RESEARCH ARTICLE

Bedside index (BISAP) v/s Ranson scores in predicting mortality and severity in patients with acute pancreatitis

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Abstract

Objective: To determine the diagnostic accuracy of the bedside index for severity in acute pancreatitis in comparison with Ranson scores in predicting mortalities and severities in patients with acute pancreatitis.

Methods: The cross-sectional study was conducted at the Department of Emergency Medicine, Aga Khan University Hospital, Karachi, from July 1, 2017, to January 1, 2018, and comprised patients who presented with acute pancreatitis. The bedside index for severity in acute pancreatitis score was applied in the emergency department and the patients were followed up in ward/intensive care unit where Ranson scores were calculated within the following 48 hours. Both the scores were calculated and compared for the prediction of severity and mortality for each patient. Data was analysed using SPSS 20.

Results: Of the 136 patients, 88(64.7%) were males and 48(35.3%) were females. The overall mean age was 42.04±16.42 years (16-75 years), On the basis of two scores, mild and moderate acute pancreatitis was diagnosed in 123(90.4%) and 119(87.5%) patients respectively, while severe condition was diagnosed in 13(9.6%) and 17(12.5%) patients respectively. The bedside index had specificity 94.62% compared to 91.54% for Ranson score; sensitivity 100% vs 100%; negative predictive value 100% vs 100%; positive predictive value 46.15% vs 35.29%; and diagnostic accuracy 94.85% vs 91.91%.

Conclusion: The bedside index for severity in acute pancreatitis and Ranson score were both found to be reliable tools in predicting mortalities and severities in patients with acute pancreatitis.

Keywords: Acute pancreatitis, Abdominal pain, BISAP score, Ranson score. (JPMA 71: 1988; 2021)

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Introduction

One of the most common pathologies diagnosed in patients presenting with abdominal pain coming to the emergency room (ER) is acute pancreatitis (AP), which is a major surgical challenge[1] with the most common triggering factor being gall stones.[2] It is the inflammation of the pancreas in which there is sudden activation of pancreatic enzymes which self-digest and self-destruct the pancreas itself. It is self-limiting in majority of cases, and requires only symptomatic treatment, but severe disease is present in 20-30% cases that can progress to systemic inflammation and cause life-threatening necrosis of the pancreas, multi-organ failure and can potentially lead to death.[2,3] A clinically-based classification system, the Atlanta Classification, is widely used and accepted universally.[4] Quick, accurate and early evidence-based risk stratification of patients allows early initiation of intensive care therapy for patients with severe acute pancreatitis (SAP) to prevent adverse outcomes, like severe disease and mortality.[5] Therefore, a tool that can stratify risk reliably in predicting severity and prognoses of AP is of great importance when it comes to managing AP patients.[2]

Accuracy, simplicity, promptness and precision are the characteristics of an ideal scoring system and one which can have reproducible description of the severity of disease. There are a variety of systemic scores available to evaluate and predict the severity and mortality in AP patients. Ranson score, Acute Physiology and Chronic Health Evaluation-II (APACHE II) and Computed Tomography Severity Index (CTSI) are among the common scoring systems used.[6] Complex scoring systems, like APACHE II, are suited well for the purpose of research, but a more simplified scoring system, such as the Bedside Index for Severity in AP (BISAP) is required to help physicians in their routine clinical practices, predicting patient's adversities in a timely fashion.[7] However, all scoring systems have their own advantages and limitations. For example, one of the limitations of the Ranson criteria is missing the early therapeutic window as the score is not completed till 48 hours of presentation of an AP patient.[3] APACHE II has its complexity as a major drawback and limitation, but has the advantage of allowing determination and prediction of disease severity on the very day of hospital admission.[7] CTSI cannot reflect the inflammatory and systemic response of patients, as its calculation is based on computed tomography (CT) scan findings of some local complications.[6]

The BISAP has been recently applied as a simple and accurate method in predicting AP severity, with studies

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demonstrating its accuracy[8] and mortality predictions being similar to those of the other scoring systems, including APACHE-IIand Ranson scores.[6] BISAP was not only proven to have high specificity, but also has a higher negative predictive value (NOV) at scores >3.[9] Incremental rise in the value of BISAP score from 3 and above has shown to correlate with an increased risk of pancreatic necrosis leading to multi-organ failure (p<0.0001), and death as the outcome.[9]

The current study was planned to determine the diagnostic accuracy of BISAP in comparison with Ranson scores in predicting mortalities and severities in AP patients in an ER setting.

Patients and Methods

The cross-sectional study was conducted at the Department of Emergency Medicine, Aga Khan University Hospital (AKUH), Karachi, from July 1, 2017, to January 1, 2018. Approval from the institutional ethics review committee was taken, also exemption for consent was accepted by the hospital ethical review committee as this study was cross sectional and did not require any interventions. The sample size was calculated by assuming sensitivity 71.5%, specificity 99.1% and prevalence 31.25%.[8] The sample was raised using consecutive non-probability sampling technique.

Those included were patients aged 16-75 years presenting to the ER with epigastric pain who were found to have AP on the basis of amylase or lipase level thrice the normal value. Those excluded were patients with chronic kidney disease (CKD), tumour lysis syndrome, chronic liver disease (CLD), patients referred from other hospitals after 1-2 days of Ap diagnosis and patients leaving against medical advice (LAMA) <48 hours post-admission.

BISAP score was calculated as blood urea nitrogen (BUN) >25mg/dL, abnormal mental status was taken as Glasgow Coma Scale (GCS) score <15, patient's age >60 years, imaging study revealing effusion in pleural cavity, evidence of systemic inflammatory response syndrome (SIRS) whose manifestations include body temperature <36°C (96.8°F) or >38°C (100.4°F), heart rate (HR) >90 beats per minute, arterial partial pressure of carbon dioxide (PaO_2) <32mmHg or high respiratory rate tachypnoea >20 breaths per minute, white blood cell (WBC) count <4x10^9 cells/L or >12x10^9 cells/L, or the presence of >10% immature neutrophils as band forms, with band forms >3% being labelled as bandemia or a "left-shift".[8] When two or more criteria were met, with or without evidence of infection, the patient was labelled as having SIRS.[8,9]

Ranson score for non-gallstone pancreatitis score 1 was given to all those having at admission age >55 years, WBC count >16000 cells/mm^3, blood glucose >200mg/dL, serum aspartate aminotransferase (AST) >250IU/L, serum lactate dehydrogenase (LDH) >350 IU/L; and at 48 hours serum calcium <8.0mg/dL, haematocrit fall >10%, hypoxaemia PaO_2 <60mmHg, BUN having increased >5mg/dL after intravenous (IV) fluid hydration, base deficit, or negative base excess, >4mEq/L, and sequestration of fluids >6L.[3,6] Ranson score for gallstone pancreatitis score 2 was given to all those having at admission age >70 years, WBC count >18000 cells/mm, blood glucose >220mg/dL, serum AST >250IU/L, serum LDH >400IU/L; and at 48 hours, serum calcium <8.0mg/dL, haematocrit fall >10%, hypoxaemia PaO_2 <60mmHg, BUN having increased by >2mg/dL after IV fluid hydration, base deficit, or negative base excess, >5mEq/L, and sequestration of fluids >4L. Scores 3 or more were labelled as SAP.[6,9]

True positive (TP) level was set at score >3 for both BISAP and Ranson, false positive (FP) at score >3, true negatives (TN) at score <3, and false negative (FN) at score <3. Sensitivity was taken as the ability to rule out mortality, meaning TP + FN. Specificity was the ability to rule in mortality, meaning TN + FP. Mortality was defined as death occurring within hospital stay or within 28 days, and that was labelled as positive.

Data was collected using the Emergency Severity Index-IV (ESI-IV) as a triaging tool on the electronic database. Triage system ESI-IV has five levels, from P1 to P5, with P1 requiring immediate intervention, P2 being in a high-risk situation, while P3-P5 patients were categorised as per the number of resources utilised in management. At the triage counter, a standard set of vital signs were measured and documented for all patients. All patients who came with severe abdominal pain and were being managed in ER for AP were enrolled using electronically-generated medical record numbers. BISAP score was applied and calculated in the ER, and the patients were followed in ward/intensive care unit (ICU) where the Ranson score was calculated in the following 48 hours. Both the scores were calculated to predict severity and mortality for each patient.

Data was analysed using SPSS 20. Mean and standard deviation (SD) of all quantitative variables, like age, systolic blood pressure (SBP), HR, BISAP and Ranson scores, were calculated. Also, shock index (SI) values were derived by dividing HR with SBP.Frequencies and percentages were calculated for gender, disposition, level of care and mortality in Ranson and BISAP. Tables (2 x 2) were used to calculate specificity, sensitivity, diagnostic accuracy (DA), NPVs and positive predictive values (PPVs) for BISAP and Ranson scores while keeping Ranson score as the gold standard. Effect-modifiers, like age, gender, episode of

pancreatitis, shock index, disposition of patient and level of care, was dealt with through stratification and 2 x 2 tables to calculate specificity, sensitivity, NPV, PPV and DA for BISAP and Ranson scores.

Results

Of the 136 patients, 88(64.7%) were males and 48(35.3%) were females. The overall mean age was 42.04±16.42 years (16-75 years) (Table 1), On the basis of BISAP and Ranson scores, mild AP (MAP) and moderate AP (ModAP) were diagnosed in 123(90.4%) and 119(87.5%) patients, while SAP was diagnosed in 13(9.6%) and 17(12.5%) patients respectively (Table 2).

TP, FP, FN and TN values of the two scores were worked out (Table 3). BISAP had specificity 94.62% compared to 91.54% for Ranson score; sensitivity 100% vs 100%; NPV 100% vs 100%; PPV 46.15% vs 35.29%; and DA 94.85% vs 91.91% (Table 4).

Table-1: Descriptive statistics.

Variable	n	Minimum	Maximum	Mean±SD
Age (Years)	136	16	75	42.04±16.42
Gender				
Male	88	16	73	40.88±16.06
Female	48	17	75	44.19±17.03

SD=Standard Deviation.

Table-2: Distribution of types of acute pancreatitis (AP) on the basis of bedside index for severity in acute pancreatitis (BISAP) and Ranson scores (n=136).

Types of AP	BISAP Score n (%)	Ranson Score n (%)
MAP to ModAP	123 (90.4)	119 (87.5)
Severe AP	13 (9.6)	17 (12.5)
Total	136 (100)	136 (100)

MAP: Mild acute pancreatitis; ModAP: Moderate acute pancreatitis

Table-3: Sensitivity and specificity 2×2 table bedside index for severity in acute pancreatitis (BISAP) and Ranson scores.

	GOLD STANDARD	
	Positive	Negative
Positive	True Positive (TP)	False Positive (FP)
Negative (TN)	False Negative (FN)	True Negative
BISAP Score	**MORTALITY**	
	Positive	**Negative**
Positive	6	7
Negative	0	123
Ranson Score	**MORTALITY**	
	Positive	**Negative**
Positive	6	11
Negative	0	119

Table-4: Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy (DA) of bedside index for severity in acute pancreatitis (BISAP) and Ranson scores.

Variables	Result	
	Bisap Score	Ranson Score
Sensitivity	100.0%	100.0%
Specificity	94.62%	91.54%
PPV	46.15%	35.29%
NPV	100.0%	100.0%
Diagnostic Accuracy	94.85%	91.91%

PPV: positive predictive value; NPV: negative predictive value

Discussion

AP can present in varying degrees, from a mild, self-limiting disease to a severe and potentially life-threatening condition. AP is a common surgical condition that is seen worldwide associated with morbidity/mortality, and adding to the burden on healthcare systems[10] with several studies reporting an increase in the incidence of disease annually.[11] As Ranson score is most commonly used for the identification of AP severity and mortality in the current setting, the current study used BISAP score for predicting the same severity in the local population because of its early identification of AP severity and mortality as well as due to its cost effectiveness.

In the current study there were 136 AP patients, with a male preponderance (64.7%). A similar study also reported high prevalence among males (63.35%).[2] Other studies[12,13] reported the high prevalence of AP in females (59.1% and 66%). Difference in age was observed in these studies due to difference in age selection of patients in AP. One study reported male preponderance with mean age similar to that in the current study.[14] Like the current study, the other study also showed that young adults were the most affected.[14]

In the current study, mean BISAP score was 0.58±1.05 (0-5) and mean Ranson score was 1.50±1.32 (0-9). One study reported higher average of BISAP (1.0±0.8) and Ranson (2.7±1.4) scores.[2] Literature shows a cut-off value for ranson score of ≥3 for SAP.[15] On that basis, BISAP and Ranson score diagnosed MAP and ModAP in 123(90.4%) and 119(87.5) patients and SAP in 13(9.6%) and 17(12.5%) patients respectively. Similar results were reported earlier[2] while contrasting results have also been found.[13]

In the current study, 6(4.4%) patients died in hospital and all these patients were suffering from SAP. A. study reported 3(1.9%) deaths; 2 died due to SAP and 1 due to MAP.[2] Another study reported high prevalence of AP mortality (7.1%); mostly in SAP.[12] High prevalence of mortality (>10%) have been reported by a study.[14]

Conclusion

Both BISAP and Ranson scores were found to be very reliable tools for the identification of AP patients at higher risk of severity and mortality. BISAP and Ranson score had the same sensitivity, but BISAP score had higher specificity for predicting AP severity and mortality. Overall, BISAP had an edge as Ranson score is calculated only after 48 hours.

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References

1. Munsell MA, Buscaglia JM. Acute pancreatitis. J Hosp Med 2010; 5: 241-50.
2. Cho JH, Kim TN, Chung HH, Kim KH. Comparison of scoring systems in predicting the severity of acute pancreatitis. World J Gastroenterol 2015; 21: 2387-94.
3. Chen L, Lu G, Zhou Q, Zhan Q. Evaluation of the BISAP score in predicting severity and prognoses of acute pancreatitis in Chinese patients. Int Surg 2013; 98: 6-12.
4. Petrov MS, Windsor JA. Classification of the severity of acute pancreatitis: how many categories make sense? Am J Gastroenterol 2010; 105: 74-6.
5. Juneja D, Gopal PB, Ravula M. Scoring systems in acute pancreatitis: which one to use in intensive care units?. J Crit Care 2010; 25: 358.
6. 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: 435-41.
7. Wu BU. Prognosis in acute pancreatitis. CMAJ 2011; 183: 673-7.
8. Shabbir S, Jamal S, Khaliq T, Khan ZM. Comparison of BISAP score with Ranson's score in determining the severity of acute pancreatitis. J Coll Physicians Surg Pak 2015; 25: 328-31.
9. Minkov G, Yovchev Y, Halacheva K, Popharitov C, Popharitov A, Nikolov St, et al. The necessity of re-evaluation of scoring systems according to the new classification of acute pancreatitis. Trakia J Sci 2014; 12(S1): 244-50.
10. 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: 1096-101.
11. Peery AF, Dellon ES, Lund J, Crockett SD, McGowan CE, Bulsiewicz WJ, et al. Burden of gastrointestinal disease in the United States: 2012 update. Gastroenterology 2012; 143: 1179-87
12. Hameed T, Khan AZ, Shah I, Khan AQ, Ahmad M. Factors leading to acute pancreatitis in tertiary care hospitals in Pakistan - a multicenter study. JRMC 2018; 22: 50-3.
13. Kumar AH, Griwan MS. A comparison of APACHE II, BISAP, Ranson's score and modified CTSI in predicting the severity of acute pancreatitis based on the 2012 revised Atlanta classification. Gastroenterol Rep (Oxf) 2018; 6: 127-31.
14. Kaushik MR, Dubey AP, Jain R, Rathore A, Pathak A. Prospective evaluation of the BISAP score and its correlation with Marshall score in predicting severity of organ failure in acute pancreatitis. Int J Adv Med 2017; 4: 534-9.
15. Simoes M, Alves P, Esperto H, Canha C, Meira E, Ferreira E, et al. Predicting acute pancreatitis severity: comparison of prognostic scores. Gastroenterology Res 2011; 4: 216-22.