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Original Research Article

Comparison of bedside index of severity in acute pancreatitis (BISAP) and acute physiology and chronic health evaluation (APACHE II) score in assessing severity of acute pancreatitis

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ABSTRACT

Background: Acute Pancreatitis (AP) is one among the major diseases in the surgery wards with high rate of mortality. In spite of many scoring systems introduced to grade the severity of AP for optimal and timely management, mortality rate is still in a high pace. The aim of this study is to compare BISAP scoring system and APACHE II scoring system for accuracy and easiness in predicting the severity and mortality of AP and to deliver appropriate and timely intervention.
Methods: The first 100 patients with AP in the year 2016 (January to August) were studied prospectively by calculating APACHE II score and BISAP score. According to Revised Atlanta classification severe AP was ascertained and the sensitivity and specificity of both scoring systems were assessed from chi square table. By using ROC curve accuracy and diagnostic value of two scoring systems were compared.
Results: 100 patients with an age ranging from 20 to 80 years with a mean of 41.18 and male female ratio of 10.1:1 were studied. 95% of the patients presented with a symptom of abdominal pain and 49 out of 100 were having alcoholism as etiology. The average hospital stay of the patients was 12.03 days. Four patients died out of 11 severe AP and rest 89 were grouped into mild AP. BISAP score more than or equal to three have 64.2% chance of severe AP and was statistically significant in predicting the severity of AP. Areas under curve of the ROC curve after depicting the sensitivity and specificity of BISAP scores for severity and mortality were 0.90 and 0.96 respectively. APACHE II scores more than or equal to nine have 23.8% chance of severe AP and was statistically significant in predicting severity of AP. When sensitivity and specificity of APACHE II score were charted in ROC curve, areas under curve were 0.853 and 0.75 for severity and mortality in AP respectively.
Conclusions: Compared to APACE II, BISAP is better scoring system in predicting both severity and mortality of AP on considering accuracy and easiness.

Keywords: APACHE II, Acute pancreatitis, BISAP, Mortality, Severity

INTRODUCTION

Acute pancreatitis (AP) is a common disorder with a huge burden to the health care and it includes wide spectrum of diseases varying from mild self-limiting to fulminant types leading to multi organ failure and death. The overall mortality rate is 3-10%, but in case of severe disease it may rise up to 11-30%.[1] The severity assessment is inevitable to target at the management goals. The mild cases respond well to the supportive measures whereas the severe may require intensive monitoring and therapeutic interventions.[2]

Several scoring systems were developed in the late 20th century to classify AP according to the severity. It includes Ranson's criteria, the Acute Physiology And Chronic Health Evaluation (APACHE II) score, Bedside Index for Severity in Acute Pancreatitis (BISAP), Computed Tomography Severity Index (CTSI), etc.[3-5] Knaus et al proposed a scoring system APACHE in 1981 taking into consideration of 34 possible measurements obtained during the first day of admission to ICU.[6]

In 1985 Knaus et al developed APACHE II scoring system incorporating age and chronic health problems to physiological and laboratory values.[7] It is one of the widely used scoring systems, but it requires large number of parameters and got complexity in quick calculations.[8]

In 2008, the BISAP was proposed on the basis of a retrospective study on a large population in USA for the early identification of patients in severe disease. It's a five-point system including blood urea nitrogen (BUN) >25mg/dl, impaired mental status, Systemic Inflammatory Response Syndrome (SIRS), age >60 years, pleural effusion.[9]

This prospective study was undertaken to compare the BISAP score and APACHE II score in their ability and accuracy to differentiate between patients with mild and severe AP and thereby to predict complications and mortality and to predict appropriate point for timely intervention.

METHODS

First 100 patients admitted to the Department of Surgery, SCB Medical college hospital, Cuttack from January 2016 to August 2016 with laboratory and radiological evidence of acute pancreatitis were studied prospectively. Patients with paediatric age less than 15 years, cases of chronic pancreatitis, hereditary pancreatitis, and traumatic pancreatitis were excluded from the study.

The patients admitted were resuscitated with nasogastric decompression, IV fluids, broad spectrum antibiotics, analgesics and electrolyte imbalance correction and were evaluated clinically and subjected to laboratory and radiological investigations according to the proforma. For each of 100 patients in the study, APACHE II score ranging from 0 to 71 and BISAP score ranging from 0 to 5 were calculated.

According to the Atlanta Classification guidelines 1992, patients were classified in to mild and severe AP. Severe AP includes 1) presence of one or more local complications like pancreatic necrosis, pancreatic abscess and pancreatic pseudocyst 2) presence of one or more organ system failures like shock (systolic BP <90mmhg), pulmonary insufficiency (Pao2 <60mmhg on room air), renal failure (creatinine > 2mg/dl after fluid replacement), gastro intestinal bleeding (> 500ml estimated blood loss within 24 hours), DIC (thrombocytopenia and hypofibrogenemia and fibrin split products) and severe hypocalcemia (8mg/dl).[10]

APACHE II score of more than or equal to 9 and BISAP score of more than or equal to 3 were expected to predict the severe acute pancreatitis.

Chi-square chart was used to find the p value of two scoring systems in predicting the severity. Receiver Operating Characteristic (ROC) curve was used to identify the cut-off points and the area under the curve (AUC) to distinguish between the efficacies of tests.

RESULTS

100 Patients who satisfied the inclusion criteria were studied after obtaining an informed consent. The age of patients ranged from 20 to 80 years and peak incidence was noted in the 4th decade of life. Mean age of the study is 41.18. Out of 100 patients' males were 91 with a male female ratio of 10.1:1. The length of the hospital stay ranged from one to 32 days with mean length of 12.03 days. 95% of the patients presented with abdominal pain and rest with vomiting and fever.

Table 1: BISAP score and severe AP.

BISAP score	No. of patients	Severe AP	Mild AP	Mortality
≥3*	14	9	5	4
<3	86	2	84	0

*Statistically significant, p value <0.05.

History of alcohol consumption and its possibility of being etiological factor were established in 49 out of 100 patients while gallstone disease was attributed to 23 patients and rest included idiopathic, drug induced, hypertriglyceridemia etc.

Out of 100 patients 89 presented with mild AP and 11 with severe AP as assessed basing on revised Atlanta Classification system. Four patients died out of 11 severe AP. BISAP score was divided into two groups: score ≥3 and <3 (Table 3). APACHE II score was divided in to two groups: score ≥9 and <9 (Table 4). All the 100 patients were classified into 2 groups with mild AP, severe AP and Mortality.

In BISAP scoring system, chance of patients having severe AP in scores more than 2 was 64.2% and mild AP in scores less than or equal to 2 was 97.6%. The BISAP score more than 2 is statistically significant in predicting severe AP with p value less than 0.05.

In APACHE II scoring system, chance of patients having severe AP in scores more than 8 was 23.8% and mild AP in scores less than or equal to 8 was 98.27%. The APACHE II score more than 8 is statistically significant in predicting severe AP with p value = 0.00494.

Table 2: APACHE II score and severe AP.

APACHE II score	No. of patients	Severe AP	Mild AP	Mortality
≥9*	42	10	32	3
<9	58	1	57	1

*Statistically significant, p value = 0.00494.

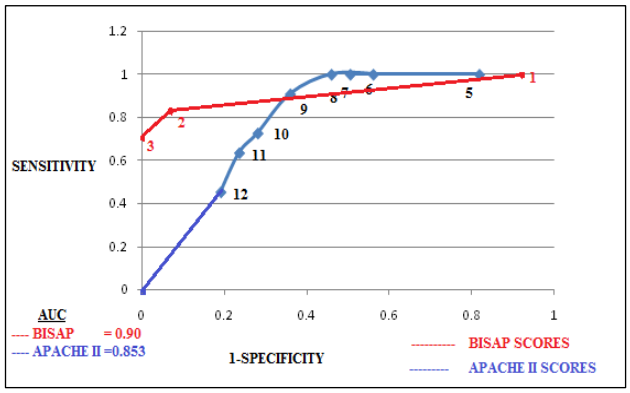

Figure 1: ROC curve of BISAP score and APACHE-II score showing severity of AP.

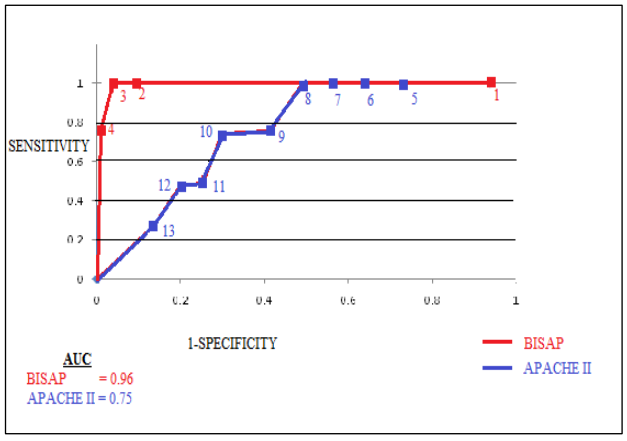

Figure 2: ROC curve of BISAP score and APACHE II score showing mortality of AP.

After depicting sensitivity and specificity of BISAP score for severity of AP in ROC curve, the best cut-off point was got at 3 and the area under the curve was 0.90; and ROC curve for APACHE II, the best cut-off point was got at 10 and the area under the curve was 0.853 (Figure 1). The AUC of ROC curve of sensitivity and specificity of BISAP score and APACHE II for mortality of AP was 0.96 and 0.75 respectively (Figure 2).

DISCUSSION

AP is one of the commonest disorders in surgery wards with severe AP having high morbidity and mortality. Early hospital admission and appropriate timely interventions can prevent mortality due to severe AP. In this study, two different scoring systems BISAP and APACHE II were compared and analysed for their efficacy in predicting the severity and mortality of AP.

The mean age of the patients in our study was 41.18 years with male to female ratio of 10.1:1 as compared to Singh et al (49.6 years, 6:1) and Papachristou et al (52 years,5.1:1).[1,11] The increase in male preponderance is mainly due to etiology as 49% of our patients are alcoholic and all of them are males. The most common etiological factor causing AP in this study is alcohol consumption 49%, while gall stone disease contributed 23 % of its etiology. As per Bidarkundi et al the main etiology was alcoholism (46.67%), while Singh et al, Papachristou et al and pongprasobchai et al found gall stone disease to be the main etiological factor with 27%, 36% and 45% respectively.[1,11-13]

In present study, nine patients out of 14 with BISAP score more than or equal to three had severe AP and the values are statistically significant p value <0.01. In the studies by Singh et al and B U Wu et al, BISAP score ≥ 3 have statistically significant values with p value less than 0.01.[9,11] Ten out of 42 patients with APACHE II score more than or equal to 9 had severe AP and the values are statistically significant. In other studies Singh et al and Papachristou et al showed similar results which are statistically significant.[1,11]

Table 3: AUC of BISAP and APACHE II for severity of AP in different studies.

Study	n (no. of cases)	BISAP (AUC)	APACHE II (AUC)
Papachristou et al[1]	185	0.81	0.78
Cho et al[4]	299	0.74	0.78
Yang et al[15]	326	0.79	0.81
Bollen et al[10]	131	0.68	0.77
Our study	100	0.90	0.85

Table 4: AUC of BISAP and APACHE II for mortality of AP in different studies.

Study	n (no. of cases)	BISAP (AUC)	APACHE II (AUC)
Papachristou et al[1]	185	0.82	0.94
Bollen et al[10]	131	0.88	0.91
Singh et al[11]	397	0.82	0.88
Yang et al[15]	326	0.86	0.85
Our study	100	0.96	0.75

On depicting sensitivity and specificity of BISAP score and APACHE II score for severity in ROC curve, the best cut-off point is obtained at 3 and 10 respectively. Chen et al found the cut-off scores 2 and 8 for BISAP and APACHE II respectively.[14] The AUC for severity in ROC curve of BISAP score is 0.90 and that of APACHE II is 0.853. In Table 3, AUC of ROC curve for severity of AP

in BISAP and APACHE II in various studies are compared. When ROC curve for mortality is charted of BISAP score and APACHE II score, AUC in our study is 0.96 and 0.75 respectively. In Table 4, AUC by different authors of the same are reviewed for comparison.

BISAP score was found to have greater AUC in ROC curve compared to APACHE II score in both severity and mortality of AP. Further APACHE II requires a large number of parameters to be collected and this ICU dependent scoring is tedious and cumbersome. Hence, BISAP score is found to be easier and better to predict the severity and mortality of AP, in our opinion.

CONCLUSION

Both BISAP and APACHE II scores are good in predicting severity of AP with cut-off scores of 3 in BISAP and 10 in APACHE II showing the highest sensitivity and specificity in our study. AUC for severity and mortality in AP is found to be higher in BISAP in comparison to APACHE II. Therefore, BISAP score would be easier to calculate, simple to utilize and equally accurate clinical score for the evaluation of severity and prediction of mortality in AP.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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