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Original Research Article

Assessment of accuracy of BISAP score as a predictor of severe acute pancreatitis: a retrospective study

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ABSTRACT

Background: The prevalence of acute pancreatitis (AP) has increased in the past 20 years. Most patients with AP experience a clinical course that is mild and self-limited. However, 10% to 20% of patients develop a rapidly progressive inflammatory response necessitating prolonged length of hospital stay and high rates of morbidity and mortality. There are various scoring systems already in place to assess the severity of acute pancreatitis. However, they have significant drawbacks. Since the BISAP score offers the advantages of being inexpensive, rapid, and simple, we conducted this study to gauge its usefulness.
Methods: This study enrolled 138 patients with AP admitted in surgical wards of McGann District Teaching Hospital, during a time period between January 2022 to June 2022, meeting the various inclusion criteria.
Results: We found that the percentage of severity, necrosis, organ failure, death, and hospital stay increased as the BISAP score increased. In terms of sensitivity and specificity, the accuracy of the BISAP score for predicting severe acute pancreatitis was 76.2% and 63.4%. According to our study, patients with severe acute pancreatitis had BISAP scores of 3 or above.
Conclusions: BISAP can be used to identify the patients who are at risk, and this information can serve as an early guidance for appropriate and necessary therapy, improving patient outcomes. Present study concludes the increased accuracy of BISAP score for risk stratification.

Keywords: BISAP score, Acute pancreatitis, Scoring system, Mortality

INTRODUCTION

Acute pancreatitis (AP) is the inflammation of the prior normal pancreas with possible peripancreatic tissue and multiorgan involvement.[1,2] AP is highly variable in terms of its clinical presentation and severity, with majority of cases being mild and self-limiting.[3,4]

According to the 2012 Revised Atlanta Classification, AP identifies 2 phases of acute pancreatitis - early (first 1 or 2 weeks) and late (thereafter). AP can be either edematous interstitial pancreatitis or necrotizing pancreatitis, the latter involving necrosis of the pancreatic parenchyma and peripancreatic tissues, pancreatic parenchyma alone or just the peripancreatic tissues. Severity of the disease is categorized into 3 levels: mild, moderately severe and severe.[6]

In mild AP (MAP), no organ failure and no local or systemic complications occurs. In moderately severe AP (MSAP), transient organ failure (resolved within 48 hours) or local complications occurs, and in severe AP (SAP), persistent organ failure (longer than 48 hours) takes place.

Local complications included acute peripancreatic fluid collection, pancreatic pseudocyst, acute necrotic collection, and walled off necrosis.

Around 25% of patients with acute pancreatitis develop severe acute pancreatitis and average mortality rate is around 2-10%. Therefore, early identification of acute pancreatitis enables rapid intervention and treatment and can improve patient's betterment and survival.[7]

Many scoring systems that have been developed for the early detection of severe AP had limitations, i.e. they are not simple, rapid, or economical.[8] In 2008, Wu et al proposed a new prognostic scoring system for the early prediction of the severity of AP, the bedside index of severity in acute pancreatitis (BISAP).[9] Data for BISAP score collected within the first 24 hours of hospitalization. BISAP score is an uncomplicated, quick and reasonably reliable for assessment of disease severity on admission.

To assess organ failure in acute pancreatitis the criteria proposed by Marshal et al was used. Organ failure- three organ systems should be assessed to define organ failure. Pulmonary insufficiency- when arterial PO_2 is less than 60 mmHg in room air or there is a need for ventilator, renal failure- serum creatinine level more than 2 mg % after rehydration or hemodialysis, shock- systolic blood pressure less than 90 mm Hg. As per modified Marshall scoring system, a score of 2 or more for one of these three organ systems, suggests organ failure.

Over past years' management of AP has significantly changed. Primary treatment in early cases is non-surgical and supportive. Patients with infected necrosis with sepsis promptly requires intervention and early admission to intensive care has improved the overall outcome.[10]

With rising costs of intensive care treatment of acute pancreatitis and its complications there is a need for early identification of warning signs and early prompt intervention. This helps the patients to recover faster with less morbidity and mortality.[6,7]

A prospective study on the value of the BISAP scoring system as a method for the early detection of severe AP that was published recently, concluded that accuracy of this method of risk stratification was comparable with other multifactorial scoring systems in patients with AP.[9,14]

This study analyses the predictive value of BISAP score in developing severe AP (SAP) and mortality rates.

METHODS

Patients coming to McGann District Teaching hospital were included in this study, with AP as per definition, from January 2022 to June 2022. BISAP score was calculated from the laboratory and radiological findings.

Study population

138 consecutive patients who were admitted with diagnosis of acute pancreatitis in various surgery wards of Mcgann District Teaching Hospital were considered for study.

Inclusion criteria

Both males and females above the age of 20 years were included in the study with features as per the established diagnosis of acute pancreatitis as per revised Atlanta classification and definition by international census 2012, were included in the study.

Exclusion criteria

Patients aged less than 20 years, chronic pancreatitis, infection at presentation (cholangitis, cholecystitis, pneumonia), and known cases of carcinoma pancreas.

Type of study

It was a retrospective type of study.

Statistical analysis

The data was collected properly and appropriately charted using Microsoft excel. Numeric data are presented as mean±SD. Simple mathematical expressions like percentage was also used. Statistical analyses were done using statistical package for social science (SPSS) software, latest version.

Ethical considerations

The institutional ethics committee's approval for research on human subject was taken. Throughout the study strict ethical norms were maintained. Written informed consent was taken from patients in their local language (mother tongue).

Definitions

As per revised Atlanta classification and definition by international census 2012, AP is defined as patients having two of the following three features - characteristic abdomen pain, elevation of pancreatic enzymes more than three times the normal values, characteristic findings in contrast enhanced computed tomography (CECT) i.e., oedema of pancreas, altered fat and fascial planes, fluid collections, necrosis (non-enhancement area more than 30% or 3 cm).[5]

BISAP incorporates five parameters - blood urea nitrogen >25 mg/dl, presence of an impaired mental status, systemic inflammatory response syndrome (SIRS), age >60 years, and detection of pleural effusion by imaging.[9,10]

Systemic inflammatory response syndrome (SIRS) is defined by the presence of at least two of the following, pulse >90 beats per minute, respirations >20 per minute, $PaCO_2$ <32 mmHg, temperature >38°C or <37°C, white

blood cell count >12,000 or <4,000 cells/mm^3, or >10% immature neutrophils (bands).[11,12]

Procedure and data collection

Patients with symptoms of AP were identified, history and details of local and systemic examinations was collected.

The following were collected from the patient charts: sex, age, blood pressure (mm Hg), respiratory rate (breaths per minute), oxygen saturation (%), pulse rate (beats per minute), the BISAP score at admission, the creatinine level (mg/dl), Ht (%), blood urea nitrogen BUN (mg/dl), and the glucose level at admission (mg/dl). The etiology, morbidity, and mortality data were also collected. The BISAP score was evaluated at admission using the parameters available in the first 24 hours.

Imaging studies of plain radiograph of chest and abdomen, ultrasonography (USG) abdomen and pelvis, CECT of abdomen and pelvis that were done was collected. BISAP score was calculated from the laboratory and radiological findings, and patients were categorized using the revised Atlanta criteria.[7]

RESULTS

A total of 138 patients were admitted and included in our study, of which 117 were males (84%) and 31 were females (16%). Mean age was in the 4th decade (Figures 1 and 2).

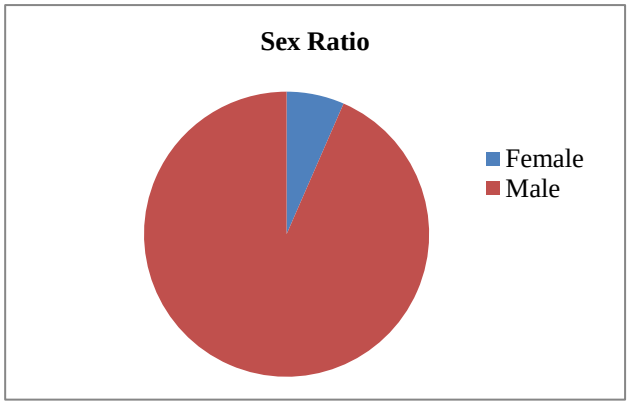

Figure 1: Sex ratio.

Of the study population, 32 patients (26%) had severe acute pancreatitis, with 3 mortalities (2.2%) (Figure 3).

Alcohol was the most common etiology (62%), followed by biliary pancreatitis (28%), remaining were idiopathic (9%) pancreatitis (Figure 4).

It was found that Acute pancreatitis affects all ages and most of the cases were between the age group of 21 to 50 years. All the patients aged ≥60 years old we admitted presented with severe AP.

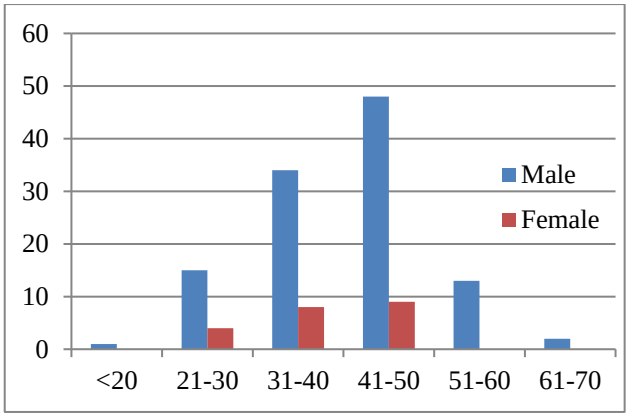

Figure 2: Age distribution.

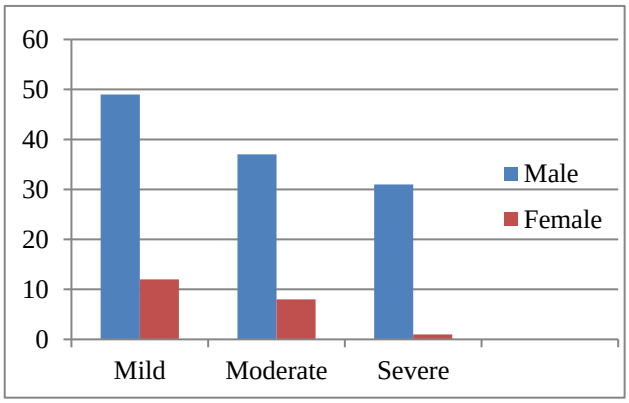

Figure 3: Severity of acute pancreatitis.

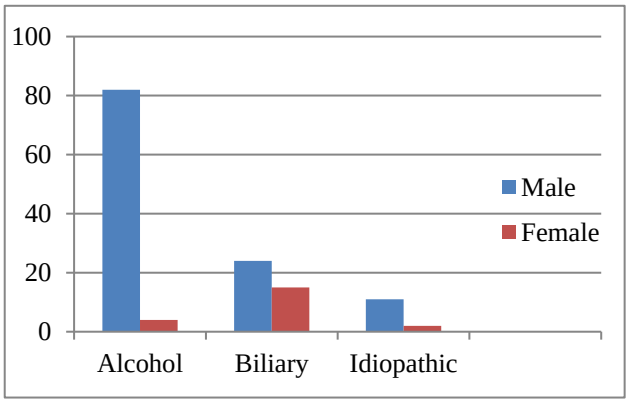

Figure 4: Etiology.

Raised BUN is independent predictor of severe pancreatitis. We saw raised BUN in 26 (81.2%) out of 32 patients of severe pancreatitis.

60.87% of patients had SIRS, and all patients with severe acute pancreatitis were found to have SIRS.

Amongst the various parameters, we found that the presence of pleural effusion was the most sensitive. All patients SAP had pleural effusion (Table 1 and Figures 5-9).

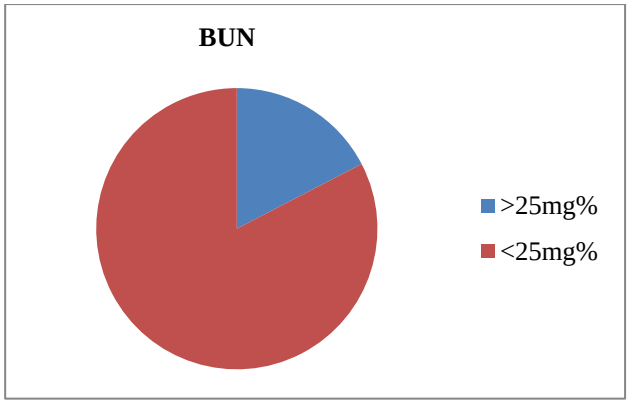

Figure 5: Frequency of raised BUN.

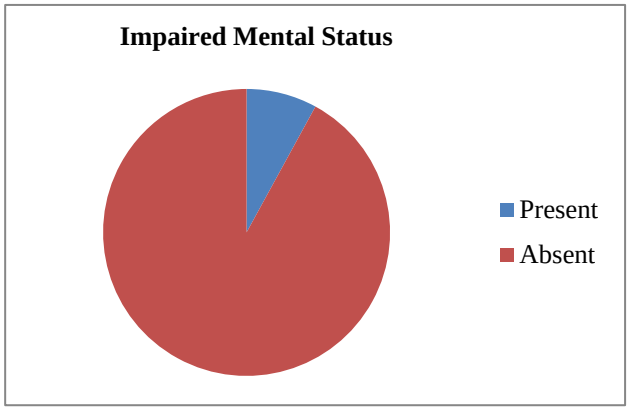

Figure 6: Frequency of impaired mental status.

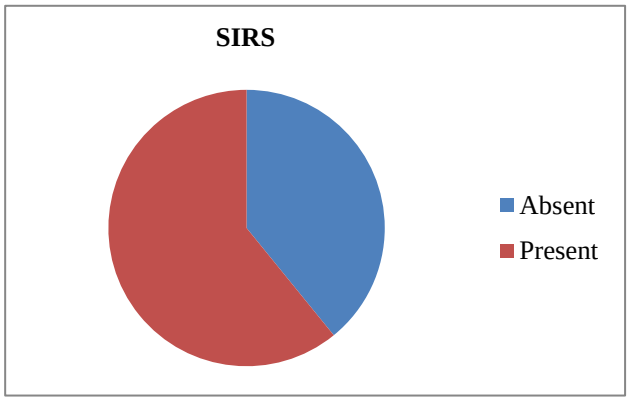

Figure 7: Frequency of SIRS.

Patients with BISAP score ≥3 carries higher risk of severity, organ failure and mortality, than BISAP score of <3. There was 1 organ failure and 1 mortality in patients with BISAP score 3. In patients with BISAP score ≥4, we had 3 organ failure and 2 deaths.

There was increasing trend in the percentage of severity, organ failure, necrosis and mortality with increasing BISAP scores. Patients with BISAP ≥3 was more frequent in patients with SAP, with transient or persistent organ failure and pancreatic necrosis.

Accuracy to predict severe acute pancreatitis by BISAP score was 76.2%, on the basis of sensitivity and 63.4% on the basis of specificity.

Table 1: Distribution of cases according to BISAP parameters.

Parameters	Frequency	Percentage
BUN (mg%)		
>25	24	17.39
<25	114	82.60
Impaired mental status		
Present	11	7.97
Absent	127	92.03
SIRS		
Present	84	60.87
Absent	54	39.13
Age		
>60	3	2.17
<60	135	97.83
Pleural effusion		
Present	47	34.06
Absent	91	65.94

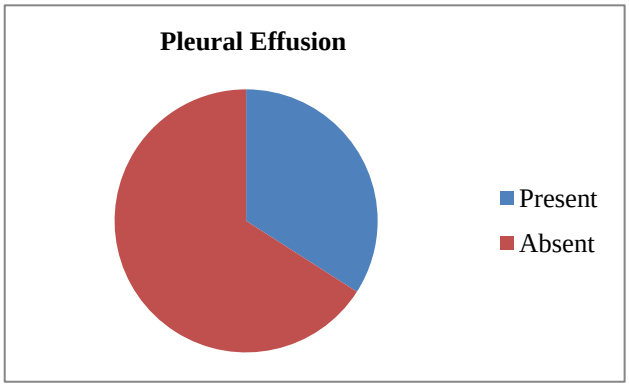

Figure 8: Frequency of pleural effusion.

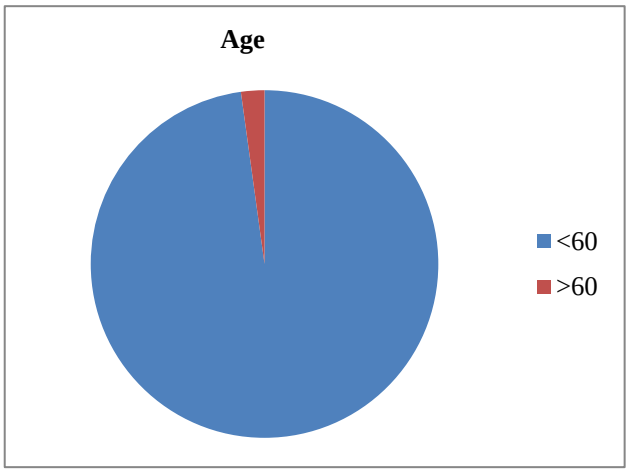

Figure 9: Frequency of age of patient >60 versus age<60.

DISCUSSION

A new prognostic scoring system, the bedside index for severity in acute pancreatitis (BISAP), is a simple and accurate method for early identification of patients at risk of in hospital death.

The BISAP scoring method overcomes the shortcomings and challenges of the current prognostic scoring systems. Ranson and Glasgow scores need 48 hours to calculate, as well as information that is not typically obtained at the time of admission and isn't easily accessible in small centres.[2,14-16]

Organ failure occurred far more frequently in patients with a BISAP score below 3 than in those with a BISAP score above 3, according to Singh et al. According to our analysis, a BISAP score of 3 was highly predictive of organ failure.[10]

The most widely used scoring system is APACHE II, which was first developed for the prognostication of ICU patients. However, it requires several parameters, some of which are not relevant for AP. Additionally, the chronic health profile component of the score involves a thorough medical history and records, which is challenging to collect for all patients. For clinicians, it is cumbersome and challenging to recall.[14,17-19] These require data to be collected at the time of admission and then at 48 hours. CTSI is not useful for prognosis in early stages of the disease as the morphological changes develop late.[1,14,20]

In comparison to other scoring systems, the BISAP score has a number of advantages for determining severity. First off, it's easy to calculate the score because it simply requires the standard imaging, laboratory investigation studies, and vital signs that are taken at the time of presentation or within 24 hours of it. Second, the score was developed and tested using 36, 248 acute pancreatitis cases spread over 389 hospitals, reflecting the full spectrum of healthcare delivery.[9] The third is that the score predicts in-hospital mortality.

Both BISAP and APACHE II use age, GCS and SIRS. With the addition of BUN and pleural effusion parameters, BISAP attains a high predictive ability to detect severe AP and mortality which is equivalent to the complex APACHE II. A BISAP score of 3 was linked to more severe disease, more organ failure, and higher death, hence most authors selected a BISAP score of three as their cutoff and BISAP score of 2 or more by few.[2,21-24]

The extrapancreatic organ failure and local pancreatic problems that are present in severe illness are defined by the revised Atlanta classification, and more recently, organ failure is seen to be a much stronger predictor of severe disease and length of hospitalization.[2,21]

BISAP predicts severity and likelihood of progression to organ failure more accurately in the early stage of the disease, thus adding to the advantage of this scoring system.

Park et al in his retrospective study of the 303 patients compared BISAP score with other scoring systems.[2] AUCs for BISAP predicting severe pancreatitis, organ failure and death were 0.80, 0.93 and 0.86, respectively, which were similar to those for APACHE-II (0.80, 0.95, 0.87) and Ranson criteria (0.74, 0.84, 0.74) and greater than AUCs for CTSI (0.67, 0.57, 0.42). In his study BISAP predicted severity, death, and especially organ failure in acute pancreatitis as good as APACHE-II did and was better than Ranson criteria, CTSI, CRP, haematocrit and BMI.

In this study, we evaluated the usefulness of BISAP as an early marker of the severity of acute pancreatitis.

To provide a standard approach, a larger prospective study comparing all scores and individual parameters is required to overcome the limitations of our study, it being conducted in a single tertiary care center. Also, the approach to prognostication of Acute Pancreatitis by various institutions take different approaches based on their preferences.

CONCLUSION

There is a very long history of attempts to find prognostic or predictive markers that accurately stratify the risk. BISAP is easy-to-calculate clinical prediction scale, requiring only physical examination, vital signs, laboratory data, and imaging for detection of pleural effusion that are usually documented on presentation. It has the advantage of simplicity and can be performed within the first 24 hours of admission. The patients at risk can be identified and it can act as an early guide for the accurate and required treatment resulting in improved patient outcomes. There is an increasing trend in these outcomes with increasing BISAP. We concluded that BISAP score is a reliable means of predicting the severity, necrosis, organ failure and mortality in patients with acute pancreatitis.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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