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RESEARCH ARTICLE

EVALUATION OF BISAP SCORE IN PREDICTING SEVERITY OF ACUTE PANCREATITIS

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MAP- Mild Acute Pancreatitis,
SIRS- Systemic Inflammatory Response Syndrome, MODS- Multi organ Dysfunction Syndrome.

ABSTRACT

Early identification of patients at high risk s critical for early goal directed aggressive therapies in patients with Severe Acute Pancreatitis in preventing complications. A Prospective study was carried out over a period of two years at a tertiary hospital in rural India, and the results are presented here. The mortality rate was 3.92%. BISAP Score of ≥ 3 was associated with significantly higher rates of Organ failure, further more a score ≥ 3 was associated with significantly higher rates of persistent organ failure rates, which was further associated with significantly increased mortality rates. It can be concluded that a simple and reliable scoring system in form of BISAP can be safely and accurately used in predicting in hospital mortality rates in patients with severe acute pancreatitis.

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INTRODUCTION

Acute Pancreatitis is an acute inflammation of pancreatic gland with auto-digestion of pancreatic tissue often incurring variable damage to adjacent organs (Mifkovic *et al.,* 2006). Acute pancreatitis has been known, to frequently follow a very complicated and life threatening course. Mild form of acute pancreatitis, which accounts for 75-80% of cases, has virtually no mortality and patients recover more or less spontaneously.[2, 3] the severe form, however, is characterized by local and systemic complications and may lead to multi organ failure and is burdened by a mortality rate between 5% and 20% (Wu, 2011; Ranson *et al.,* 1974). The Atlanta symposium defined severe acute pancreatitis (SAP) as attacks associated with organ failure and/ or local complications such as pseudo cyst formation (Bradley, 1992). Early, quick, and accurate risk stratification of AP patients would permit evidence-based early initiation of intensive care therapy for patients with severe acute pancreatitis (SAP) to prevent adverse outcomes and allow treatment of mild acute pancreatitis (MAP) on the common ward. Therefore, a reliable risk stratification tool to predict the severity and prognoses of AP is of great clinical importance for the management of this disease (Lifen Chen *et al.,* 2013). An ideal scoring system should promise an early, quick, simple, accurate, and reproducible description of disease severity. Numerous scoring systems incorporating physiological parameters, laboratory investigations and radiological studies have been developed to improve accuracy of severity prediction. The scoring systems currently in use are Ranson's Criteria, APACHE II, Modified Glasgow scale, Computed tomography severity index (CTSI). Each of these studies has its own limitations. The main limitation of the Ranson's criteria is that the evaluation cannot be completed until 48 hours following admission, which may lead to missing an early therapeutic window and increased mortality (Ranson and Pasternack, 1977). APACHE II has the advantage of allowing determination of disease severity on the day of admission, but complexity is its major drawback (Yeung *et al.,* 2006; Larvin and McMahon *et al.,* 1989). CTSI is calculated based on CT findings of some local complications and cannot reflect the systemic inflammatory response (Ju *et al.,* 2006; Kaya *et al.,* 2007). In 2008, Wu *et al*., 2008 retrospectively developed a new scoring system, the bedside index for severity in acute pancreatitis (BISAP), to estimate the risk of in-hospital mortality in patients with AP. The BISAP incorporates 5 variables: blood urea nitrogen level. 25 mg/dL, impaired mental status, development of systemic inflammatory response syndrome, age. 60 years, and presence of pleural effusion.

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MATERIALS AND METHODS

This is a prospective study carried out at a tertiary center in rural southern India, during the years 2013 to 2015. All patients with a confirmed diagnosis of acute pancreatitis based on clinical and biochemical diagnosis of acute pancreatitis were included in the study. Informed consent was obtained from all patients prior to inclusion in the study. Patients with recurrent pancreatitis and chronic pancreatitis were excluded from the study, so were the patients unwilling to participate in the study. Regional Ethics committee approval was obtained prior to the initiation of the study. A thorough history and physical examination was carried out on all patients. Routine biochemical analysis was carried out along with serum amylase and lipase. All patients underwent ultrasound examination as a routine screening test. CT scan was performed on a need basis, when suspicion of progression of acute pancreatitis was evident on clinical and biochemical examination. This procedure was necessary in keeping with the socioeconomic status of the patients presenting to the tertiary hospital in rural India. Acute pancreatitis was defined based on the presence of the following features: characteristic abdominal pain (occasionally absent); serum amylase level three times the upper limit of normal; the presence or absence of characteristic imaging findings of AP; and exclusion of other diseases.

Classification of acute pancreatitis as mild or severe was done according to the 1992 Atlanta Symposium[4] based on the presence or absence of either organ failure or local complications or both. Organ failure was defined as shock (systolic blood pressure < 90 mmHg), pulmonary insufficiency (arterial PO2, < 60 mmHg), renal failure (serum creatinine >177 µmol/L after rehydration), or gastrointestinal bleeding (>500 mL per 24 hours) (Bradley, 1993). Local complications included pancreatic necrosis and abscess. BISAP Scores were calculated within first 24 hrs of admission of patients with acute pancreatitis. The efficacy of BISAP score in predicting severity of AP as well as pancreatic necrosis, organ failure, and mortality in SAP patients was assessed in the present study.

Statistical Analysis

Statistical analyses were performed using SPSS 20.0. Numeric data are presented as mean ± SD. Variables that follow a normal distribution were compared using a t test, whereas those not following a normal distribution were compared using the rank sum test. Level of significance was fixed at 0.05 and statistical test Fischer's exact test was used to assess statistical significance.

RESULTS

Patient demographics

A total of 102 patients with acute pancreatitis were included in the study. 80 of our patients were males (78.43%), 22 were female patients (21.57%). The mean age was 46.31 ± 17.01 years. Table 1 shows the demographics of patients in the current study.

Table 1. Demographics of patients with Acute Pancreatitis based on severity

Characteristic	MAP	SAP	Total
Male	59 (74%)	21 (26%)	80 (81.6%)
Female	17 (77.27%)	5 (22.27%)	22 (18.4%)
Total	76 (74.51%)	26 (25.49%)	102 (100%)

Among 80 males, 59 (74%) had Mild Acute Pancreatitis, while 21 (21.57%) had Severe acute Pancreatitis. The rates of mild and severe acute pancreatitis in women were 17 (77.27%) and 5 (22.27%). Fisher's exact test P=0.075.

Severity of BISAP Score

Among total of 102 patients, 74 patients had a BISAP score <3 and 28 patients had score >3 as seen in table 2. Fisher's exact test P=0.035.

Table 2. BISAP Severity scores

Severity	Frequency	Percentage
Score <3	76	74.51%
Score >3	26	25.49%
Total	102	100%

Etiology of Acute Pancreatitis

An analysis of etiology of acute pancreatitis was carried out on all patients and the results are summarized in table 3 according to severity of pancreatitis.

Table 3. Etiology of Acute Pancreatitis

Etiology	MAP	SAP	Total
Alcoholic	48 (77.42%)	14 (22.58%)	62 (60.78%)
Biliary	12 (54.54%)	10 (45.45%)	22 (21.56%)
Idiopathic	16 (90%)	2 (10%)	18 (17.65%)
Total	76 (74.51%)	26 (25.49%)	102 (100%)

Alcoholic Pancreatitis was the most predominant diagnosis seen in 62 patients (60.78%). Gallstone pancreatitis was the second most common diagnosis seen in 22 patients (21.56%). 18 patients had idiopathic pancreatitis (17.65%) of whom only 2 had severe acute pancreatitis. Fischer's exact test P= 0.15.

Evidence of Organ Failure

Transient organ failure was defined as dysfunction of one or more organ systems which resolves to normal functioning state with adequate therapy with in 48 hrs. Any organ dysfunction that persists beyond 48 hrs has been defined as persistent organ failure. In our study 16 (15.68%) patients had documented evidence of Transient organ failure. Among whom 62.5% (n=10) patients had a BISAP Score >3, while 6 patients (37.5%) patients had score less than 3. Of the 16 patients with transient organ failure, all patients with BISAP Score <3 had evidence of complete resolution of organ failure, while 50% of patients (n=5) had progressed to persistent organ failure despite adequate goal directed therapies. Fisher's exact test P=0.028.

Table 4. Organ Failure in relation to BISAP Score

BISAP Score	<3	>3	Total
Transient Organ Failure	6 (37.5%)	10 (62.5%)	16
Persistent Organ Failure	0	5	5

Further analysis of the organ failure in the cohort identified that there were 23 documented organ failures involving 3 organ systems namely, Renal, Pulmonary and Cardiovascular, in the 16 patients with 11 patients having just one organ system failure, 4 patients having 2 organ system failure and 1 patient having all 3 organs in failure. The organ failure data is shown in table 5.

Table 5. Frequency of Organ failure in Acute Pancreatitis

Organ failure	Frequency	Percentage
Renal	10	45.45
Pulmonary	7	31.81%
Cardiovascular	5	22.72%

Renal impairment was the predominant organ system involved as seen in 45.45% of organ failures. Next in frequency were Pulmonary and Cardiovascular impairment seen in 31.81% and 22.72% of the total organ systems involved. Fisher's exact test P=0.017.

Clinical outcomes

Of the 102 patients in the study, 4 (3.92%) patients succumbed to the sequalae of Acute Pancreatitis. Analysis of the BISAP score in predicting the mortality rates were calculated and shown in Table 6.

Many previous studies have applied Atlanta criteria to define the severity of AP (Stimac *et al.,* 2007; Liu *et al.,* 2006). Over years, the Ranson criteria and APACHEII system have been well-established in the assessment of patients with AP. However, both of them have significant weaknesses. The Ranson criteria require 48 hours to complete, which will miss the potentially valuable early treatment. The APACHEII system is a generic score for all critically ill patients. It requires the collection of many parameters, which may not be available outside the ICU, and some parameters may be irrelevant to the prognosis (Chauhan, 2010). By contrast, the BISAP score is simpler to calculate and only uses routine clinical data within 24 hour of presentation. BISAP is a newly developed scoring system for predicting AP severity and prognosis (Wu *et al.,* 2008). In their study, the correlation between BISAP scores of 0, 1, 2, 3, 4, 5 and the observed mortality rates were reported as 0.1%, 0.5%, 1.9%, 5.3%, 12.7% and 22.5% respectively. Our study had a mortality rate of 3.92%. Further analysis of the mortality data suggested, a 15.38% mortality rate among patients with BISAP Score >3. This corresponds to the study by Wu *et al.,* 2008. The current study observed that setting a cut off score at ≥3 was associated with significantly higher rates of organ failure either transient or persistent (p value 0.028). Further on it was also observed that the organ failure rates in patients with BISAP score ≥3 also was associated with clinically significant mortality rates (p value 0.001). A study by Papachristou *et al.,* 2010reported that with the cutoff value set at 3, BISAP score had a sensitivity of 37.5%, a specificity of 92.4%, a PPV of 57.7%, and an NPV of 84.3% in predicting SAP. In the present study, setting a cutoff value at 3 yielded a comparable sensitivity (37.80%), specificity (91.2%), PPV (52.1%), and NPV (87.50%).

Table 6. Clinical outcomes in relation to BISAP Score

BISAP Score	No of patients	No Organ Failure	Any organ failure without mortality	Organ failure with mortality
<3	76 (74.51%)	70 (92.11%)	6 (7.89%)	0
>3	26 (25.49%)	16 (61.54%)	10 (38.46%)	4 (15.38%)
Total	102 (100%)	86 (84.31%)	16 (15.68%)	4 (3.92%)

Total of 76 patients had a BISAP Score < 3, of whom 6 patients (7.89%) had evidence of transient organ failure and all of them showed a complete clinical evidence of resolution of organ failure. 26 patients (25.49%) had BISAP score >3 at admission, 10 patients (38.46%) of them had organ failure persistent beyond 48 hrs of organ directed therapy. Of the 10 patients, with persistent organ failure, 4 patients have died (15.38%). The final mortality rate in our study was 3.92%. Fisher's exact test P=0.001.

DISCUSSION

At present, multiple scoring systems are available for evaluating the severity of AP. The Atlanta classification is a clinically based classification system that is most widely used and relatively universally accepted (Bollen *et al.,* 2007; Petrov and Windsor, 2010). It defines the severity and complications of AP by evaluating both local and systemic changes in the development and progression of the disease (Stimac *et al.,* 2007). Although the Atlanta classification cannot meet the requirement for early evaluation of AP, it is a relatively objective index for assessing the severity of AP.

A recent systematic review and meta analysis by Weig Gao *et al.,* focused on the predictive value of BISAP score for assessing clinical outcomes of AP. Our pooled results showed that the BISAP score at a cut-off of ≥ 3 had a moderate sensitivity and a high specificity for predicting mortality and SAP. In comparison, at a cutoff of ≥ 2, the sensitivity increased whereas the specificity decreased for both outcomes. When calculating the likelihood ratios for BISAP score at a threshold of 3, PLR (Positive Likelihood Ratios) were above 5 for both outcomes, suggesting that a BISAP score of ≥ 3 did well in predicting mortality and severity of AP. This is helpful that patients with SAP will be put on monitored beds early. However, the NLRs (Negative Likelihood Ratio) exceeded 0.2 for these outcomes at any cut-off, which indicated that a low BISAP score was not robust enough to predict patients at low risk for death or SAP. Thus, many patients with mild disease may be falsely be labeled as having mild disease when later they will develop SAP.

Conclusion

From this prospective non randomized study we conclude that a cut off value of BISAP score ≥3 was significantly predictive

of organ failure and the same was held true in predicting mortality rates with clinical significance. We demonstrated that BISAP has the advantages of simplicity and speed over traditional scoring systems and in predicting SAP and the prognoses of SAP. We confirmed that the BISAP score is an accurate means for risk stratification and prognostic prediction in patients in rural Southern India.

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