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Validation of Bisap Scoring System in Predicting the Severity of Acute Pancreatitis according to the Latest Atlanta Classification

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Abstract

Acute pancreatitis (AP) is an inflammatory condition of the pancreas with a clinical course that varies from mild to severe, leading to activation of pancreatic enzyme and causing self-digestion of the pancreas. The overall mortality rate of AP is 2–5%, but the mortality of severe acute pancreatitis (SAP) may range upto 20–30%. So it is important to assess the disease severity in a timely and accurate manner There are variety of score systems such as Ransom's criteria[1], Acute Physiology and Chronic Health Evaluation (APACHE) II [2] and Computed Tomography Severity Index (CTSI). But these systems have their own distinct pros and cons. A new mortality based prognostic scoring system for use in acute pancreatitis has been derived and validated which was named the *Bedside Index of Severity in Acute Pancreatitis* (BISAP). The 5-point BISAP score system incorporates the variables: Blood urea nitrogen level >25 mg/dl, Impaired mental status, Systemic inflammatory response syndrome (SIRS), and age > 60years, and presence of pleural effusion. Thus the BISAP score represents a simple way to identify patients at risk of increased mortality and the development of intermediate markers of severity within 24h of presentation.

Keywords: Acute pancreatitis; BISAPS Score; Ransons criteria; Systemic inflammatory response syndrome (SIRS)

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Introduction

Acute pancreatitis (AP) is an inflammatory condition of the pancreas with a clinical course that varies from mild to severe, leading to activation of pancreatic enzyme and causing self-digestion of the pancreas. The mild acute pancreatitis is a self-limiting disease that ranges about 80–90% of patients with only minimal or transitional systemic manifestations, but about 20–30% of patients develop a severe disease that can progress to systemic inflammation and pancreatic necrosis, multi-organ failure, and potentially death. The overall mortality rate of AP is 2–5%, but the mortality of severe acute pancreatitis (SAP) may range upto 20–30%. So it is important to assess the disease severity in a timely and accurate manner to provide comprehensive treatment to AP patients, which will allow the clinician to consider more aggressive interventions to prevent adverse outcomes and decrease the high mortality of SAP.

The early prediction of severity in acute pancreatitis is still one of the main challenges in clinical practice. Currently several clinical factors including age, obesity, alcohol consumption and smoking predisposing to a severe disease course have been identified. There are variety of score systems such as Ranson's criteria [1], Acute Physiology and Chronic Health Evaluation (APACHE) II [2]and Computed Tomography Severity Index (CTSI). But these systems have their own distinct pros and cons. The Ranson's score is relatively accurate at classifying the severity of AP, but the evaluation cannot be completed until 48 hours, which will miss the potential for early treatment and increase mortality. The APACHE II system allows the determination of disease on the first day of admission and is more accurate than

Ranson's score but it is a little complicated. Also there are many inflammatory markers such as C-reactive protein (CRP), interleukin-6 (IL-6) etc.

Several studies show that cytokines play an important role in the cascading inflammatory responses and it may act as mediators of distant organ complications in SAP. So the levels of cytokine in serum may also reflect the degree of the inflammatory response.

Table 1: Individual components of BISAP scoring system

1. BUN >25 mg/dl
2. Impaired mental status (Glasgow Coma Scale Score <15)
3. SIRS - SIRS is defined as two or more of the following:
➢ Temperature of <36 or >38°C
➢ Respiratory rate >20 breaths/min or Pa CO2 <32 mmHg
➢ Pulse >90 beats/min
➢ WBC <4,000 or >12,000 cells/mm 3 or >10% immature bands)
4. Age >60 years
5. Pleural effusion detected on imaging

One point is assigned for each variable within 24 hrs of presentation and added for a composite score of 0–5

In 2008, Wu et al. [3] proposed a new prognostic scoring system for estimating the severity of AP in the early phase, the ability to stratify patients early in their course is a major step to improving future management strategies in acute pancreatitis. The Ranson and modified Glasgow score contain data not routinely collected at the time of hospitalization. In addition both require 48hr to complete, missing a potentially valuable early therapeutic window. APACHE II was originally developed as an intensive care instrument and requires the collection of a large number of parameters, some of which may not be relevant to prognosis in acute pancreatitis.

B U Wu et al., in 2008 [3] using classification and regression tree (CART) analysis, a clinical scoring system was developed for prediction of in hospital mortality in acute 20 pancreatitis. The scoring system was derived on data collected from 17,992 cases of acute pancreatitis from 212 hospitals in 2000-2001. It was validated on data collected from 18,256 acute pancreatitis cases from 177 hospitals in 2004-2005. The accuracy of the scoring system for prediction of mortality was measured by the area under the receiver operating characteristic curve (AUC). The performance of the new scoring system was further validated by comparing its predictive accuracy with that of APACHE II. A new mortality based prognostic scoring system for use in acute pancreatitis has been derived and validated which was named the *Bedside Index of Severity in Acute Pancreatitis* (BISAP). The 5-point BISAP score system incorporates the variables: Blood urea nitrogen level >25 mg/dl, Impaired mental status, Systemic inflammatory response syndrome (SIRS), and age > 60years, and presence of pleural effusion. During the past 4 years, several studies have been conducted in Western countries to validate the accuracy of BISAP in estimating the severity of acute pancreatitis, but no studies were designed to validate this system according to the latest Atlanta classification [4].

VikeshK. Singh et al. [5] evaluated 397 consecutive cases of acute pancreatitis admitted to their institution between June 2005 and December 2007. BISAP scores were calculated on all cases using data within 24hrs of presentation. The ability of the BISAP score to predict mortality was evaluated using trend and discrimination analysis. The optimal cutoff score for mortality from the receiver operating curve was used to evaluate the development of organ failure, persistent organ failure, and pancreatic necrosis. Among 397 cases, there were 14 (3.5%) deaths. There was a statistically significant trend for increasing mortality ($p<0.0001$) with increasing BISAP score. The area under the receiver operating curve for mortality by BISAP score in the prospective cohort was 0.82 (95% confidence interval: 0.70, 0.95), which was similar to that of the previously published validation cohort by B U Wu. BISAP score more or equal to 3 was associated with an increased risk of developing organ 21 failure (odds ratio=7.4, 95% confidence interval: 2.8, 19.5), persistent organ failure (odds ratio=12.7, 95% confidence interval: 4.7, 33.9) and pancreatic necrosis (odds ratio=3.8, confidence interval: 1.8, 8.5).

Thus the BISAP score represents a simple way to identify patients at risk of increased mortality and the development of intermediate markers of severity within 24h of presentation.

Materials and Methods

The demographic, clinical, laboratory, and radiologic data for all patients admitted to our institution with a diagnosis of acute pancreatitis between October 2014 and September 2016 were prospectively collected for this study. Consent was obtained from all the patients.

After obtaining approval from the Institutional ethical committee, M V J medical college & Research Hospital, all cases suffering from acute upper abdominal pain characteristic of pancreatitis fulfilling the inclusion and exclusion criteria were included in the study. 108 patients were chosen by purposive sampling based on inclusion criteria. They were evaluated clinically and investigated

with total leukocyte count, BUN, serum creatinine, arterial blood gas analysis, Random Blood Sugar (RBS), liver function tests, LDH, Serum amylase, Serum lipase, ultrasound abdomen and computed tomography (CT) scan were performed. BISAP score was calculated in all such patients within 24hrs of hospitalisation. Data obtained were statistically analysed.

Objectives of Study

1. To study the causes, clinical features and management of Acute Pancreatitis.
2. To evaluate the ability of BISAP score to predict the severity of acute pancreatitis.
3. To identify patients with potentially severe acute pancreatitis who require aggressive early treatment.

The Atlanta Symposium in 1992 attempted to offer a global consensus and a universally applicable classification system for acute pancreatitis [6]. Although the Atlanta 1992 Classification was useful, better understanding of the pathophysiology of organ failure and necrotising pancreatitis as well as improved diagnostic imaging have made it necessary to revise the Atlanta Classification. So the latest updated revision has recently been proposed. The following definitions and classifications are proposed for use in clinical and research communications.

There are important reasons to define and stratify the severity of acute pancreatitis.

1. On admission, it is important to identify patients with potentially severe acute pancreatitis who require aggressive early treatment.
2. In a secondary care setting, clinicians need to identify such patients for possible transfer to specialist care
3. For specialists who receive such referrals, there are advantages to stratifying these patients into subgroups based on the presence of persistent organ failure (based on modified marshall grading) and local or systemic complications. This classification defines three degrees of severity (Table 2) based on presence of transient organ failure, persistent organ failure, and local or systemic complications [7]:

   1.Mild acute pancreatitis,

   2.Moderately severe acute pancreatitis

   3.Severe acute pancreatitis.

Acute pancreatitis was defined as two or more of the following:

- Characteristic abdominal pain
- Serum amylase and / or lipase level 3 times the upper limit of normal.
- Contrast-enhanced computed tomography (CECT) or transabdominal ultrasonographyof the abdomen demonstrating changes consistent with acute pancreatitis.

Although local complications may be identified during the early phase, they are not the predominant determinants of severity [29], and it may be unreliable to determine the extent of necrosis during the first few days of disease. In addition, the extent of morphologic changes is not directly proportional to the severity of organ failure. Therefore, the definition of severe or moderately severe acute pancreatitis in the early phase depends on the presence and duration of organ failure.

Table 2: Classification of severity of acute pancreatitis

Severity category	Local complications	Systemic complications
Mild acute	No local complications	No organ failure
Moderately severe	Sterile peripancreatic collection	Transient organ failure that resolves in 48 hrs
Severe	Infectious peripancreatic collection	Persistent organ failure > 48hrs (single or multiple organ failure

BISAP scores were calculated on all patients based on data obtained within 24 hr of presentation (Table1).Systemicinflammatory response syndrome was defined as ≥ 2 or more of the following: temperature of < 36 or >38 ° C, P a CO 2 < 32 mm Hg or respiratory rate >20 breaths / min, pulse >90 beats / min, and white blood cell count < 4,000 or >12,000 cells / mm 3 or >10 % immature bands. The presence of a pleural effusion was determined by a CT scan, chest radiograph, or abdominal ultrasound obtained within 24 hr of presentation.

Organ failure was defined as a score of ≥ 2 in one or moreof the three (respiratory, renal, and cardiovascular) out of the five organ systems initially described in the Marshall score (2,3) (Table 3). Organ failure scores were calculated for all patientsduring the first 72 hr of hospitalization based on the laboratory value or clinical measurement during each 24 hr period. Duration of organ failure was defined astransient (≥ 48 h) or persistent (>48 h) from the time of presentation. A CECT or transabdominal ultrasonographyof the abdomen, obtained at any time in the first 7 days of hospitalization, was required to differentiate necrotizingfrom interstitial pancreatitis. All patients with a CT or transabdominal ultrasonography within the first 24 hours in which necrosis could not be definitively ascertained (n = 23) underwent a repeat scan within the first 7 days of hospitalization.The impairment of pancreatic perfusion and signs of peripancreatic necrosis evolve over several days, 16–19 which explains why an early CECT may underestimate the eventual extent of pancreatic and peripancreatic necrosis. In the first

Table 3: Modified Marshall scoring system for organ dysfunction was adopted for assessing the organ failure

Organ System	Score				
	0	1	2	3	4
Respiratory (PaO2/FiO2)	>>400	3301–400	2201–300	1101–200	≤<101
Renal (serum creatinine, mg/dl)	<1.4	11.4–1.8	11.9–3.6	33.6–4.9	>>4.9
Cardiovascular (systolic blood pressure in mm Hg Off inotropic support)	>90	<<90, fluid responsive	<<90, Non-fluid responsive	<<90, pH< 7.3	<<90, pH <7.2

For non-ventilated patients, the FiO2 can be estimated from below:

Supplemental oxygen (l/min)	FiO2 (%)
Room air	21
2	25
4	30
6–8	40
9–10	50

A score of 2 or more in any system defines the presence of organ failure.

few days of the illness, the pattern of perfusion of the pancreatic parenchyma as seen on CECT may be patchy, with variable attenuation before the area of impaired enhancement becomes more demarcated and/or confluent. After the first week of thedisease, a non-enhancing area ofpancreatic parenchyma should be considered to be pancreatic parenchymal necrosis.

Statistical Methods [8-11]

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements were presented on Mean± SD (Min-Max) and results on categorical measurements were presented in Number (%). Significance was assessed at 5% level of significance. The following assumptions on data were made, Assumptions: 1.Dependent variables should be normally distributed, 2.Samples drawn from the population should be random, Cases of the samples should be independent Analysis of variance (ANOVA) was used to find the significance of study parameters between three or more groups of patients, Student 't' test (two tailed, independent) was used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Chi-square/ Fisher Exact test was used to find the significance of study parameters on categorical scale between two or more groups, Non-parametric setting for Qualitative data analysis.

Results

The study included 108 patients admitted with the characteristic pain abdomen suspicious of acute pancreatitis. When the age distribution of the patients in our study was analyzed, it was found that 38% of the patients were 20-39 years old and 40% of the patients were between the age 40-59 years and 22% of the patients were aged 60years and more. When the sex distribution of the patients in our study was analyzed, pancreatitis was found to be more common in males 58% (63 patients)and 42% (45 patients) were females.

The leading cause in our study was alcoholism which was found in 62 patients (57%) when compared to gall stone pancreatitis which was demonstrated in 40 patients (37%). In other 6 patients cause was not found. (Fig. 1).

The severity of pancreatitis was defined by calculating BISAP score. A score of 3 or more was classified as severe acute pancreatitis and score <3 were defined as mild acute pancreatitis. In the study population majority of the patients had mild acute pancreatitis that had no organ failure and 34 patients having BISAP score ≥ 3 were classified as severe acute pancreatitis. In the study population majority of the patients had mild acute pancreatitis that had no organ failure and 34 patients having BISAP score ≥ 3 were classified as severe acute pancreatitis. (Fig. 2 and Table 3).

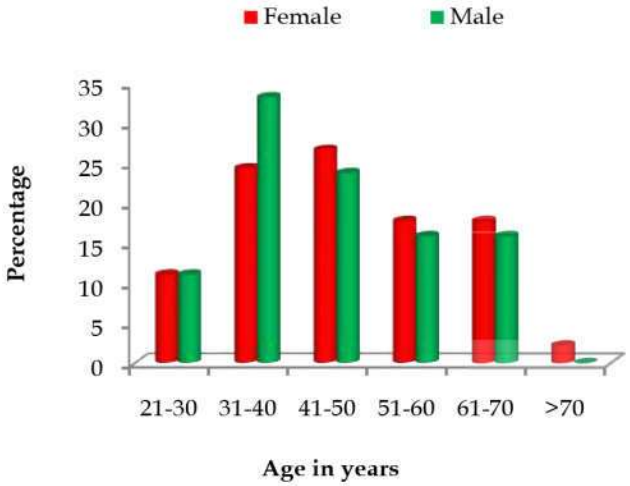

Fig. 1: Distribution of patients with age

Out of 108 patients 15 patients needed ICU stay for >7days, 49 patients required ICU management for < 7days and remaining 44 patients did not require ICU and treated in the wards (p=0.508, Not Significant, Fisher Exact test). (Table 4 and 5).

Out of 108 patients 83 (77%) had no organ failure while the remaining 25 had organ failure. In the organ failure group majority were suffering from acute renal failure comprising 20 (18%) patients while 3 patients had respiratory failure due to acute

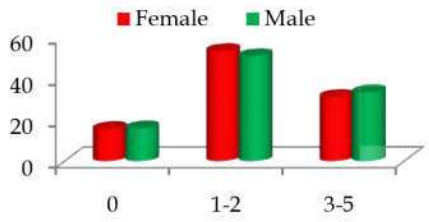

Fig. 2:

Table 3: BISAP Score distribution of patients studied

BISAP Score	Gender		Total
	Female	Male	
0	7(15.6%)	10(15.9%)	17(15.7%)
1-2	24(53.3%)	32(50.8%)	56(51.9%)
3-5	14(31.1%)	21(33.3%)	35(32.4%)
Total	45(100%)	63(100%)	108(100%)

Table 4: Aetiology of Pancreatitis in the population studied

Etiology	Gender		Total	
	Female	Male		
Alcohol	4(8.9%)	58(92.1%)	62(57.4%)	P<0.001**, Significant, Fisher Exact test
Gall Stone	36(80%)	4(6.3%)	40(37%)	
Others	5(11.1%)	1(1.6%)	6(5.6%)	
Total	45(100%)	63(100%)	108(100%)	

Table 5: ICU Stay of patientsstudied

ICU Stay	Gender		Total
	Female	Male	
0	22(48.9%)	22(34.9%)	44(40.7%)
1-2	4(8.9%)	8(12.7%)	12(11.1%)
3-5	13(28.9%)	17(27%)	30(27.8%)
6-10	5(11.1%)	12(19%)	17(15.7%)
>10	1(2.2%)	4(6.3%)	5(4.6%)
Total	45(100%)	63(100%)	108(100%)

P=0.508, Not Significant, Fisher Exact test

Table 6: Comparison of clinical variables in relation to incidence of local complications

Variables	Local Complications		Total	P value
	No	Yes		
Age in years	44.3±11.97	49.4±12.67	45.28±12	0.094+
BUN	21.4±20.58	39.1±35.36	24.74±24	0.004**
BISAP Score	1.54±1.15	3.25±0.97	1.86±1.3	<0.001**
ICU Stay	2.31±2.78	6.15±4.86	3.02±3.5	<0.001**
Hospital Stay	10.06±3.05	13.45±5.17	10.69±3	<0.001**
Amylase	511.6±236.	665.2±335	540.09±263.08	0.018*
Lipase	493.6±232.	580.95±280	509.50±242.73	0.146

Table 7: Comparison of clinical variables in relation to incidence of Mortality

Variables	Mortality		Total	P value
	No	Yes		
Age in years	45.05±12.1	53.33±13.3	45.28±12.2	0.248
BUN	23.91±24.1	53.67±33.2	24.74±24.7	0.040*
BISAP Score	1.78±1.22	4.67±0.58	1.86±1.30	<0.001**
ICU Stay	2.69±3.00	14.67±2.31	3.02±3.57	<0.001**
Hospital Stay	10.36±3.23	22.00±3.61	10.69±3.75	<0.001**
Amylase	531.73±255.17	832.67±429.94	540.09±263.08	0.050+
Lipase	502.59±235.94	751.33±409.06	509.50±242.73	0.080+

respiratory distress syndrome and 1 patient had cardiac failure and 1 patient had both renal and respiratory failure which was recorded as multi organ failure. Out of 108 patients 25 (23%) had organ failure in which 18 patients had transient organ failure which was resolved in < 48hours. Many of these patients had BISAP score of ≥ 3 and 5 patients had a score of <3. All these patients recovered without mortality. Out of 108 patients 25 (23%) had organ failure in which 7(6.5%) patients had persistent organ failure which persisted for > 48hours. All of them had BISAP score of ≥ 3. (Table 7).

In our study we had three mortality of which one patient having BISAP score of 4 died of ARDS, one patient with score of 5 died of cardiac failure and 1 patient with a score of 5 developed severe sepsis with multi organ dysfunction syndrome.

In this study out of 108 patients 20 patients had varying degrees of pancreatic necrosis. Among these 20 patients 15 patients had a BISAP score of ≥ 3 and remaining patients had a score of <3. Out of 88 patients that had no pancreatic necrosis 79% of patients had BISAP score <3 and about 21% of patients had a BISAP score of ≥ 3.(Table 8).

Prospective observational cross sectional study was conducted in teriary care hospital. The data was collected from pretested questionaries , The facets of BISAP score was categorised by the total score deviation methods. Original data was transformed by Med Calculator with greater accuracy and lesser SE. ROC analysis was done to know the cut of value of BIASP by using SPSS statistical software. Severity cut of value were obtained by ROC curve, prefixed with highest sensitivity and specificity values. (Fig. 3).

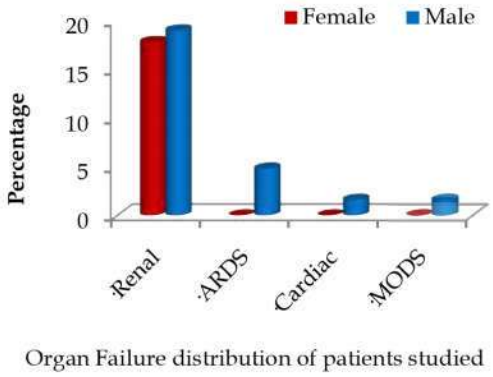

Fig. 3: Sumaary of ROC of BISAP score for predicting mortality

Pooled area under the AUC was calculated to determine BISAP's predictive performance. MedCalc statistical software (Version 17.4.4) was used to calculate the pooled AUC using a random effects model. Heterogeneity among the studies was assessed using Cochran's *Q* test and ANOVA. A *p* value <0.1 was

considered significant for heterogeneity. An a priori subgroup analysis was performed for severe pancreatitis rate (<20% and 20% or higher) and definition of SAP.

This study was limited by relatively small numbers of studies being available in the literature, limited reporting of data and heterogeneity between the studies. This limits the quality of the evidence and ability to perform analysis at different cut-off points to determine sensitivity and specificity. There is probable publication bias. Efforts were made to minimize the publication bias, which included not using language restriction in the search, a manual search of reference lists of included studies and the use of multiple databases. Also, a random effect model was used in calculating pooled estimates instead of a fixed effect model. A random effect model provides more conservative pooled estimates.

Nine cohorts from 8 studies were identified for the BISAP score at a cut-off of ≥ 3 [9,21,23–26,28,29]. Patients with a BISAP score ≥ 3 significantly had an higher likelihood of mortality (DOR = 13.72; 95% CI, 9.82–19.18; p< 0.05). No significant heterogeneity was revealed (p = 0.10; I^2 = 39.9%). The pooled sensitivity was 56% (95% CI, 53%-60%), and the pooled specificity was 91% (95% CI, 90%-91%). The summary PLR and NLR were 5.65 (95% CI, 4.23–7.55) and 0.48 (95% CI, 0.41–0.56), respectively. The SROC curve yielded an AUC of 0.87. (Table 9).

Table 9: ANOVA comparison to know the significance level of SAP

Variables	Error df	MSS	F
Blood urea nitrogen > 25 mg/dl	12	1058	18.56 (P ≤0.01005)
Abnormal mental status (Glasgow coma score <15)	22	2635	19.66(P ≤0.01228)
Evidence of systemic inflammatory response syndrome	16	1852	15.88(P ≤0.01116)
Greater than or equal to 60 years old	23	2238	13.62(P ≤0.0021)
Pleural effusion	28	2689	17.25(P ≤0.012300)

Discussion

In this study on 108 patients, acute pancreatitis was found more commonly in males (63) than in females (45) with a mean age of 46.78 years for female and 44.21years for males and with alcohol being the most common aetiology (57%), in agreement with a study by Rithin et al. [12] in which the mean age was 40.9 years and alcohol being common aetiology in of the patients. In our study, there was significant correlation in clinical findings like temperature, pulse, mean arterial pressure, GCS and respiratory rate which is similar to the findings of Rithin et al. [12]. Thus, fever, tachypnoea, tachycardia, decrease in MAP and decreased GCS correlate well with the severity of pancreatitis. Laboratory parameters like Serum amylase, Serum lipase, correlated well with the severity of pancreatitis.

CECT is considered to be the gold standard for imaging in acute pancreatitis [13], In our study, Ultrasound (USG) findings in acute pancreatitis like bulky pancreas, free fluid and gall stones were comparable to CECT and were found to have a statistically significant (<0.001) correlation with the severity. In additional to this CECT is less sensitive than USG in detecting gallstones or biliary duct stones [14]. USG is the most sensitive modality for evaluating the biliary tree and gallbladder [15]. The only limitation of USG as an investigation is that the pancreas can be obscured by the presence of bowel gas. Complications of pancreatitis like peri-pancreatic free fluid, pseudocysts, acute haemorrhage and venous thrombosis can be well made out in USG with sensitivity of 67% and a specificity of 100%. Exposure to radiation and multiple scans to assess progress and complications are limitations in the use of CECT. It carries a risk of anaphylactic reactions to IV contrast. Moreover, contrast cannot be used in patients with renal insufficiency. Ultrasonography in these situations is reliably safe in diagnosing local complications and prognosis.

In our study, of the 108 patients with pancreatitis, 83 were diagnosed to have mild pancreatitis, 18 were moderately severe and 7with severe acute pancreatitis.

The BISAP score uses clinical findings and imaging to derive a five-point score. It includes five points of SIRS criteria, making a total of eight variables and thus making the whole scoring system cumbersome. Its advantage is that it is a bedside score that can be performed daily with ease unlike the Ranson's score which requires 48 hrs to yield a prognostic score. The Ranson's criteria, however, take into account the inflammatory and vascular leak syndrome leading to the multi-organ failure persistent for 48hrs. APACHE-II measures the physiological response to injury and inflammation-driven damage and can be used for daily assessment of the patient's status.

In the present study, we defined SAP using the latest 2012 Atlanta classification system and we also evaluated sensitivity and specificity of BISAP score system for the early prediction of the severity, pancreatic necrosis and mortality in a prospective study in our institution. We found an increased risk of SAP with the increasing BISAP scores in the first 24 h, which would be helpful in clinical practice. In

the new Atlanta classification, AP was classified into three degrees: Mild acute pancreatitis, moderately severe acute pancreatitis, and severe acute pancreatitis. The new classification includes pancreatic complications (absence, sterile, infectious) and organ failure (absence, transient, persistent) for the broad spectrum of clinically relevant changes that occur in Acute pancreatitis. So we should use the latest classification to improve the clinical assessment of patients and facilitate communication between the treating physicians, and promote a standardized method for reporting clinical studies [16].

It is widely accepted that Ranson's and APACHE II scores are two commonly used indices to predict severity of acute pancreatitis in everyday clinical trials. The BISAP scoring system has the advantage over Ranson and APACHE II score of being calculated within 24 h after admission. Nevertheless, the Ranson scoring system seems to more accurately predict persistent organ dysfunction over 48 h, and APACHE II scores, which were initially designed for intensive care usage, seem to be a little complicated. In addition, the accuracy of BISAP in predicting SAP, mortality and pancreatic necrosis might not be the best, but not the least of the three scoring systems. According to these results, we concluded that the BISAP scoring system might be the most useful scoring system in predicting the severity of AP in the first 24 h after admission. Also, the BISAP scoring system might actually show better discrimination in predicting mortality than in predicting SAP, as indicated in our study and other recent studies.

Conclusion

BISAP is a newly developed scoring system for predicting AP severity and prognosis. Currently, only limited data are available regarding the validation of this system among different patient populations. A study by Papachristou [17] stated that with the cut off value set at 3, BISAP score had a sensitivity of 37.5%, and a specificity of 92.4% in predicting SAP. In our study, setting a best cut off value at 3 yielded a comparable sensitivity (88.9%) and specificity (50.0%).

In conclusion, this study to validate BISAP scoring systems using the 2012 Atlanta classification has shown that it is simple and convenient.

1. BISAP scoring system may be a useful tool for predicting outcomes in regions where it is frequently caused by alcohol as in India.
2. In the assessment and diagnosis of acute pancreatitis, the sensitivity and specificity of the BISAP scoring system might not be the best. But the advantage of BISAP is that it can be assessed within 24 h of presentation and is simple and renewable. On the contrary, the Ranson's scores can be assessed at least 48 h after admission; and the APACHE II score was more complicated than the BISAP score system. So we can estimate that the BISAP score may be a valuable source for risk stratification and prognostic prediction in patients with acute pancreatitis because of its simplicity and repeatability.
3. Several factors may contribute to the differences. First, there are differences in the characteristics of study patients (geographical & cultural differences), such as race, lifestyle, and genetic basis. In addition, etiologic distribution may also explain the noted differences. Finally, the different definitions of SAP may also be a reason for these variations.

Of course, a large scale prospective and multicenter validation study is required to confirm our results and further our recognitionof BISAP scores in AP.

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