



### RESEARCH ARTICLE

#### EVALUATION OF BISAP SCORING IN ACUTE PANCREATITIS.

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#### Manuscript Info

#### Abstract

#### Manuscript History

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#### Introduction:-

Pancreatitis is an inflammation of glandular parenchyma leading to injury or destruction of acinar components. The pathologic process could result in a self-limiting disease with no sequelae or in catastrophic auto digestion activity with systemic cytotoxic effects and life- threatening complications in the acute form. In the case of chronic inflammation, fibrosis and calcification are the main features of the disease.

Acute pancreatitis is a disease with substantial burden on the healthcare system. Recent data indicate a rise in absolute number as well as rate of emergency room visits, hospital admissions and direct healthcare costs for Acute Pancreatitis. With an overall mortality rate of 2-5%, a reliable method of risk stratification for Acute Pancreatitis is

of significant clinical importance.<sup>(6,7)</sup> Acute pancreatitis, which is the subject of this study, is the most frequent pancreatic disease and is also the one that often presents diagnostic dilemma and especially therapeutic ones. Current methods of risk stratification in Acute Pancreatitis have limitations. The Ranson and modified Glasgow score contain data not routinely collected at time of hospitalization. In addition both require 48 hours to

complete, missing a potentially valuable early therapeutic window.<sup>(8,9)</sup> The most commonly utilized prediction scoring system for clinical research studies in Acute Pancreatitis is the Acute Physiology and Chronic Health

Examination (APACHE) II.<sup>(10,11)</sup> However, the 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.

The purpose of this study was to develop a simple and accurate clinical scoring system for stratifying patients according to their risk of in hospital mortality. To develop a clinical tool useful early in course of the disease, we will examine data collected within the first 24 hr. of hospitalization.

#### Aim and objectives:-

Monitoring of a patient of acute pancreatitis needs various complicated scoring systems. So there is a need of simple and clinically oriented severity scoring system so that progression and subsequent mortality can be easily predicted and checked. With the help of a bedside index score like BISAP score within 24 hours of onset of acute pancreatitis can enable us for timely intervention and prevention of adverse effects of the disease.

**Specific objectives of this study:-**

1. To find out the severity of acute pancreatitis.
2. Guidance of scoring for prediction of organ failure.
3. To predict mortality

**Methods:-**

This study was performed in department of surgery, Katihar Medical College and Hospital between November 2015-April 2017. All patient of acute pancreatitis with onset within 24 hrs admitted in emergency ward under department of surgery were taken into study. Patient admitted after 24 hrs of onset of acute attack and patient with organ failure were excluded from the study.

All patient underwent clinical, biochemical and radiological investigation for diagnosis. Immediately patients were assessed by BISAP scoring system, at the same time were also assessed by Marshall scoring system for organ failure.

**BISAP** (Bedside index for Severity in Acute Pancreatitis) includes the following criteria:-

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:
  - (i) Temperature of < 36 or > 38 ° C.
  - (ii) Respiratory rate > 20 breaths/min or PaCO<sub>2</sub> < 32 mm Hg.
  - (iii) Pulse > 90 beats/min.
  - (iv) WBC < 4,000 or >12,000 cells/mm<sup>3</sup> or >10% immature band cells.
4. Age > 60 years.
5. Pleural effusion detected on imaging.

One point assigned for each variable within the 24 hours of presentation, making the score 0-5.

All Patients were assessed for risk of developing organ failure by Marshall scoring system.

Parameters for organ failure based on Marshall scoring system are:

1. Respiratory system (PaO<sub>2</sub>/FiO<sub>2</sub>)
2. Renal (serum creatinine mg/dl)
3. Cardiovascular (systolic blood pressure)

**Assessment of Pancreas:-**

All patients underwent CECT abdomen after 4 days of onset of disease and were repeated depending upon the course of the disease.

**Results and Analysis:-**

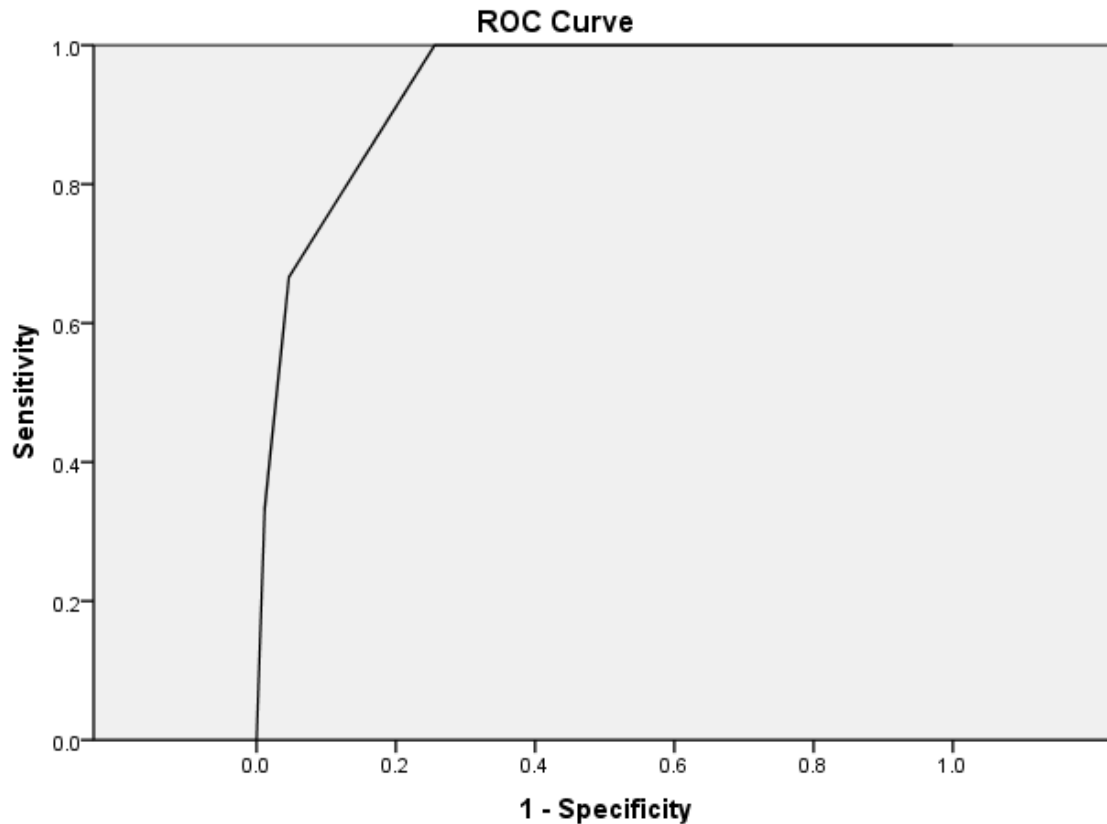
Patients admitted in General Surgery Ward of Katihar Medical College and Hospital, with diagnosis of Acute Pancreatitis between period of November 2015 to April 2017 were included in this study. Diagnosis was based various parameters including radiological (USG/CT Scan), and Biochemical Parameters (S. Amylase and S. Lipase) values. Total 100 patients were fulfilling the criteria of disease and hence included in study.

Data was analyzed by SPSS 10.

Among 92 cases, there were 6 (6.52 %) 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 0.938 (95 % confidence interval: 0.862, 1.00).

Fischer's exact test value of 19.263 is also significant.

This finding is in coherence with other studies previously done and thus establishing the significance of BISAP as a simple and accurate predictor of mortality.



Diagonal segments are produced by ties.

**Figure 1:-** The area under ROC curve for mortality- .938

Area under the Curve

Test Result Variable(s): BISAP SCORE

Area	Std. Error <sup>a</sup>	Asymptotic Sig. <sup>b</sup>	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
.938	.035	.000	.862	1.000

The test result variable(s): BISAP SCORE has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.

a. Under the nonparametric assumption

b. Null hypothesis: true area = 0.5

Coordinates of the Curve

Test Result Variable(s): BISAP SCORE

Positive if Greater Than or Equal To <sup>a</sup>	Sensitivity	1 – Specificity
-1.00	1.000	1.000
.50	1.000	.721
1.50	1.000	.256
2.50	.667	.047
3.50	.333	.012
5.00	.000	.000

The test result variable(s): BISAP SCORE has at least one tie between the positive actual state group and the negative actual state group.

The smallest cut off value is the minimum observed test value minus 1, and the largest cut off value is the maximum observed test value plus 1.

All the other cutoff values are the averages of two consecutive ordered observed test values.

#### Chi-Square Tests:-

	Value	Df	Asymp. Sig. (ed)	Exact Sig. (2- sided)
Pearson Chi- Square	31.855 <sup>a</sup>	4	.000	.000
Likelihood Ratio	20.808	4	.000	.000
Fisher's Exact Test	19.263			.000
N of Valid Cases	92			

Percentage Of Cases According To Score.

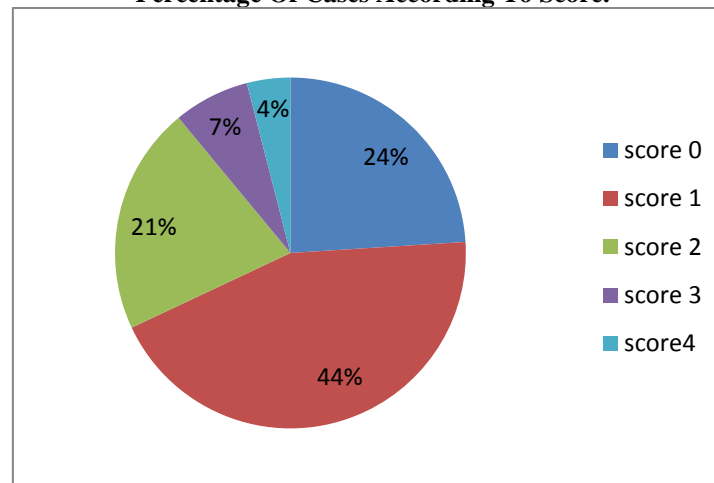
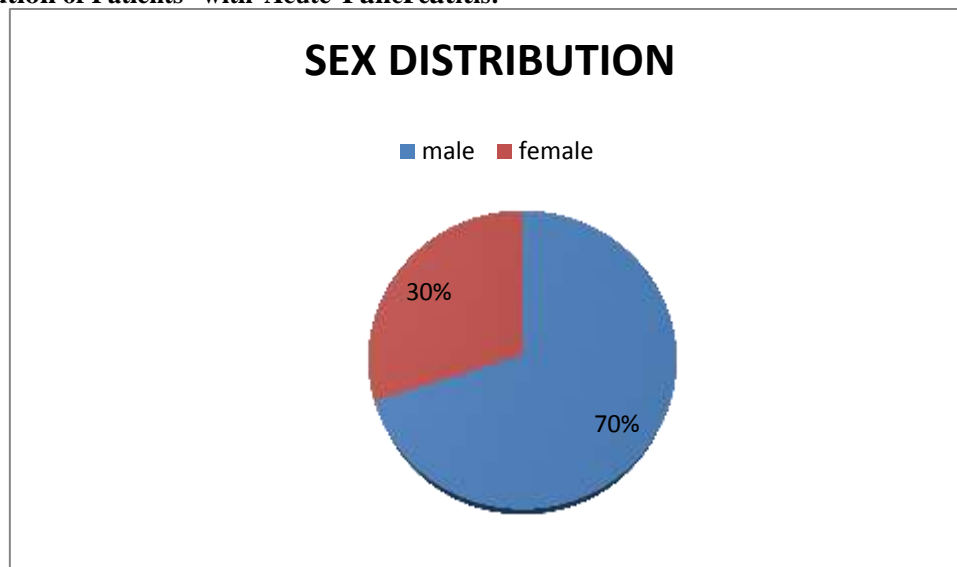


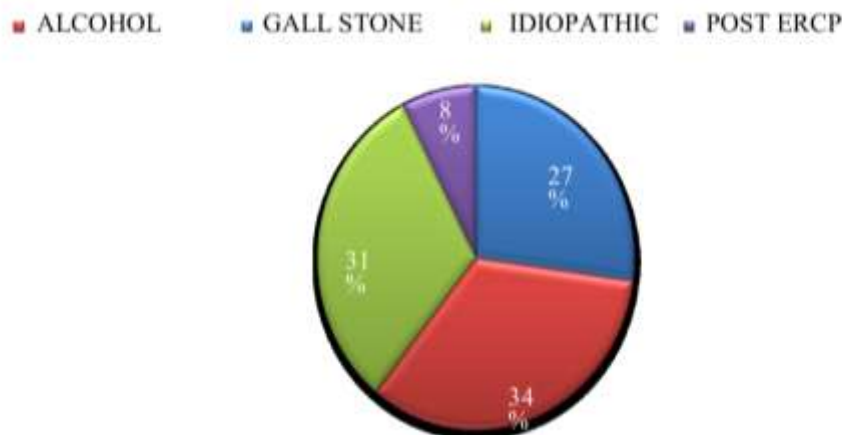
Diagram showing percentage of cases in each group.

24% of patients having BISAP Score 0, 44% patients score 1, 21% patients score 2, 7% and remaining 4% of patients having score 3 and 4 respectively.

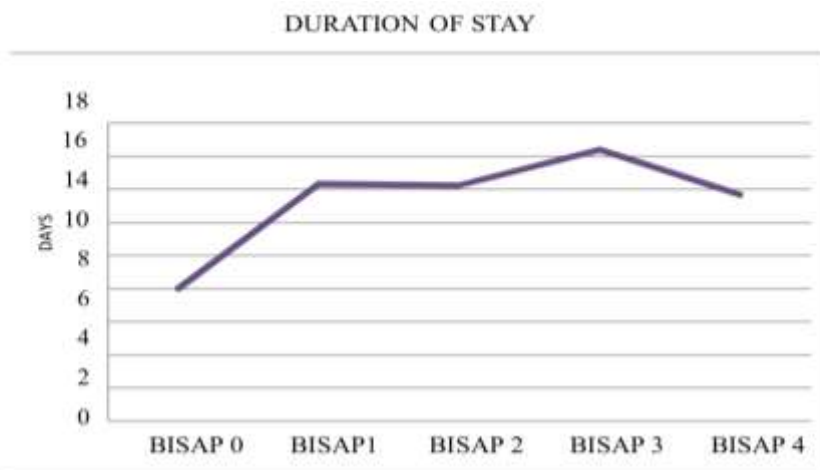
#### Sex distribution of Patients with Acute Pancreatitis:-



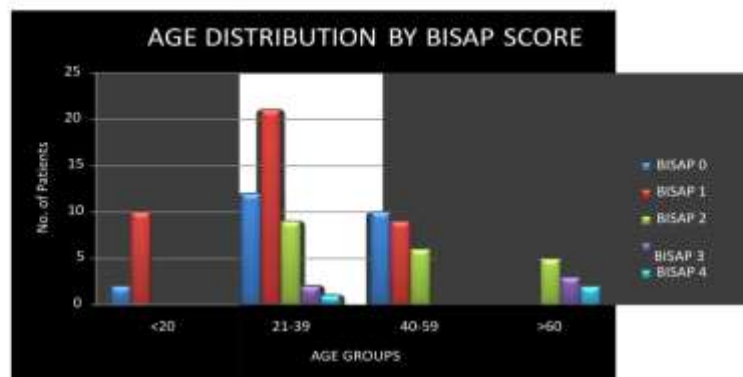
Pie chart showing Sex distribution of patients- 30% female and 70% male in our study



Pie diagram showing etiologies of Acute Pancreatitis. Most common cause in this study was found to be alcohol (34%) induced pancreatitis, as the percentage of male patients was significantly higher. Gall stone (31%) induced pancreatitis also came out to be an important cause for the disease.



Line Diagram showing average stay of patients in each group. Mean length of stay varied significantly according to BISAP score. By application Post-hoc Tukey test (not shown in table), it was found that the mean length of stay varied significantly between BISAP score 0 and 1 ( $p = 0.000$ ), 0 and 2 ( $p = 0.001$ ) and between 0 and 3 ( $p = 0.006$ ). However it did not vary significantly between scores 0 and 4 ( $p = 0.325$ ), which may be due to more numbers of mortality among those with BISAP score 4 which thereby had reduced the length of stay. No significant difference in the mean length of stay was found on comparing scores 1, 2, 3, 4 with each other.



Bar diagram showing the division of patients in different age groups. Distribution of patients with different scores in each group has been shown here. Younger age group has patients with score of only 0 and 1, thus having better prognosis. Age group more than 60 has patients with score of only 3 and 4, thus having poor prognosis.

### Discussion:-

Acute pancreatitis is a disease with substantial burden on the healthcare system. Recent data indicate a rise in absolute number as well as rate of emergency room visits, hospital admissions and direct healthcare costs for Acute Pancreatitis. With an overall mortality rate of 2-5%, a reliable method of risk stratification for Acute Pancreatitis is of significant clinical importance.<sup>(6,7)</sup>

Male to female ratio in our group of patients showed male preponderance - a ratio of 7:3 with majority of patients in the age group of 21-39 yrs(48.9%). Gompertz et al<sup>(46)</sup> in their medical records of 128 patients, median age 46.5 years were reviewed among which 55.5% were men.

The most common etiology in our study was alcohol induced as majority of the patients were male. Gall stone was 2<sup>nd</sup> most common cause and it is the main cause in female patients. In a similar study by J.L Pednekar et al<sup>(47)</sup>, the age distribution reflects the predilection of this disease for middle age. The reason for this being that commonest aetiologies are alcoholism and gall stones, both of which are common in middle age group.

With an in-hospital mortality rate of 6.52% ( $n = 6$ ), our study does not lie within the accepted range of mortality for acute pancreatitis. Singh et al. reported 14 (3.5%) deaths among 397 cases<sup>(42)</sup> but, in our study most of the cases had been transferred from other hospitals, in contrast to only 16% transferred cases in their study. This might be the cause of slight higher mortality.

Lifen Chen et al<sup>(43)</sup> showed mortality ROC curves yielded an AUC of 0.808 (95% CI, 0.718–0.880) for BISAP. In our study it is 0.938 (95 % confidence interval: 0.862, 1.00) which is quite significant. There were 6 patients in the study who had a BISAP score of 3 or 4 out of which everyone died. This proves the statistically significant correlation between BISAP score and outcome.

According to a study by Vikash K. Singh MD, et al. there was a statistically significant trend for increasing mortality ( $P < 0.0001$ ) with increasing BISAP score. A score  $> 3$  was associated with increased risk of developing organ failure, persistent organ failure and pancreatic necrosis. Another study done by Villacis X, et al. also conclude with the correct prediction of severity of acute pancreatitis by BISAP score.

B U Wu et al<sup>(45)</sup> found there was a significant trend towards higher mortality with increasing BISAP score (Cochrane–Armitage trend test  $p < 0.001$ ). In addition, significant differences existed between risk groups ( $\chi^2$   $p < 0.001$  overall, pairwise  $\chi^2$  Bonferroni-adjusted  $p < 0.001$ ). Below average mortality was observed in patients with  $< 2$  points

(<1.0% mortality). Patients with a score of 2 had increased mortality (2%). Mortality continued to rise sharply with BISAP scores of  $\geq 3$  (5–20%).

Ximena Villacís et al in a study showed mortality rate on the basis of BISAP score was 55%, 25% & 6% in score 4, 3 & 2 respectively. In our study we found that the mortality rate was 67%, 40% & 10% respectively. The mortality is high in each score in our study is due to lack of critical care facilities, lack of ICU set up in our hospital.

Acute pancreatitis, which is the subject of this study, is the most frequent pancreatic disease and is also the one that often presents diagnostic dilemma and especially therapeutic ones. Current methods of risk stratification in Acute Pancreatitis have limitations. The Ranson and modified Glasgow score contain data not routinely collected at time of hospitalization. In addition both require 48 hours to complete, missing a potentially valuable early therapeutic window.<sup>(8,9)</sup> The most commonly utilized prediction scoring system for clinical research studies in

Acute Pancreatitis is the Acute Physiology and Chronic Health Examination (APACHE) II.<sup>(10,11)</sup> However, the 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. Moreover calculation of APACHE II score is a cumbersome procedure requiring large no. of variables, several investigations, some of which are not routinely done in many hospital, with knowledge of chronic health status which may be difficult to find out in many cases.

The early identification of patients at risk for adverse outcome from AP has been an area of active investigation for many years.<sup>(29-41)</sup> Previous studies have attempted either to develop prognostic scoring systems or to identify individual risk factors for severe disease. Some of these studies have included mortality as an end point. Among recently proposed prognostic scoring systems, three have used data collected within the first 24 h of hospitalization.

The purpose of this study was to develop a simple and accurate clinical scoring system for stratifying patients according to their risk of in-hospital mortality. To develop a clinical tool useful early in course of the disease, we will examine data collected within the first 24 h of hospitalization.

Using BUN, impaired mental status, SIRS, age and pleural effusion (BISAP), we were able to stratify patients within the first 24 h of hospitalization into distinct risk groups for in-hospital mortality. Specifically, we excluded patients with evidence of early organ failure by Atlanta criteria<sup>(24)</sup> (within the first 24 h).

The ability to risk-stratify patients early in their disease course has several important implications. First, early identification of high-risk patients may alert doctors to institute aggressive resuscitation efforts and to consider specialty care referral. Second, a severity index provides standardized criteria for enrolment of subjects into future clinical studies. In addition, a population-based system of risk stratification provides an instrument for additional outcomes research. For example, identification of factors associated with death among patients with low BISAP scores may help to lead to improvements in future management strategies in AP.

The primary advantage of BISAP is simplicity. The presence of each variable contributes one point to a total 5-point score. There is no need for additional computation. In addition, each of the parameters can be easily obtained early in the course of a general hospital admission. The only subjective parameter in the new scoring system is the assessment of mental status. Although the Glasgow Coma Score is used as part of the calculation of an APACHE II<sup>(10,11)</sup> score as well as the Multiple Organ Failure Score we simplified determination of this parameter by developing the model in such a way that any evidence of disorientation or further disturbance in mental status qualifies as a positive finding. Although SIRS<sup>(27,28)</sup> is a composite parameter that involves the use of four criteria, evaluation of the systemic inflammatory response has become increasingly widespread in clinical practice and has also been demonstrated to have prognostic value in AP.

The early identification of patients at risk for adverse outcome from AP has been an area of active investigation for many years. BISAP scoring fulfills that requirement.

### Summary and Conclusion:-

BISAP SCORE evaluation is found to be simple and accurate method of predicting the mortality in acute pancreatitis in Observational Analytical Prospective Cohort Study done in our institution- Katihar Medical College and hospital.

The study included 92 patients with acute pancreatitis and were given the score from 0 to 5 on the basis of 5 simple variables. These were BUN, Impaired mental status, SIRS, Age and Pleural Effusion. All these parameters were easy to evaluate and were routinely done in our hospital for patients admitted with Acute Pancreatitis.

There was mortality of 6.52% in this study. Total 6 patients expired out of 92 patients.

Statistically significant trend in mortality was found with increasing BISAP score ( p value < 0.0001). No mortality was seen in group with score 0 whereas there was 66% mortality in group of patients with score 4. There was no patient with score of 5 in our study. This was demonstrated by the increasing mortality seen with increasing BISAP scores and high discrimination for mortality by AUC.

The area under the receiver operating curve for mortality by BISAP score in the prospective cohort was 0.938. This was in coherence with previous similar studies done, B U Wet et al<sup>(13)</sup> AUC was 0.83, Vikesh K. Singh et al<sup>(22)</sup> AUC was 0.82.

Male to female ratio in our group of patients showed male preponderance with a ratio of 7:3.

Among the various etiologies of Acute Pancreatitis, our study showed alcohol induced pancreatitis as the most common cause, with 34% of patients presenting with this association. This may be due to the male preponderance of our study. Gall stone pancreatitis was also a significant cause, as 27% of patients have this association. 8% of patients presented with Post ERCP induced pancreatitis thus stressing the complication associated with the procedure. In rest of the patients no specific cause could be identified and were labeled as idiopathic.

Duration of stay in the hospital increases with increase in BISAP score. Post hoc Turkey test shows significant variation in stay between BISAP scores 0 and 1, 0 and 2, 0 and 3. Whereas due to substantial mortality in group of patients with score 4 there was no significant variation between scores 0 and 4.

When the total number of patients were divided in different age groups, most of the patients were in age group between 21-39 (48.9%), for others it was 13% having age less than 20 years, 27% were in age group between 40-59. 10.8% were more than 60 years of age

BISAP score is an accurate means of risk stratification in patients with acute pancreatitis in an Indian population; the contributing data are clinically relevant and easy to obtain; the prognostic accuracy of BISAP is similar to those of the other scoring systems. Patients with a BISAP score equal to or greater than 4 invariably develop severe acute pancreatitis and have high mortality.

In conclusion, Identification of patients at risk for mortality early in the course of acute pancreatitis is an important step in improving outcome. BISAP score is a simple bedside tool which can be applied within first 24 hours of admission and can predict patients at risk of mortality which require more monitoring and more aggressive treatment.

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