Evaluation of Bisap Scoring System in Predicting Severity and Prognosis of Acute Pancreatitis Patients

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Abstract:
BACKGROUND AND OBJECTIVE: *Many scoring systems are introduced to assess the severity and outcome of the patients of acute pancreatitis. To evaluate the ability of the BISAP score in predicting the patients, who are at risk of severity, that is, development of systemic complications, pancreatic necrosis and organ failure.*
METHODS: *A prospective observational study was done from November 2017 to June 2019. 50 patients who admitted to K.R Hospital, department of General Surgery, MMC&RI, Mysuru who were diagnosed as acute pancreatitis included in the study. Full history, clinical examination, ultrasound abdomen and lab investigations were done for the patients and assigned BISAP score for every patients of acute pancreatitis*
RESULTS: *90 % were found to be male patients. Mean length of stay in hospital was found to be 7.16days.In our study, alcohol was the major commonest etiology of acute pancreatitis, in 66% of patients. On Evaluation BISAP score shows to have high sensitivity of 83.33% and specificity of 91% in predicting organ failure and high sensitivity of 80% and specificity of 89% in predicting pancreatic necrosis in predicting mortality Sensitivity of 100% and specificity of 93.75% in severe acute pancreatitis patients.*
CONCLUSION: *In acute pancreatitis, BISAP scoring is an accurate, simple and bedside scoring system with high sensitivity and specificity for assessing severity of disease in terms of prognosis, necrosis,organ failure, and mortality.*

I. Introduction

Acute pancreatitis is a relatively common and a potentially life threatening disease. It is defined as "an inflammatory process of the pancreas with possible peri-pancreatic tissue and multi-organ involvement inducing multi-organ dysfunction syndrome (MODS) with an increased mortality rate". The incidence and etiology of AP varies with geographical location. Most common etiology, In India, for AP is alcohol followed by gall stone.1 Idiopathic Pancreatitis is third most common.The clinical feature includes mild, self-limiting inflammation of pancreas to severe, which is characterized by pancreatic necrosis, multi organ failure, and high mortality.[2] Most of the times, acute pancreatitis is self-limiting and mild. In 20-30% of acute pancreatitis patients, progress to severity, which causes pancreatic necrosis, systemic inflammation, multiple organ failure, prolonged hospital stay and death.[3] Mortality in AP has bimodal distribution.[4]Many scoring systems and biochemical parameters are introduced to evaluate the severity and prognosis of acute pancreatitis. These include Ranson's scoring, APACHE II (acute physiology and chronic health evaluation), modified Glasgow Score, BISAP Score, Balthazar CT severity index. However, all scoring systems have their own specific Positives and negatives.[5]The present study evaluates the effectiveness of BISAP scoring in assessing the prognosis and severity in acute pancreatitis.

II. Material and Methods

This prospective comparative study was carried out on patients of Department of General SurgeryatMysore Medical College and Research Institute from November 2017 to June 2019. A total 50 subjects (both male and females) of age ≥ 18 up to 70years were considered in this study.
Study design: It is a hospital based Prospective Observational study.
Study Location: All patients diagnosed to have acute pancreatitis and admitted in In-Patient Department (IPD) of General Surgery, Mysore Medical College and Research Institute, Mysore.

Study Duration: November 2017 to June 2019.
Sample size: 50 patients.
Sample size calculation:

Sample size (**n**) of this study was calculated based on a formula used for evaluating a Prognostic/Diagnostic test is:

$n = Z\alpha^2 \times Sn(1-Sn) / (L^2 \times P)$

Where, $Z\alpha = 1.96$(Two tailed at 95% confidence interval), Sn = Sensitivity of the index test, L = allowable error around the reported incidence which is assumed to be 0.77, P = Incidence of the disease (0.3/1000 population).

Sn=62%

P=30/lakh population=$30/10^5$

L=0.77

$n = Z\alpha^2 \times Sn (1-Sn)/ (L^2 \times P) = (1.96)^2 \times 0.62(1-0.62) \times 10^5 / ((0.77)^2 \times 30)$

= 9047/ 179.7

=50.3

Hence the Final study Sample Size is 50.

Inclusion criteria:
1. Patients willing to give written informed consent.
2. All cases of acute pancreatitis patients presenting and admitted in K R Hospital attached to the Department of General Surgery, MMC&RI, Mysuru aged between 18-70 years.

Exclusion criteria:
1. Patients under 18 years and above 70 years.
2. Patients who do not give informed written consent.
3. Acute on chronic pancreatitis.

Procedure methodology: Acute Pancreatitis was defined based on the 2013 revised Atlanta Criteria: i) mid epigastric pain radiating to back ii) elevation of serum lipase more than 3 times of the normal upper limit iii) CT scan revealing evidence of AP. Presence of any 2 out of 3 criteria is regarded as acute pancreatitis.The study was carried out after obtaining permission from the RGUHS & institutional Ethics Committee of MYSORE MEDICAL COLLEGE and RESEARCH INSTITUTE clearance. Informed consent was obtained from each patient prior to study enrolment. Then eligible and willing case(s) were included in the study. Thus the desired number of study subjects was enrolled in the study. BISAP score was calculated in all such patients based on data obtained within 24hrs of Hospitalization. Control(s) were not required for this study.
- Acute pancreatitis is defined as 2 or more of the following:

1. Characteristic abdominal pain.
2. Increased levels of Serum amylase and/or lipase 3times the normal value.
3. Ultrasonography of the abdomen within first 7days of hospitalization demonstrating changes consistent with acute pancreatitis.

Study tools: 1.Predesigned Proforma.
2**.** Laboratory & Radiological investigation reports.

Statistical analysis:
Data was analysed using SPSS version 26 (SPSS Inc., Chicago, IL). Student's *t*-test was used to ascertain the significance of differences between mean values of two continuous variables and confirmed by nonparametric Mann-Whitney test. In addition, paired *t*-test, Wilcoxon test, Chi-square and Fisher exact tests were performed. The level $P < 0.05$ was considered as the cutoff value or significance.

III.   Results

Among 50, 32(64%) patients were under the age group of 20-40 year. Average age of the participants was estimated to be 38.62 ± 11.93 (mean ± sd) with median of 37 years. Mean age group of males: 38 years Mean age group of females: 44.2years (Fig.1)

Fig.1: Distribution according to age.
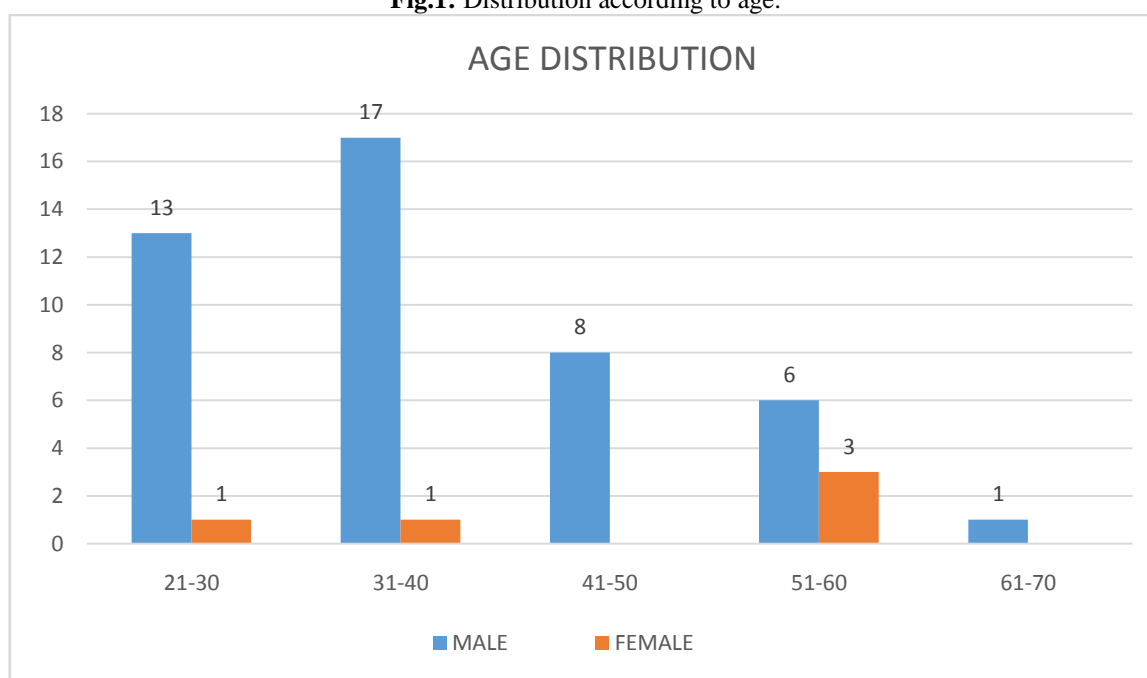
There were 45 male and 5 female patients.Male: Female ratio-9:1 (Fig.2)

**Fig.2:** Distribution according to gender.
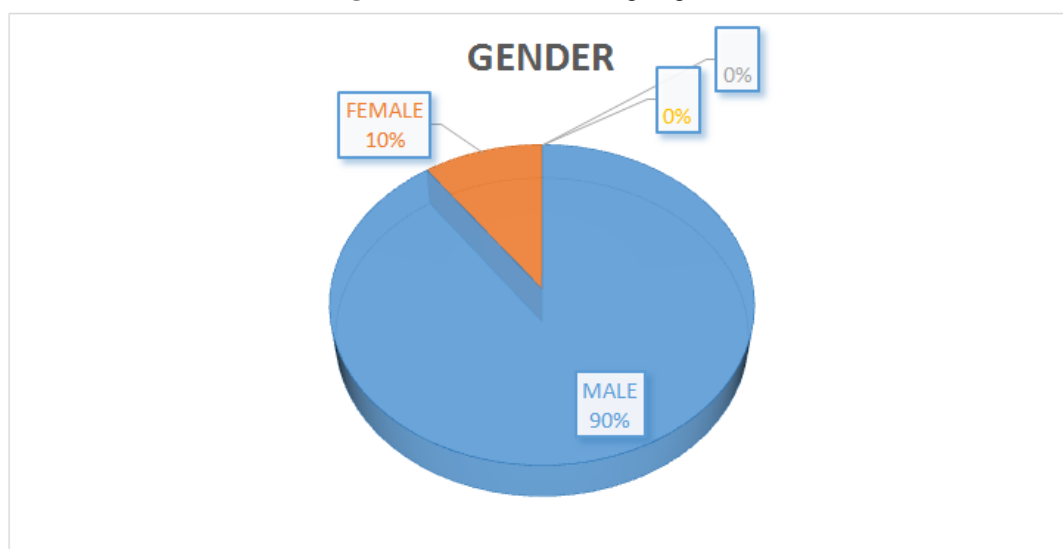
Most common etiology in this study was revealed to be consumption of alcohol which was found in 33(66%) patients, followed by Gall stone disease, which was attributed in 10(20%) patients. However, idiopathic 5(10%) was found to be the 3rd most common. (Fig.3)

Fig.3: Distribution of patients according to etiology.
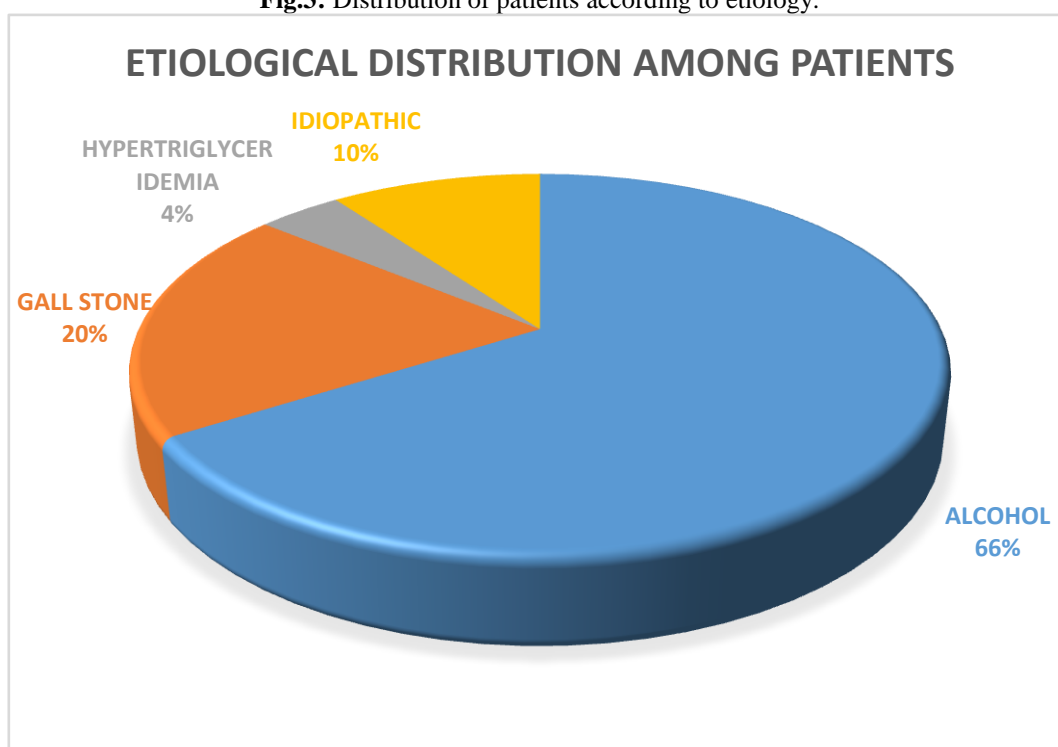
Out of 50 patients 41 **(82%)** patients had mild acute pancreatitis. and 9 with severe acute pancreatitis. Out of the 9 patients who had severe attack, 2 patients expired. (Fig.4)

Fig.4: Distribution with respect to severity of acute pancreatitis based on BISAP score, (<3 - mild, ≥ 3- severe)
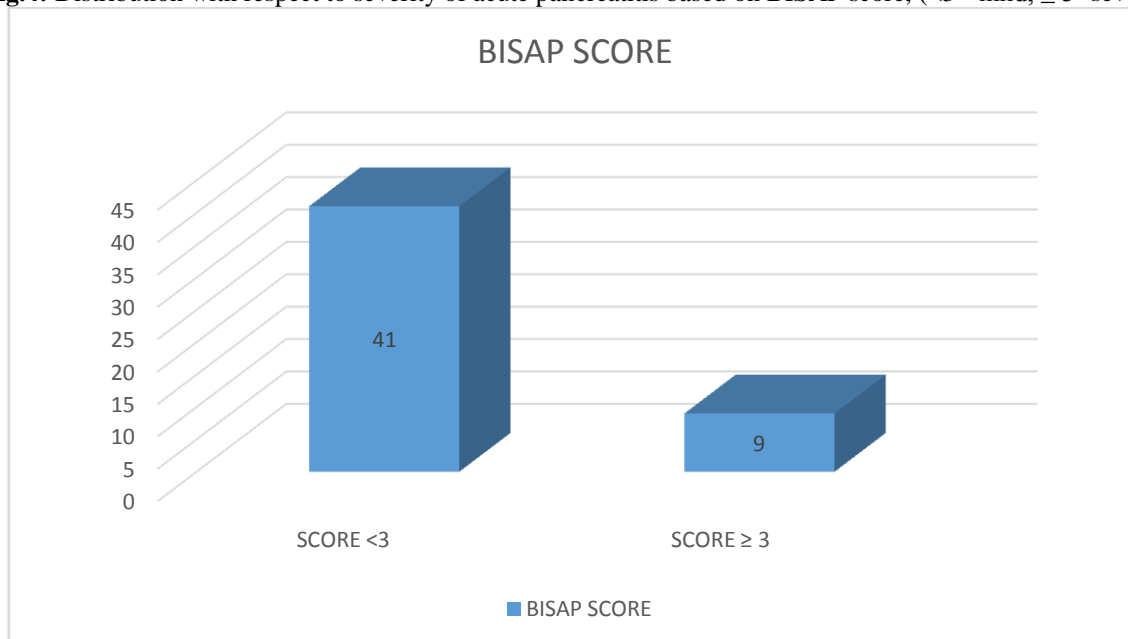
Out of 50 patients, 31 patients (**62%**) were discharged within 7 days. Average, median and range of Length of stay were estimated to be 7.16±2.51 days (mean±sd), 6 days and 15 days, respectively. Analysis also revealed that there was a moderate correlation (r=0.53) between BISAP score and Length of stay. (Fig.5). The length of hospital stay ranges from 1 to 15 days. The mean length of hospital stay was 7.16 days. Analysis also revealed that there was a moderate correlation (r=0.53) between BISAP score and Length of hospital stay. Of the 50 patients, 4% died due to complications and the rest were discharged. Pleural effusion was seen in 30(60%)

patients involving one or both lungs, as complication of acute pancreatitis. Among the 50 participants, 9 patients had severe acute pancreatitis. Out of these 9 patients, 5 had BISAP Score 4, among 5, 2 patients died.

The sensitivity and specificity of the score in terms of outcomes of patients was assessed (Table 1)

SENSISITIVITY=a/(a+c)×100=TP/(TP+FN)=100%

SPECIFICITY = d/(b+d)× 100 = 93.75%

POSITIVE PREDICTIVE VALUE = a/(a+b) × 100 = 40%

NEGATIVE PREDICTIVE VALUE = d/(c+d) × 100 = 100%

ACCURACY = (a+d)/(a+b+c+d) × 100 = 94%

Table 1: Sensitivity and specificity of BISAP scoring in terms of predicting the outcome of participants.

BISAP SCORE	DEATH No. (%)	DISCHARGE No. (%)	TOTAL No. (%)
SCORE ≥ 4	2(4)[a=TP]	3 (6)[b=FP]	5(10)
SCORE < 4	0 (0)[c=FN]	45 (90)[d=TN]	45 (90)
TOTAL	2(4)	48(96)	50(100)

TP=True positive, FP=False positive, TN=True negative, FN=False negative.

Sensitivity and specificity of BISAP score in terms of organ failure was assessed (Table 2).

SENSISITIVITY=a/(a+c)×100=TP/(TP+FN)=83.33%

SPECIFICITY = d/(b+d)× 100 = 90.9%

POSITIVE PREDICTIVE VALUE = a/(a+b) × 100 =55.55 %

NEGATIVE PREDICTIVE VALUE = d/(c+d) × 100 =97.56 %

ACCURACY = (a+d)/(a+b+c+d) × 100 = 90%

Table 2: Sensitivity and specificity of BISAP score in terms of predicting organ failure

		Organ Failure		TOTAL
		Yes	No	
BISAP	> 3	5[a=TP]	4[b=FP]	9
Score	< 3	1[c=FN]	40[d=TN]	41
Total		6	44	50

TP=True positive, FP=False positive, TN=True negative, FN=False negative.

Sensitivity and specificity of BISAP score in terms of pancreatic necrosis was assessed (Table 3).

SENSISITIVITY=a/(a+c)×100=TP/(TP+FN)=80%

SPECIFICITY = d/(b+d)× 100 = 88.89%

POSITIVE PREDICTIVE VALUE = a/(a+b) × 100 = 44.44%

NEGETIVE PREDICTIVE VALUE = d/(c+d) × 100 = 97.56%

ACCURACY = (a+d)/(a+b+c+d) × 100 = 88.%

Table 3: Sensitivity and specificity of BISAP score in terms of predicting pancreatic necrosis

		NECROSIS		TOTAL
		Yes	No	
BISAP	> 3	4[a=TP]	5[b=FP]	9
Score	< 3	1[c=FN]	40[d=TN]	41
Total		5	45	50

TP=True positive, FP=False positive, TN=True negative, FN=False negative.

IV. Discussions

Acute pancreatitis is a common disease with varied clinical presentations. Severe acute pancreatitis presents with increased mortality rate and high morbidity. Most of the patients present with mild, but however some patients land up in severity and require early hospitalization and care in ICU set up for aggressive interventions to prevent the severe attack. Severe acute pancreatitis (SAP) is defined as an AP associated with local and/or systemic complications (organ failure) according to the Atlanta classification. Early diagnosis and prognosis evaluation may reduce the morbidity and mortality associated with SAP hence, are extremely important.

Early identification of patients who are at high risk for mortality in the course ofacutepancreatitisisanimportantstepinimprovingoutcome. Multiple risk stratification tools for acute pancreatitis have been developed, but their clinical usefulness is limited. Older measures such as, the Ranson's criteria and modified Glasgow score use data that are not routinely collected at the time of hospitalization . In addition, both require 48hrs, thereby missing potentially valuable early therapeutic window. The APACHE II score is the most widely used prediction system currently but it requires the collection of large number of parameters. APACHE II was originally developed as an intensive care instrument and requires the collection of large number of

parameters, some of which may not be relevant toprognosis.

For this reason a simple and accurate clinical scoring system that is bedside index for severity in acute pancreatitis (BISAP) scoring systemwas developed in 2008. This scoring used for stratifying patients according to their risk of mortality and is able to identify patients at increased risk of mortality prior to the onset of organ failure. The ability to stratify patients early in their course is a major step to improving management strategies in acute pancreatitis.

In this study, a relatively simple and bedside scoring system, BISAP is studied to assess the severity in patients with acute pancreatitis. An attempt also made to compare this study with previous similar studies done by others.

In this study, all patients were admitted with the chief complaint of abdominal pain, some patients had a history of nausea and vomiting. The severity of acute pancreatitis was defined on the basis of BISAP score and diagnosis of AP done based on the 2012 revised Atlanta criteria. In this study Out of 50 patients, 9(18%) had severe pancreatitis, they had BISAP score more than or equal to3and 41(82%)wereclassifiedashavingmildpancreatitishavingBISAPscoreoflessthan 3. Majority of patients, the disease was self-limiting. Among the 50 patients in our study, 45(90%) were males and 5(10%) were females. Male to female ratio was 9 : 1. In mortality group, 2 were male patients. Among 50, 32(64%) patients belonged to the age group of 20-40 year. Average age of the participants was estimated to be 38.62 ± 11.93 (mean $\pm$ SD) with median of 37 years and a range of 70 years. With respect to etiological factors of the acute pancreatitis, we found alcohol being the most common cause of acute pancreatitis, accounting for 66% of cases, gallstones being the second most common, accounting for 20% of cases. The proportion of two main causes greatly depends on the geographical and cultural variations.Out 50 participants, pleural effusion developed in 30(60%) patients involving one or both lungs, as complications of acute pancreatitis. In respect to length of hospital stay (excluding death in hospital), 31(62%) out of 50 study participants were discharged from hospital within 7 days and 19(38%) patients after 7 days of admission.Analysis also revealed that there was a moderate correlation (r=0.53) between BISAP score and Length of hospital stay.The mortality rates of patients with acute pancreatitis vary from 2 to 9 % while in severe cases; it is estimated at 30%. The overall mortality in this study was 4%.

Relationship between BISAP score and outcome of participants shows that BISAP scoring system is highly sensitive (sensitivity 100%) and specific (specificity 93.75%) to predict mortality in AP with a negative predictive value 100% and positive predictive value of 40%. These values are almost similar with the previous study done to validate BISAP scoring system except low positive predictive value in this study.

Although the sample size of the present study was estimated using a suitable formula, But even then the findings seem to have less external validity, specially, in regard to formulating treatment guideline for an important surgical emergency like AP. It requires a larger multi-centric study suitable for generalization. Most of the Patients involved in the study belonged to the lower socio-economic status and thereby factors like malnutrition and delayed care seeking all come in to play for determining the morbidity and mortality. These factors weren't considered in the present study.

The etiology in this study was found to be different from worldwide accepted, hence might not be correct to compare with other studies.

The GCS used to assess the mental status of the patient were subjected to inter observervariation.Recently, it has been suggested that variation in timing of presentation to the hospital after onset of symptoms, severe acute pancreatitis has variable progression of disease; therefore the lack of predictability might be associated with this diseasevariability.

V. Conclusion

By this prospective observational study, we can conclude that the BISAP score is a bedside, simple, accurate and reliable score which can identify acute pancreatitis patients who are at risk of developing highly unfavourable outcomes within 24 hours of presentation. The advantages of simplicity and quickness over other scoring systems which are performed similarly in predicting severe acute pancreatitis can be obtained from BISAP score. So, BISAP score may be helpful for taking early decision regarding the effective management for such group of patients which can significantly alter the outcome.

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