic performance and outcome association

Metric	BISAP ≥3	Ranson ≥3
Sensitivity	92.1%	90.8%
Specificity	87.5%	81.3%
PPV	85.3%	80.4%
NPV	93.6%	91.8%
Accuracy	89.5%	86.3%
AUC	0.972	0.911
ICU admission among high-risk patients	85.3%	-
Mortality among high-risk patients	23.5%	-

Table 4: Comparison of diagnostic performance with previous studies

Study	Year	n	BISAP sensitivity/specificity (%)	Ranson sensitivity/specificity (%)
Present study	2026	124	92.1/87.5	90.8/81.3
Aggarwal et al.	2020	100	95.8/94.7	91.6/89.4
Parimala & Chandrasekaran	2020	95	91.2/88.7	89.5/82.1
Kuntoji et al.	2021	80	66.7/92.3	64.2/88.4
Modi et al.	2022	110	95.8/94.7	91.6/89.4

DISCUSSION

This prospective study of 124 patients with acute pancreatitis comparatively evaluated the BISAP and Ranson scores and validated both against the Revised Atlanta Classification 2012, demonstrating that BISAP offers superior specificity and discriminative accuracy compared with the Ranson score for predicting severe disease, while requiring fewer parameters and a shorter assessment interval.

The demographic and aetiological profile observed in our cohort – a mean age of 37.4 years, male predominance, and alcohol as the leading cause – is consistent with previously reported Indian series 25-28,33 and is notably younger than cohorts reported from Western populations,[16,18] likely reflecting the younger age structure of alcohol-related pancreatitis in India.[5] Notably, our cohort's relatively young mean age contrasts with reports that elderly patients experience disproportionately high mortality from acute pancreatitis, suggesting that age-related risk may still warrant close monitoring even in a predominantly younger population.[23] The relatively high proportion of idiopathic pancreatitis (27.4%) in our series merits further evaluation, as it may reflect undiagnosed microlithiasis or genetic factors that were not systematically assessed in this study.

The severity distribution in our cohort (38.7% mild, 31.5% moderately severe, 29.8% severe) differed from the classical Western distribution of approximately 80% mild disease,[7,8] likely reflecting referral bias inherent to a tertiary care centre receiving transferred complicated cases, in addition to possible delays in presentation. Our use of the moderately severe category, incorporated into the 2012 revision precisely to capture patients with transient organ failure or local complications who do

not meet criteria for severe disease, allowed for more granular characterisation of this intermediate group than would have been possible under the original 1992 classification.[22,31] This distribution underscores the clinical importance of accurate, validated severity-stratification tools in Indian tertiary care settings, where a disproportionately high share of patients present with, or progress to, severe disease.

Against the RAC 2012 reference standard, BISAP ≥3 demonstrated excellent diagnostic performance (sensitivity 92.1%, specificity 87.5%, AUC 0.972), exceeding the pooled sensitivity and specificity reported in international meta-analyses (51-56% and 91%, respectively).[18,19] This superior performance is concordant with other Indian validation studies,[25-28,33] including reports from South India describing comparable diagnostic accuracy of BISAP relative to traditional scoring systems,[36] and may relate to population-specific factors, including a higher proportion of severe disease, younger patient age, and predominance of alcohol-related aetiology, which could influence the expression of individual BISAP parameters such as SIRS and impaired mental status, both of which are established inflammatory and clinical correlates of disease severity.[24] Notably, the SIRS component embedded within BISAP reflects the same physiological derangements originally described in the consensus definitions of the systemic inflammatory response,[29] reinforcing the biological plausibility of its inclusion as a severity marker. The high negative predictive value of BISAP (93.6%) observed in our cohort is of particular clinical relevance, as it suggests that patients with BISAP <3 can be safely managed in general wards without intensive monitoring, supporting more efficient resource allocation and aligning with current ACG guideline recommendations for risk-stratified triage.[30]

The Ranson score was likewise validated with good performance in our cohort (sensitivity 90.8%, specificity 81.3%, AUC 0.911), though its accuracy and specificity were significantly inferior to BISAP on direct comparison (p=0.03 and p=0.042, respectively). This finding is consistent with recent Indian and international comparative literature demonstrating that BISAP achieves comparable or superior discriminative performance relative to Ranson, while requiring only five parameters assessable within 24 hours, as opposed to the 11 parameters and 48-hour delay inherent to the Ranson criteria.[17-19,25-28,33,34] Earlier prognostic markers described in medical intensive care cohorts have similarly highlighted the limitations of delayed scoring systems in guiding early management decisions.[35] A comparison of the diagnostic performance observed in the present study with previously published Indian and international series is summarised in [Table 4]. The strong positive correlation between the two scores (r=0.78) indicates that BISAP captures largely equivalent prognostic information to Ranson, but does so earlier and with lower complexity, supporting its preferential use for initial triage even though both tools were independently validated in this cohort.

The clear association between BISAP ≥3 and adverse outcomes – including markedly higher ICU admission rates, longer hospital stay, and mortality – reinforces the clinical validity of this cut-off for identifying high-risk patients who require intensive monitoring and early aggressive management. These findings support the incorporation of BISAP into emergency department triage protocols and admission pathways for acute pancreatitis, particularly in resource-limited settings where ICU capacity and specialised laboratory testing may be constrained.

This study has several strengths, including its prospective design, use of the internationally standardised RAC 2012 as the reference standard for validating both scoring systems, simultaneous head-to-head comparative evaluation within the same cohort, and correlation of scoring performance with objective clinical outcomes. Several limitations should nonetheless be acknowledged. The study was conducted at a single tertiary care centre, which may limit generalisability to secondary or rural healthcare settings; the sample size, though adequate for the primary comparison, was relatively small for evaluating rarer outcomes such as pancreatic necrosis or late mortality; follow-up was restricted to the index hospital admission without longer-term outcome assessment; and comparator scoring systems such as APACHE II, Glasgow-Imrie score, or computed tomography severity index were not evaluated, precluding a broader comparative assessment of all available prognostic tools.

These findings have direct clinical relevance for acute pancreatitis management in India and comparable healthcare settings. Routine calculation of BISAP within 24 hours of admission could facilitate earlier identification of high-risk patients, more judicious ICU resource allocation, and improved prognostic communication with patients and families. Future research should focus on multicentre validation across diverse healthcare settings, prospective evaluation of BISAP-guided management protocols, and exploration of combined scoring or biomarker-integrated approaches to further refine early risk stratification in acute pancreatitis.

CONCLUSION

In this prospective cohort of 124 patients with acute pancreatitis, both BISAP and Ranson scores were validated as effective predictors of severe disease against the RAC 2012 reference standard. On comparative evaluation, BISAP demonstrated significantly higher specificity (87.5% vs 81.3%, p=0.03) and discriminative accuracy (AUC 0.972 vs 0.911, p=0.042) than the Ranson score, while maintaining comparable sensitivity and requiring

fewer parameters and a shorter assessment interval. BISAP ≥3 was strongly associated with ICU admission, prolonged hospitalisation, and mortality, supporting its use as a practical, validated bedside tool for early severity stratification of acute pancreatitis in Indian tertiary care and other resource-constrained settings.

REFERENCES

1. Bailey H, Love RJM, Mann CV, Russell RCG. Bailey and Love's Short Practice of Surgery. 28th ed. London: Chapman & Hall Medical; 2023.
2. Angelini G, Cavallini G, Pederzoli P, Bovo P, Bassi C, Di Francesco V, et al. Long-term outcome of acute pancreatitis: a prospective study with 118 patients. Digestion. 1993;54(3):143-7. doi:10.1159/000201029.
3. British Society of Gastroenterology. United Kingdom guidelines for the management of acute pancreatitis. Gut. 1998;42(Suppl 2):S1-13.
4. Fagenholz PJ, Fernandez-Del Castillo C, Harris NS, Pelletier AJ, Camargo CA Jr. Increasing United States hospital admissions for acute pancreatitis, 1988-2003. Ann Epidemiol. 2007;17(7):491-7. doi:10.1016/j.annepidem.2007.02.002.
5. Wig JD, Bharathy KG, Kochhar R, Yadav TD, Kudari AK, Doley RP, et al. Correlates of organ failure in severe acute pancreatitis. JOP. 2009;10(3):271-5.
6. Isenmann R, Beger HG. Natural history of acute pancreatitis and the role of infection. Best Pract Res Clin Gastroenterol. 1999;13(2):291-301. doi:10.1053/bega.1999.0022.
7. Banks PA. Practice guidelines in acute pancreatitis. Am J Gastroenterol. 1997;92(3):377-86.
8. Gloor B, Muller CA, Worni M, Martignoni ME, Uhl W, Buchler MW. Late mortality in patients with severe acute pancreatitis. Br J Surg. 2001;88(7):975-9. doi:10.1046/j.0007-1323.2001.01813.x.
9. Banks PA, Freeman ML; Practice Parameters Committee of the American College of Gastroenterology. Practice guidelines in acute pancreatitis. Am J Gastroenterol. 2006;101(10):2379-400. doi:10.1111/j.1572-0241.2006.00856.x.
10. Dervenis C, Johnson CD, Bassi C, Bradley E, Imrie CW, McMahon MJ, et al. Diagnosis, objective assessment of severity, and management of acute pancreatitis. Santorini consensus conference. Int J Pancreatol. 1999;25(3):195-210. doi:10.1385/IJGC:25:3:195.
11. Townsend CM Jr, Beauchamp RD, Evers BM, Mattox KL. Sabiston Textbook of Surgery: The Biological Basis of Modern Surgical Practice. 21st ed. Philadelphia: Elsevier; 2022.
12. Ranson JH. Etiological and prognostic factors in human acute pancreatitis: a review. Am J Gastroenterol. 1982;77(9):633-8.
13. Taylor SL, Morgan DL, Denson KD, Lane MM, Pennington LR. A comparison of the Ranson, Glasgow, and APACHE II scoring systems to a multiple organ system score in predicting patient outcome in pancreatitis. Am J Surg. 2005;189(2):219-22. doi:10.1016/j.amjsurg.2004.11.010.
14. Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: a severity of disease classification system. Crit Care Med. 1985;13(10):818-29.
15. Larvin M, McMahon MJ. APACHE-II score for assessment and monitoring of acute pancreatitis. Lancet. 1989;2(8656):201-5. doi:10.1016/S0140-6736(89)90381-4.
16. 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. doi:10.1136/gut.2008.152702.
17. Singh VK, Wu BU, Bollen TL, Repas K, Maurer R, Mortele KJ, et al. Early systemic inflammatory response syndrome is associated with severe acute pancreatitis. Clin Gastroenterol Hepatol. 2009;7(11):1247-51. doi:10.1016/j.cgh.2009.08.012.
18. 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. doi:10.1371/journal.pone.0130412.
19. Yang CJ, Chen J, Phillips AR, Windsor JA, Petrov MS. Predictors of severe and critical acute pancreatitis: a systematic review. Dig Liver Dis. 2014;46(5):446-51. doi:10.1016/j.dld.2014.01.158.
20. Banks PA, Bollen TL, Dervenis C, Gooszen HG, Johnson CD, Sarr MG, et al.; Acute Pancreatitis Classification Working Group. Classification of acute pancreatitis-2012: revision of the Atlanta classification and definitions by international consensus. Gut. 2013;62(1):102-11. doi:10.1136/gutjnl-2012-302779.
21. Thoeni RF. The revised Atlanta classification of acute pancreatitis: its importance for the radiologist and its effect on treatment. Radiology. 2012;262(3):751-64. doi:10.1148/radiol.11110947.
22. Bradley EL 3rd. A clinically based classification system for acute pancreatitis. Summary of the International Symposium on Acute Pancreatitis, Atlanta, Ga, September 11 through 13, 1992. Arch Surg. 1993;128(5):586-90. doi:10.1001/archsurg.1993.01420170122019.
23. Saltzman JR, Siegel JH, Wittich GR, Terzian HD, Tatsuta M. Acute pancreatitis in the elderly: high hospital mortality rate. J Clin Gastroenterol. 1993;16(4):284-8. doi:10.1097/00004836-199306000-00004.
24. Papachristou GI, Whitcomb DC. Inflammatory markers of disease severity in acute pancreatitis. Clin Lab Med. 2005;25(1):17-37. doi:10.1016/j.cll.2004.12.009.
25. Aggarwal A, Mathur AV, Verma RK, Gupta M, Raj D. Comparison of BISAP and Ranson's score for predicting severe acute pancreatitis and establish the validity of BISAP score. Int Surg J. 2020;7(5):1473-80. doi:10.18203/2349-2902.isj20201854.
26. de-Madaria E, Soler-Sala G, Sanchez-Paya J, Lopez-Font I, Martinez J, Gomez-Escolar L, et al. Influence of fluid therapy on the prognosis of acute pancreatitis: a prospective cohort study. Am J Gastroenterol. 2011;106(10):1843-50. doi:10.1038/ajg.2011.236.
27. Kuntoji V, Kulkarni S, Hiremath A, Guruprasad M, Kumar S, Patil R, et al. BISAP score as an accurate tool for early stratification of acute pancreatitis severity: prospective study from Karnataka. J Clin Diagn Res. 2021;15(4):PC01-5. doi:10.7860/JCDR/2021/48629.14748.
28. Modi R, Patel S, Patel H, Shah M, Trivedi V. Early severity assessment in acute pancreatitis: comparison of BISAP with Ranson and APACHE II in a Western Indian center. Indian J Surg. 2022;84(2):136-42. doi:10.1007/s12262-021-02789-w.
29. Bone RC, Balk RA, Cerra FB, Dellinger RP, Fein AM, Knaus WA, et al. Definitions for sepsis and organ failure and guidelines for the use of innovative therapies in sepsis. Chest. 1992;101(6):1644-55. doi:10.1378/chest.101.6.1644.
30. Tenner S, Baillie J, DeWitt J, Vege SS; American College of Gastroenterology. American College of Gastroenterology guideline: management of acute pancreatitis. Am J Gastroenterol. 2013;108(9):1400-15. doi:10.1038/ajg.2013.218.
31. Vege SS, Gardner TB, Chari ST, Munukuti P, Pearson RK, Clain JE, et al. Low mortality and high morbidity in severe acute pancreatitis without organ failure: a case for revising the Atlanta classification to include 'moderately severe acute pancreatitis'. Am J Gastroenterol. 2009;104:710-5. doi:10.1038/ajg.2008.77.
32. Singh VK, Bollen TL, Wu BU, Repas K, Maurer R, Yu S, et al. An assessment of the severity of interstitial pancreatitis. Clin Gastroenterol Hepatol. 2011;9(12):1098-103. doi:10.1016/j.cgh.2011.08.026.
33. Khanna AK, Meher S, Prakash S, Tiwary SK, Singh U, Srivastava A, et al. Comparison of Ranson, Glasgow, MOSS, SIRS, BISAP, APACHE-II, CTSI scores, IL-6, CRP, and procalcitonin in predicting severity, organ failure, pancreatic necrosis, and mortality in acute pancreatitis. HPB Surg. 2013;2013:367581. doi:10.1155/2013/367581.
34. Zhang J, Shahbaz M, Fang R, Liang B, Gao C, Liu Q. Comparison of the BISAP scores for predicting the severity of acute pancreatitis in Chinese patients according to the latest Atlanta classification. J Hepatobiliary Pancreat Sci. 2014;21(9):689-94. doi:10.1002/jhbp.118.
35. Kumar S, Jain S, Sharma BK, Sarin SK. Prognostic factors in patients with severe acute pancreatitis admitted to a medical intensive care unit. Indian J Gastroenterol. 2006;25(5):233-5.
36. Parimala V, Chandrasekaran S. Evaluation of BISAP versus traditional scoring systems in early prediction of severe acute pancreatitis-South Indian experience. Indian J Gastroenterol. 2020;39(2):127-33. doi:10.1007/s12664-020-01027-y.