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RESEARCH ARTICLE

PROSPECTIVE EVALUATION OF THE BISAP SCORE IN ASSESSING MORTALITY AND INTERMEDIATE MARKERS OF SEVERITY IN ACUTE PANCREATITIS'

***Burhan T. Kaydawala and Nimish J. Shah**

3689, Banu Manzil, Burhani Mohalla, Behind Vegetable Market, Dahod-389151

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ABSTRACT

Background: There is a need for a simple and clinically oriented severity scoring system that can predict mortality of acute pancreatitis within 24 h of presentation. Early recognition of severe disease would enable the clinician to consider more aggressive interventions within a time frame that could potentially prevent adverse outcomes. (1) The Bedside Index for Severity in Acute Pancreatitis (BISAP) is a new, convenient, prognostic multifactorial scoring system.(8) In this study of patients with acute pancreatitis, we evaluate the BISAP SCORE in assessing mortality and intermediate markers of severity in an acute pancreatitis.

Aim and Objectives:

1. To evaluate the accuracy of the BISAP SCORE to predict mortality in acute pancreatitis patients from our institution.
2. To assess the accuracy of the BISAP SCORE to predict which patients are at risk for intermediate markers of severity including the development of organ failure, persistent organ failure and pancreatic necrosis.

Methods: This prospective observational study was conducted in the SSG hospital between APRIL 2015 to JANUARY 2016. Total 70 patients were diagnosed to have acute pancreatitis at SSGH from APRIL 2015 to JANUARY 2016. BISAP scores were calculated on all patients based on data obtained within 24 h of presentation.

Results: In our study out of 70 patients, 9 patients (12.85%) expired. The sensitivity of BISAP score in predicting the mortality in acute pancreatitis was 88.9% ,for the same specificity was 83%. This results were statistically significant with p value for BISAP score being 0.001. There was a statistically significant trend for increasing mortality with increasing BISAP score. The sensitivity of BISAP score in predicting the development of organ failure was 75%, for the same specificity was 84%. This results were statistically significant with p value for BISAP score being 0.001. The sensitivity of BISAP score in predicting the development of necrosis was 55.6%, for the same specificity was 82%.This results were statistically significant with p value for BISAP score being 0.03.

Conclusion: The BISAP score stratifies patients within the first 24 h of admission according to their risk of in hospital mortality and is able to identify patients at increased risk of mortality prior to the onset of organ failure. The BISAP score represents a simple way to identify patients at risk of increased mortality and the development of intermediate markers of severity within 24 h of presentation.

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INTRODUCTION

There is a need for a simple and clinically oriented severity scoring system that can predict mortality of acute pancreatitis within 24 h of presentation. Early recognition of severe disease would enable the clinician to consider more aggressive interventions within a time frame that could potentially prevent adverse outcomes (Singh, 2009). Acute pancreatitis (AP) is a sudden inflammation of the pancreas characterized by activation of pancreatic enzymes to cause self-digestion of the pancreas. In most cases, AP is mild, self-limiting, and requires no special treatment; however, 20% to 30% of patients develop a severe disease that can progress to systemic inflammation and cause pancreatic necrosis, multiorgan failure, and potentially death (Chen, 2013). 80% of patients will have mild attack of pancreatitis, the mortality from which is around 1%.

***Corresponding author: Burhan T. Kaydawala**
3689, Banu Manzil, Burhani Mohalla, Behind Vegetable Market, Dahod-389151
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Criteria for organ failure based on marshall scoring system

ORGAN SYSTEM	SCORE				
	0	1	2	3	4
Respiratory (Pao2 / Fio2)	>400	301-400	201-300	101-200	<101
Renal(Serum Creatinine, mg/dl)	<1.5	>1.5-<1.9	>1.9-<3.5	>3.5-<5.0	>5.0
Cardiovascular(SBP, mm hg)	>90	<90, Fluid Responsive	<90, Fluid Unresponsive	<90, PH<7.3	<90, PH <7.2

In those who have a severe attack of pancreatitis, the mortality varies from 10% to 30%. About one-third of deaths occur in the early phase of attack (first two week) from multiple organ failure, while deaths occurring after two weeks of onset are due to septic complications (Dervenis, 1999). 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 (Ji Young, 2013). 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 to prognosis (Wilson, 1990). For this purpose a simple and accurate clinical scoring system that is Bedside Index For Severity In Acute Pancreatitis (BISAP) scoring system was developed. This scoring system is used for stratifying patients according to their risk of hospital mortality and is able to identify patients at increased risk of mortality prior to the onset of organ failure. Data for BISAP score are collected within the first 24hr of hospitalization. The ability to stratify patients early in their course is a major step to improving future management strategies in acute pancreatitis (B U Wu, 2008). The Bedside Index for Severity in Acute Pancreatitis (BISAP) is a new, convenient, prognostic multifactorial scoring system (Byung Geun Kim, 2013). In this study of patients with acute pancreatitis, we evaluate the BISAP SCORE in assessing mortality and intermediate markers of severity in an acute pancreatitis.

Individual components of the BISAP scoring system

- BUN >25 mg/dl
- Impaired mental status (Glasgow Coma Scale Score < 15)
- S IRS

SIRS is defined as two or more of the following

- Temperature of < 36 or > 38 ° C
- Respiratory rate > 20 breaths/min or P a CO2 < 32 mm Hg
- Pulse > 90 beats/min
- WBC < 4,000 or >12,000 cells/mm 3 or >10% immature bands
  1. Age >60 years
  2. Pleural effusion detected on imaging

BISAP: bedside Index for Severity in Acute Pancreatitis;

SIRS: Systemic Inflammatory Response Syndrome.

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

PATIENTS AND METHODS

- This prospective observational study was conducted in the SSG hospital between APRIL 2015 to JANUARY 2016. Seventy patients diagnosed to have acute pancreatitis were included in this study. Patients of Acute Pancreatitis Between Age 18 – 70 Years were included. Known case of ischemic heart disease, known case of chronic renal failure ,Acute pancreatitis patients with organ failure at or within 24hrs of presentation were excluded from this study.
- Acute pancreatitis was defined as two or more of the following: characteristic abdominal pain; serum amylase and / or lipase levels 3 × the upper limit of normal; and / or a contrast-enhanced computed tomography (CT) of the abdomen or USG abdomen within the first 7 days of hospitalization demonstrating changes consistent with acute pancreatitis.
- BISAP scores were calculated on all patients based on data obtained within 24 h of presentation. Impaired mental status was assessed by a Glasgow Coma Scale score of < 15 within 24 h of presentation.

Individual components of the 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:

i. Temperature of < 36 or > 38 ° C
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5. Pleural effusion detected on imaging

BISAP: Bedside Index for Severity in Acute Pancreatitis
SIRS: Systemic Inflammatory Response Syndrome.

- One point is assigned for each variable within 24 h of presentation and added for a composite score of 0 – 5.
- The presence of a pleural effusion was determined by a CT scan, chest radiograph, or chest ultrasound obtained within 24 h of presentation.
- Imaging obtained within 24 h of presentation at the hospital of origin for transferred patients was also collected and reviewed.
- Organ failure is defined as a score of ≥2 in one or more of the three (respiratory, renal, and cardiovascular) out of the five organ systems initially described in the marshall score.
- Organ failure scores were calculated for all patients during the first 72 hrs of hospitalization based on the

most extreme laboratory value or clinical measurement during each 24hrs period.

Marshall JC, Cook DJ, Christou NV *et al.* Multiple organ dysfunction score: a reliable descriptor of a complex clinical outcome (Marshall, 1995).

Patients clinical course was monitored. End points of the study were:

- Discharge from hospital
- Development of organ failure / development of necrosis
- Death

Statistical Methods

The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of BISAP SCORE were calculated in their ability to predict the mortality and development of organ failure and pancreatic necrosis and patients outcome were evaluated. Statistical analysis were made using the Chi-square test. P value less than 0.05 were accepted as statistically significant.

RESULTS

Seventy patients diagnosed to have acute pancreatitis were included in this study over the period of one year. The study included patients between 18 to 70 years age groups with mean age being 35.7 years. The study included 59 men and 11 women (ratio 5.3:1).

Table 1. Age distribution

AGE GROUP	NO. OF PATIENTS
<20	6
21-40	45
41-60	16
>60	3

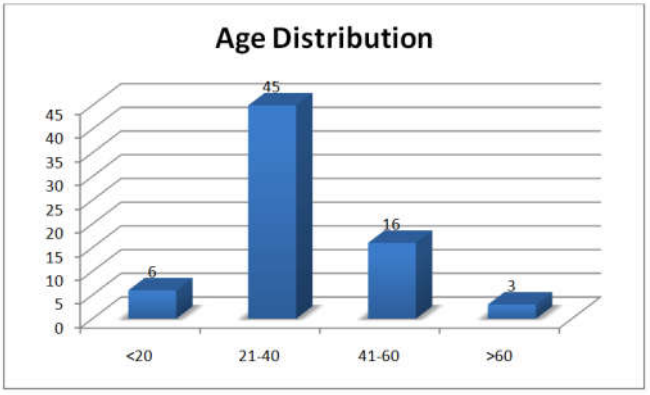


Table 2. Aetiological analysis of acute pancreatitis

Aetiology	No of Cases	Percentage
Alcohol	61	87.2%
Gall Billiary	4	5.8%
Non-Alcoholic Non-Billiary	5	7.0%

Alcohol and gall stones were the most frequent causative factors where the etiology was discernible. In our study among the seventy patients, 42 patients had first episode of pancreatitis and 26 patients were found to be having prior episodes of the acute pancreatitis.

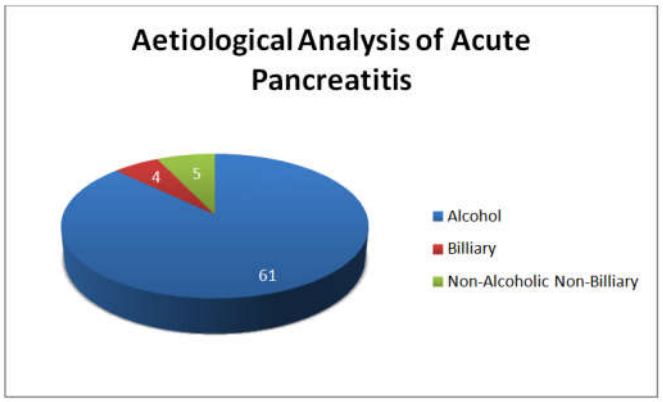


Table 3. Prior Episodes

No. of prior episodes	No. of patients	Percentage (%)
0	42	60%
1	24	34.4%
2	2	2.8%
≥3	2	2.8%

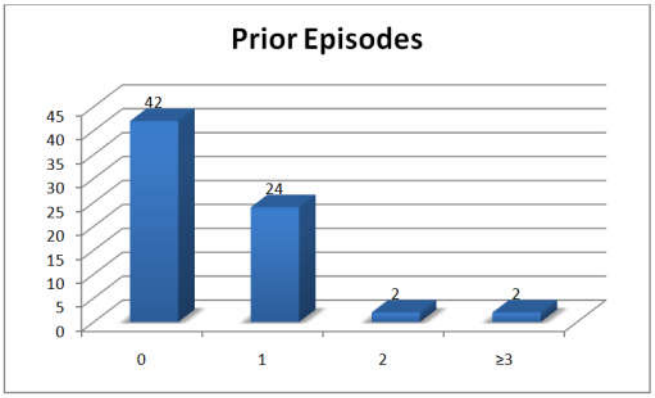
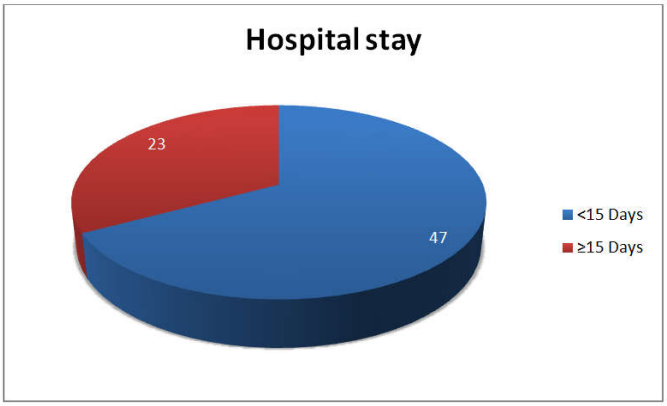


Table 4. Hospital stay

Hospital stay	No. of patients	Percentage (%)
<15 Days	47	67.14 %
≥15 Days	23	32.86 %

The BISAP score values were calculated within 24 hours of the admission. Patients with the BISAP score ≥3 were predicted to have severe clinical course and increased hospital stay, while those with score of <3 were predicted to have milder clinical course and less hospital stay.

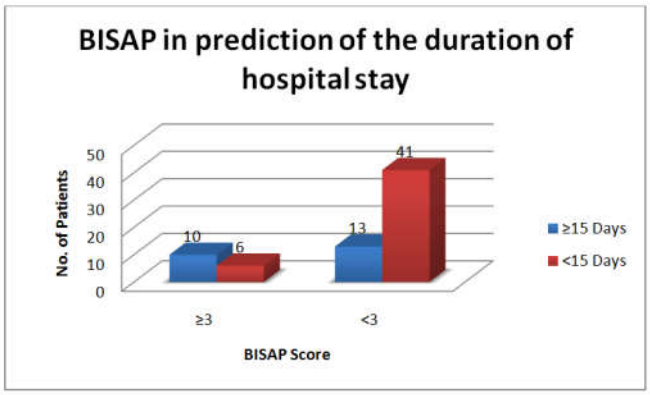


Patient who required more than 15 days of hospital stay were stated to have protracted clinical course.

Table 5. BISAP in prediction of the duration of hospital stay

BISAP	≥15 Days	<15 Days	Total
≥3	10	6	16
<3	13	41	54
Total	23	47	70

The sensitivity of BISAP in prediction of longer duration of hospital stay was 43.5%, specificity of the same was 87.2%, PPV was 62.5% and NPV was 76%.The result was statistically significant with p value for BISAP being 0.01 and Chi sq 6.61.



Evaluation of Intermediate Marker of Severity

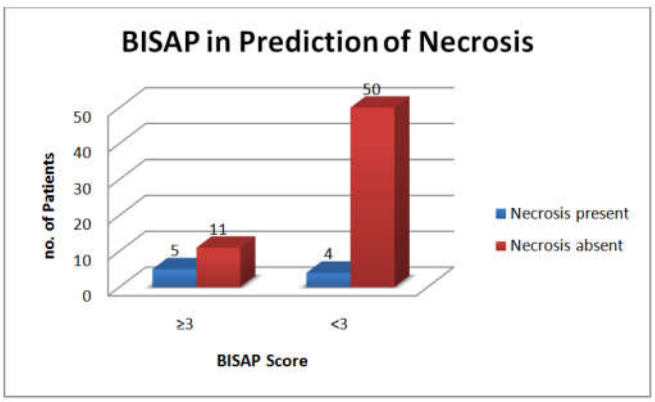
During the study period of the patients in the hospital 21 patients developed local complications like pseudocyst and necrosis of pancreas, in whom 15 patients developed pseudocyst out of which 3 patients required intervention. Nine patients developed necrosis of the pancreas in which 2 required intervention.

Development of necrosis in acute pancreatitis: Out of 70 patients 9 patients (12.85%) developed necrosis of pancreas.

Table 6. BISAP in Prediction of Necrosis

BISAP	Necrosis present	Necrosis absent	Total
≥3	5	11	16
<3	4	50	54
Total	9	61	70

The sensitivity of BISAP score in predicting the development of necrosis was 55.6%, for the same specificity was 82%, PPV was 31.2% and NPV was 92.5%. This results were statistically significant with p value for BISAP score being 0.03 and Chi sq 4.31

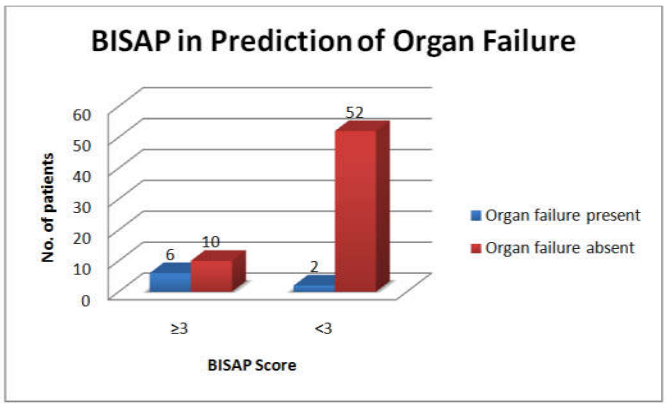


Development of organ failure in acute pancreatitis: In our study out of 70 patients with excluding 4 patients with documented organ failure within 24 hours of presentation, 8 patient (11.4%) developed organ failure out of which 6 patients developed renal failure and 2 patients developed hypotensive shock.

Table 7. BISAP in Prediction of Organ Failure

BISAP	Organ failure present	Organ failure absent	Total
≥3	6	10	16
<3	2	52	54
Total	8	62	70

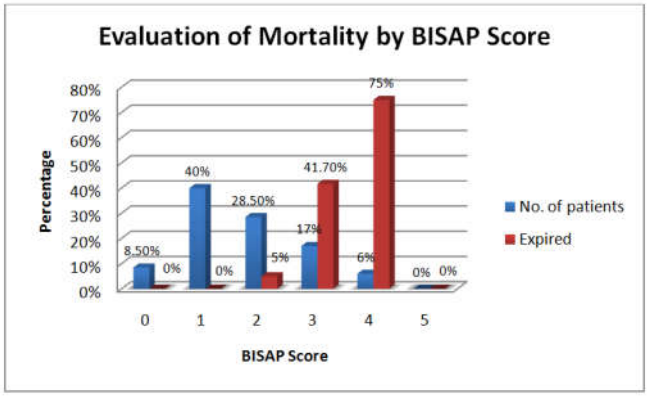
The sensitivity of BISAP score in predicting the development of organ failure was 75%, for the same specificity was 84%, PPV was 37.5% and NPV was 96.3%. This results were statistically significant with p value for BISAP score being 0.001 and Chi sq 10.78



Evaluation of Mortality by bisap score: In our study out of 70 patients, 9 patients (12.85%) expired.

Table 8. Evaluation Of Mortality by individual BISAP Score

BISAP	No. of patients	Expired
0	6 (8.5%)	0 (0%)
1	28 (40%)	0 (0%)
2	20 (28.5%)	1 (5%)
3	12 (17%)	5 (41.7%)
4	4 (6%)	3 (75%)
5	0 (0%)	0 (0%)

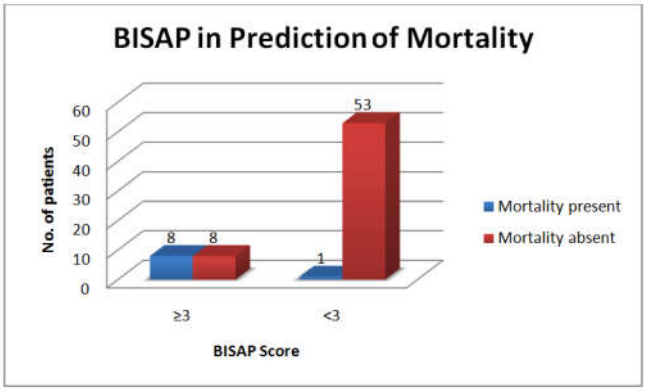


All these patients had BISAP score ≥3 except 1 patient who had <3 BISAP score. There were 8.5%, 40%, 28.5%, 17%, 6% and 0% of cases with BISAP score of 0-5 respectively with

corresponding mortality rate of 0, 0, 5%, 41.7%, 75% and 0%. The sensitivity of BISAP score in predicting the mortality in acute pancreatitis was 88.9% ,for the same specificity was 83%,PPV was 50% and NPV was 98.2%.This results were statistically significant with p value for BISAP score being 0.001 and Chi sq 21.41

Table 9. BISAP in Prediction of Mortality

BISAP	Mortality present	Mortality absent	Total
≥3	8	8	16
<3	1	53	54
Total	9	61	70



DISCUSSION

We have evaluated the ability of the BISAP score to predict mortality in our study with acute pancreatitis, irrespective of episode. This was demonstrated by the increasing mortality seen with increasing BISAP scores. We compared our study with Vikesh K. Singh *et al*; 2009, Lichen Chen *et al*; 2013 and JI Young Park; 2013 for BISAP score in predicting mortality in acute pancreatitis. The sensitivity and specificity of BISAP score in predicting mortality in our study and Vikesh K Singh *et al* were 88.9%, 83% and 71%, 83.5% respectively.

Comparison of our study with Vikesh K. Singh *et al*; 2009, Lichen Chen *et al*; 2013 and JI Young Park; 2013 for BISAP score in predicting mortality in acute pancreatitis

	Our study	Vikesh K Singh *et al*	Lichen Chen *et al*	JI Young Park *et al*
Sensitivity	88.9%	71%	83.3%	66.7%
Specificity	83%	83.5%	67.4%	80.1%
PPV	50%	17.5%	25.6%	6.3%
NPV	98.2%	99%	96.8%	99.2%

The Sensitivity of BISAP score in predicting mortality in our study was 88.9% which was comparable to Lichen Chen *et al* 2013,.The specificity in predicting mortality in our study was 83% which was comparable to Vikesh K Singh *et al* and JI Young Park *et al* . NPV of BISAP score in predicting mortality in our study was 98.2% which is comparable to Vikesh K Singh *et al* , Lichen Chen *et al*, JI Young Park *et al* but PPV of BISAP score in predicting mortality failed to get comparable results to Vikesh K Singh *et al* and JI Young Park *et al*. The different outcome parameters on BISAP score of our studies like Organ failure, Mortality and Necrosis were compared to Vikesh K Singh *et al* 2009, Ramalingeshwara Kantly *et al* 2014 and Jia Zhang 2014 on the basis of p value and percentage of outcome parameters. We see that the p value relating to development of necrosis (0.03 in our study and 0.004 in Vikesh K Singh *et al*), development of organ failure (0.001 in our study and 0.001 in Vikesh K Singh *et al*) and mortality (0.001 in our study and 0.001 in Vikesh K Singh *et al*). The mortality rate of our study was 12.85% which is much higher than Vikesh K Singh *et al*, Jia Zhang *et al* and Ramalingeshwara Kantly *et al* 2014 but p value of the BISAP score in predicting mortality is comparable to all these studies.

Comparison of outcome parameters on BISAP score of our study with study of Vikesh K Singh *et al* 2009 and Jia Zhang 2014 and Ramalingeshwara Kantly *et al* 2014[9]

Outcome parameter	Our study (P-value) (n=70)	Vikesh K Singh et (P-value) (n=397)	Ramalingeshwara Kantly *et al* (n=100)	Jia Zhang *et al* (P-value) (n=155)
Pancreatic necrosis	12.85% (0.03)	14% (0.004)	20%	15.4%(0.001)
Organ Failure	11.44% (0.001)	18% (0.001)	20%	13.5%
Mortality	12.85% (0.001)	3.5% (0.001)	3%	3.2%(0.001)

In our study we found that with increase in BISAP score mortality increases, in our study 8 patients out of 16 patients with BISAP ≥3 expired and 1 patient out of 54 patients with BISAP <3 expired. There were 8.5%, 40%, 28.5%, 17%, 6% and 0% of cases with BISAP score of 0-5 respectively with corresponding mortality rate of 0, 0, 5%, 41.7%, 75% and 0%, compared to Vikesh K Singh *et al* there were 24.2%, 42.3%, 19.1%, 11.1%, 2.5%, 0.8% of cases with BISAP score of 0-5 respectively with corresponding mortality rate of 0%, 2%, 0%, 9%, 50%, 33%.

Comparison of the individual score of BISAP of our study with other study in predicting mortality of acute pancreatitis:

BISAP	Our study (n=70)		Vikesh K Singh et (n=397)		JI Young Park *et al* (n=115)	
	Case	Mortality	Case	Mortality	Case	Mortality
0	8.5%	0%	24.2%	0%	43.9%	0%
1	40%	0%	42.3%	2%	35.3%	1.9%
2	28.5%	5%	19.1%	0%	14.8%	0%
3	70%	41.7%	11.1%	9%	9.9%	23%
4	6%	75%	2.5%	50%	1.38%	25%
5	0%	0%	0.8%	33%	0.3%	0%

The BISAP score carries several important advantages over other prognostic scoring systems in acute pancreatitis. The score is simple to calculate, requiring only those vital signs, laboratories, and imaging that are commonly obtained at the time of presentation or within 24 h of presentation. The score predicts in hospital mortality.

Conclusion

The BISAP score stratifies patients within the first 24 h of admission according to their risk of in hospital mortality and is able to identify patients at increased risk of mortality prior to the onset of organ failure. The BISAP score represents a simple way to identify patients at risk of increased mortality and the development of intermediate markers of severity within 24 h of presentation. In our opinion, the ability of the BISAP score to stratify patients at risk of mortality within 24 h of presentation will help improve clinical care.

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