DIAGNOSTIC ACCURACY OF BEDSIDE INDEX OF SEVERITY IN ACUTE PANCREATITIS (BISAP) SCORE IN PREDICTING OUTCOMES IN PATIENTS PRESENTING WITH ACUTE PANCREATITIS

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ABSTRACT

Objective: To determine the diagnostic accuracy of Bedside Index of Severity in Acute Pancreatitis score in predicting outcomes in terms of mortality and severe acute pancreatitis in patients presenting with acute pancreatitis.

Study Design: Cross sectional validation study.

Place and Duration of Study: Department of Surgery, Combined Military Hospital Malir, from Mar 2019 to Nov 2019.

Methodology: A total of 125 patients with the diagnosis of acute biliary pancreatitis were enrolled in the study. Bedside Index of Severity in Acute Pancreatitis score values were worked out for all patients within 24 hours of presentation. The mortality rate and frequency of severe acute pancreatitis was determined. Sensitivity, specificity, negative predictive value, positive predictive value, and diagnostic accuracy of Bedside Index of Severity in Acute Pancreatitis Score was calculated.

Results: The mortality rate was 14 (11.2%) and the frequency of severe acute pancreatitis was 41 (32.8%). Bedside Index of Severity in Acute Pancreatitis Score of ≥3 had a sensitivity of 92.86%, specificity of 83.93%, and diagnostic accuracy of 85.6% in predicting mortality in acute pancreatitis. Similarly Bedside Index of Severity in Acute Pancreatitis Score of ≥3 had a sensitivity of 63.41%, specificity of 94.05%, and diagnostic accuracy of 84% in predicting severe acute pancreatitis in patients of acute pancreatitis.

Conclusion: Bedside Index of Severity in Acute Pancreatitis Score of ≥3 has a high diagnostic accuracy in predicting severity and is a valuable tool for early assessment of patients with acute pancreatitis.

Keywords: Acute pancreatitis, BISAP score, Mortality, Severe acute pancreatitis.

INTRODUCTION

Acute pancreatitis is a potentially life threatening inflammatory pathology of the pancreas which is most commonly associated with cholelithiasis in the population of subcontinent[1]. The most common cause of acute pancreatitis in the western population is biliary pancreatitis and alcohol intake followed by infections[1]. The worldwide incidence of acute pancreatitis stands at 56 patients per 100,000 population. Since the turn of the century, the overall mortality from acute pancreatitis has been reported to be around 5-15%. Moreover, the mortality rate attributable to severe acute pancreatitis (SAP) is very high. i.e. Between 25-40%. Early diagnosis with prompt institution of aggressive supportive care improves outcome. Fifty percent of all deaths occur within the first week of admission to the hospital[2,3].

Various scoring systems have been devised for early risk stratification to predict morbidity and mortality in patients presenting with acute pancreatitis[4]. They include Glasgow's criteria, Ranson's criteria, the Acute Physiology and Chronic Health Evaluation (APACHE-II) score, the Balthazar Computed Tomography Severity Index (CTSI), the Bedside Index of Severity in Acute Pancreatitis (BISAP) score, Panc 3 score, Harmless Acute Pancreatitis Score (HAPS), and the Japanese Severity Score[5-7].

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Wu and colleagues from United States proposed "The Bedside Index of Severity in Acute Pancreatitis" (BISAP) score in the year 2008. The score was developed to predict the in hospital mortality and severity of acute pancreatitis within first 24 hours of hospital admission[8]. The advantage of BISAP score over the other complex scoring systems is that the data required to calculate BISAP can be easily obtained on admission through physical examination, record of vital signs and requesting very few laboratory investigations and chest radiograph to detect pleural effusion[9].

The rationale of conducting this study was that there is scarcity of research protocols regarding evaluation of BISAP score for prediction of disease severity in acute pancreatitis in Pakistan. Although it is a new, convenient, and reliable prognostic score for early risk stratification in patients with acute pancreatitis, it needed validation by research in local population. In a resource limited country like ours, the findings of this study would help in validating BISAP score, which would in turn help in improving the management of patients presenting with acute pancreatitis.

METHODOLOGY

This was an analytical cross sectional study carried out on a total of 125 patients of both genders between 41-70 years of age admitted in surgical ward Combined Military Hospital, Malir, diagnosed as acute biliary pancreatitis were enrolled in the study after taking permission from institution review board vide IRB certificate number 1440/Trg/2019/adm. Patients with non-biliary pancreatitis, chronic pancreatitis, ischemic heart disease, chronic renal failure, and diabetes mellitus were excluded from the study. A voluntary informed consent was signed by all patients before inclusion in the study. The sample size was calculated by taking the study by Hagier *et al*[10], as the parent study taking a. Sensitivity = 85.7%, b. Specificity = 88.7%, c. Prevalence= 31.25%, d. Desired Precision = 6.7% for Specificity and 11% for Sensitivity, and e. Confidence level = 95%. The sample size was125 patients.

A detailed history of all patients followed by a thorough physical examination was performed. Vital signs were recorded. Glasgow coma scale (GCS) score of the patients was documented. Laboratory investigations including blood counts, renal profile and liver function tests were requested urgently on admission along with serum amylase levels. An urgent ultrasound of abdomen was requested to check for presence of gall stones and only cases of biliary pancreatitis were included in the study. Chest x-ray was done to look for pleural effusion. BISAP values were worked out for all patients derived from data obtained within 24 hours of presentation.

BISAP score consists of following five criteria having 1 point each, 10.

Patient age >60 years old (1 point). Altered mental status with a GCS <15 (1 point). BUN >25 mg/dL (8.9 mmol/L) (1 point). Evidence of systemic inflammatory response syndrome (SIRS) (1 point). Pleural effusion on X-ray (1 point).

BISAP score of ≥3 was taken as positive for SAP. Patients were labelled as having SAP if they had persistent organ failure for more than 48 hours. Organ failure included respiratory failure identified by the need for mechanical ventilation or arterial PaO2 <60 mmHg with unassisted breathing, circulatory failure or shock (systolic blood pressure <90 mmHg), or renal failure (serum creatinine of more than 2mg/dL after hemodialysis or rehydration)[10]. Similarly patients who died during the hospital stay were included in the mortality.

Data analysis was carried out using the SPSS-23 software. Mean and standard deviation were determined for the numerical variables i.e. Age, BMI and BISAP score. Qualitative variables like gender, mortality and SAP were expressed as frequency and percentages. Frequency and percentages for true positive, false positive, true negative, and false negatives was calculated. Specificity, sensitivity, positive predictive value (PPV), negative predictive value (NPV) was

worked out by the given formula and 2 x 2 tables. ROC curve was plotted and likelihood ratio was also calculated.

RESULTS

A total of 125 patients were included in the study. The age range in my study was from 41-70 years. The mean age of our patients was 53.94 ± 8.76 years. The mean age of male patients was 54.20 ± 8.53 years while for female patients it was 53.73 ± 8.98 years. Majority of patients included in the study were females i.e. 71 patients (56.8%) while 54 patients (43.2%) were males. The mean BMI of our patients was 26.40 ± 3.70 kg/m^2. The minimum BMI was 21 kg/m^2 and maximum BMI was 34 kg/m^2. The mean BISAP score was 2.14 ± 0.9. Thirty one patients (24.8%) included in the study had BISAP score of ≥3. The mortality rate was 11.2% (14 patients), while 32.8% (41 patients) presented with SAP. The patient distribution according to mortality and SAP is given in table-I.

Table-I: Distribution of patients according to mortality and severe acute pancreatitis.

Complication	Category	Frequency (%)
Mortality	Yes	14 (11.2%)
	No	111 (88.8%)
Severe Acute Pancreatitis	Yes	41 (32.8%)
	No	84 (67.2%)
Total		125 (100%)

Table-II: The relationship of BISAP score of ≥3 with mortality.

BISAP Score	Mortality		*p*-value
	Yes	No	
≥3	13 (41.94%)	18 (58.06%)	<0.001
<3	1 (1.05%)	94 (98.95%)	
Total	14 (11.20%)	111 (88.80%)	

Table-III: The relationship of BISAP score of ≥3 with mortality.

BISAP Score	Severe Acute Pancreatitis (SAP)		*p*-value
	Yes	No	
≥3	26 (83.87%)	5 (16.13%)	<0.001
<3	15 (15.96%)	79 (84.04%)	
Total	41 (32.80%)	84 (67.20%)	

The relationship of BISAP score of ≥3 with mortality is shown in table-II. BISAP score of ≥3 was found to have a sensitivity of 92.86%, specificity of 83.93%, PPV of 41.94%, NPV of 98.95%, diagnostic accuracy of 85.6%, positive likelihood ratio of 5.78 and negative likelihood ratio of 0.085 in predicting mortality in patients of acute pancreatitis. Cut off value for BISAP score was found to be 4 as shown in ROC curve in fig-1.

The relationship of BISAP score of ≥3 with SAP is shown in table-III. BISAP score of ≥3 was found to have a sensitivity of 63.41%, specificity of 94.05%, PPV of 83.87%, NPV of 84.04%, diagnostic accuracy of 84%, positive likelihood ratio of 10.66 and negative likelihood ratio of 0.389 in predicting SAP in patients of acute pancreatitis. Cut off value for BISAP score was found to be 4 as shown in ROC curve in fig-2.

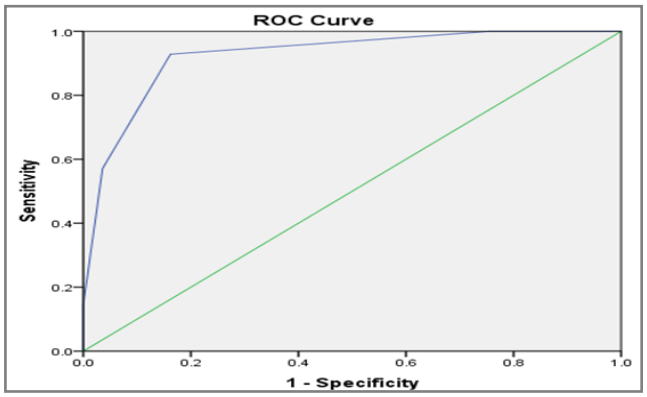

Figure-1: ROC Curve (Mortality).

Coordinates of the curve.

BISAP Score	Sensitivity	1 - Specificity
0.00	1.000	1.000
1.00	1.000	0.757
2.00	0.929	0.162
3.00	0.571	0.036
4.00	0.143	0.000
5.00	0.000	0.000

DISCUSSION

Acute pancreatitis is a common etiology of acute abdomen that has a worldwide incidence varying from 5-80 cases per 100,000 people per annum[11]. Acute pancreatitis is associated with a high mortality and morbidity. The overall mortality rate in acute pancreatitis is between 3.8-21.3%. The mortality rate is even higher in cases

of SAP with studies reporting mortality from 16.3-45.6%[12-14]. Therefore, early identification and diagnosis of SAP will help in segregation of patients with increased risk of complications. BISAP score is a simple, reliable, quick and easy to calculate score that helps in predicting the severity of acute pancreatitis at the time of admission to the hospital[15].

The mean age of patients in our study was 53.94 ± 8.76 years. There was a slight female pre-

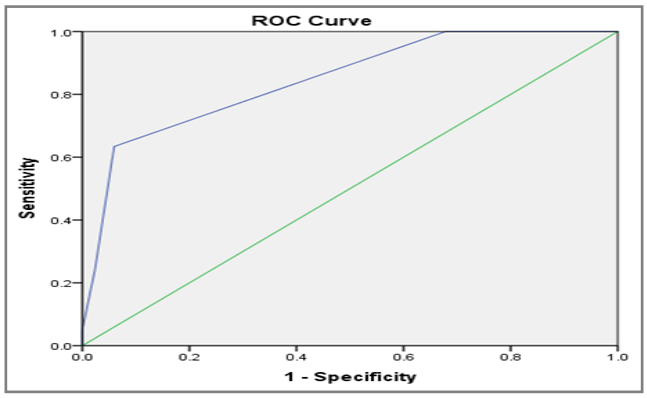

Figure-2: ROC Curve (SAP).

Coordinates of the Curve

BISAP Score	Sensitivity	1-Specificity
0.00	1.000	1.000
1.00	1.000	0.679
2.00	0.634	0.060
3.00	0.244	0.024
4.00	0.049	0.000
5.00	0.000	0.000

ponderance with our study sample comprising of 56.8% females which can be attributed to the higher prevalence of cholelithiasis. The mean BMI of patients included in our study was 26.40 ± 3.70 kg/m^2. A study by Arif *et al*, reported a much younger mean age of 35.25 ± 8.29 years. However the female proportion of 60.7% in their study was comparable to our findings[15]. Another study by Shabbir *et al* reported a mean age of 46.89 ± 15.75 years and frequency of females of 56% which was comparable to our study[16].

A study by Yadav *et al*, in 2016 reported that the sensitivity, specificity, negative predictive value and positive predictive value of BISAP score of ≥3 in predicting mortality was 100%, 69.2%, 100% and 26.7% respectively. The mortality rate was 10.1% in the study. The study also reported that the sensitivity, specificity, negative predictive value and positive predictive value of BISAP score of ≥3 in predicting SAP was 97.6%, 94.8%, 98.6% and 91.1% respectively[9].

Another study by Hagjer *et al*, in 2018 reported the mortality rate in patients with acute pancreatitis to be 11.6%. The sensitivity, specificity, negative predictive value and positive predictive value of BISAP score of ≥3 in predicting mortality was 85.7%, 88.7%, 97.9% and 50% respectively. Moreover the sensitivity, specificity, negative predictive value and positive predictive value of BISAP score of ≥3 in predicting SAP was 90.9%, 95.9%, 97.9% and 83.3% respectively[10].

Shabbir *et al*, in 2015 reported that the mortality rate in patients presenting with acute pancreatitis was only 5% with 3 out of 4 patients (75%) having a BISAP score of ≥3. The frequency of patients classified as SAP was 31.25%. Fifteen out of these 25 patients (60%) has a BISAP score of ≥3. The observed mortality rate and severity of pancreatitis stratified by BISAP score of ≥3 was reported to be statistically significant with *p*-values of 0.003 and 0.001 respectively[16].

The findings of our study regarding sensitivity and specificity of BISAP score of ≥3 are in agreement to the findings by Yadav *et al*, Arif *et al,* and Shabbir *et al*[9,15,16]. Yang *et al*, in their meta-analysis and Kumar *et al*, in their study also reported comparable results to our study[17,18].

BISAP score is an easy to calculate score which can be effectively usedin triage of patients with acute pancreatitis. The score is particularly suitable for our population because in a resource poor country like ours where the facility of high resolution CT scans is not available everywhere. The other major benefit is that the score can be calculated very quickly and it does not require 48 hours as is needed in Ranson's criteria[19]. However further studies are required to compare the BISAP score with other scoring systems in acute pancreatitis so as to devise and improve evidence based management of patients of acute

pancreatitis. We strongly recommend the use of BISAP score in all the hospitals of the country to help segregate patients requiring intensive care for preventing morbidity and mortality associated with acute pancreatitis.

CONCLUSION

Bedside Index of Severity in Acute Pancreatitis Score of ≥3 has a high diagnostic accuracy in predicting severity and is a valuable tool for early assessment of patients with acute pancreatitis.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

REFERENCES

1. Shah AP, Mourad MM, Bramhall SR. Acute pancreatitis: current perspectives on diagnosis and management. J Inflamm Res 2018; 11(1): 77-85.
2. Naeem M, Saeed T, Samad A, Waheed MR. Frequency of mortality of patients with acute pancreatitis using bedside index for severity. J Med Sci 2018; 26(2): 159-63.
3. Vengadakrishnan K, Koushik AK. A study of the clinical profile of acute pancreatitis and its correlation with severity indices. Int J Health Sci. 2015;9(4):410-7.
4. Zhou H, Mei X, He X, Lan T, Guo S. Severity stratification and prognostic prediction of patients with acute pancreatitis at early phase: A retrospective study. Medicine (Baltimore) 2019; 98(16): e15275-78.
5. 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.
6. Kuo DC, Rider AC, Estrada P, Kim D, Pillow MT. Acute Pancreatitis: What's the Score? J Emerg Med 2015; 48(6): 762-70.
7. Choudhuri AH, Duggal S, Biswas PS, Uppal R. A comparison of Acute Physiology and Chronic Health Evaluation II score and serum procalcitonin change for predicting mortality in acute pancreatitis. Indian J Crit Care Med 2020; 24(3): 190-94.
8. 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): 1698-03.
9. Yadav J, Yadav SK, Kumar S, Baxla RG, Sinha DK, Bodra P, et al. Predicting morbidity and mortality in acute pancreatitis in an Indian population: a comparative study of the BISAP score, Ranson's score and CT severity index. Gastroenterol Rep (Oxf) 2015; 4(3): 216-20.
10. Hagjer S, Kumar N. Evaluation of the BISAP scoring system in prognostication of acute pancreatitis. A prospective observational study. Int J Surg 2018; 54(1): 76-81.
11. Shah AP, Mourad MM, Bramhall SR. Acute pancreatitis: current perspectives on diagnosis and management. J Inflamm Res 2018; 11(1): 77-85.
12. Popa CC, Badiu DC, Rusu OC, Grigorean VT, Neagu SI, Strugaru CR. Mortality prognostic factors in acute pancreatitis. J Med Life 2016; 9(4): 413-18.
13. Fu CY, Yeh CN, Hsu JT, Jan YY, Hwang TL. Timing of mortality in severe acute pancreatitis: experience from 643 patients. World J Gastroenterol 2007; 13(13): 1966-69.
14. Haider MIZ, Rashid H, Saeed S, Murtaza B, Ali S. Clinicopathological pattern of acute pancreatitis – a single centre study. Pak J Pathol 2017; 28(2): 92-97.
15. Arif A, Jaleel F, Rashid K. Accuracy of BISAP score in prediction of severe acute pancreatitis. Pak J Med Sci 2019; 35(4): 1008-12.
16. 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(5): 328-31.
17. Yang YX, Li L. Evaluating the ability of the bedside index for severity of acute pancreatitis score to predict severe acute pancreatitis: a meta-analysis. Med Princ Pract 2016; 25(2): 137-42.
18. 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(2): 127-31.
19. Kim YJ, Kim DB, Chung WC, Lee JM, Youn GJ, Jung YD, et al. Analysis of factors influencing survival in patients with severe acute pancreatitis. Scand J Gastroenterol 2017; 52(8): 904-08.