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A prospective study to predict the severity of acute pancreatitis by BISAP score

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ABSTRACT

Background: Acute pancreatitis (AP) is as an inflammation of the pancreas with varied range of complication like peri-pancreatic collection, pancreatic necrosis, renal failure, multi-organ dysfunction syndrome which increases mortality rate and morbidity. Majority of AP cases are mild but severe cases of AP are associated with increased complication and mortality. BISAP is simple bedside prognostic scoring system for predicting severity of AP. BISAP is a collection of simple routine investigation and scores are quantified at 24hours of onset of AP. This study aims to assess prognosis of AP cases at ESIC Medical college and Post Graduate Institute of Medical Science and Research, Bangalore, Karnataka, India.
Methods: A prospective study of 60 Patients who were diagnosed as AP according to RAC. All patients were admitted in high dependency unit with close observation of vital parameters and investigations were done at 24 hours of onset of AP. BISAP score >3 was considered as Severe Acute Pancreatitis, its correlation with local complications, organ failure, ICU stay and Mortality was studied. Statistical analysis done using Chi-square test and Fisher Exact test for local complications and organ failure using xL Stat and SPSS v.21.0, a p-value <0.05 was considered to be significant.
Results: Of the 60 patients, BISAP score was >3 and <3 in 15 and 45 patients respectively. Alcohol was the most common cause of acute pancreatitis, accounting for 53.33%. In current study 12 (20%) patients developed organ failure and among them 9 (75%) had transient organ failure and 3 (25%) had persistent organ failure. Total 8 (13%) patients had developed pancreatic necrosis and among them 6 had BISAP >3. Mortality rate in this study was 2%.
Conclusions: The BISAP score is a simple and fairly accurate method for the early identification of patients at increased risk for in hospital mortality and to identify patients at risk of the development of intermediate markers of severity and organ failure within 24 hours of presentation.

Keywords: Acute Pancreatitis, APACHE, BISAP, Complications, Mortality, MODS, Organ Failure, Pancreatitis, Prognosis, Revised Atlanta criteria, RANSON

INTRODUCTION

Acute pancreatitis (AP) 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.[1] Many scoring system have been introduced from time to time for prediction of severity of AP based on various parameters. Ranson's criteria and Modified Glasgow score use data that are not routinely collected at the time of hospitalisation. In addition, both require 48 hours, thereby missing potentially valuable

early therapeutic window.[2] Now, APACHE-II is most widely used prognostic score for AP but its complex nature and collection of large number of parameters makes it less favourable.[3] BISAP is a simple bedside prognostic score which involves routine investigation of admitted patients.

BISAP is acronym for Bedside Index for Severity in Acute Pancreatitis. 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.[4]

METHODS

In a Prospective observational study, 60 patients who were diagnosed as AP were admitted in high dependency unit at (ESIC MC and PGIMSR, Bangalore, Karnataka, India). Diagnosis of AP was made on basis of Revised Atlanta criteria (RAC), which states that, acute pancreatitis (regardless of presence or absence of chronic pancreatitis) is clinically defined by at least the first two of the three features.

Definition of diagnosis of acute pancreatitis

- Abdominal pain consistent with Acute Pancreatitis (acute onset of a persistent, severe, epigastric pain often radiating to the back)
- Serum lipase activity (or amylase activity) at least three times greater than the upper limit of normal
- Characteristic findings of acute pancreatitis on contrast-enhanced computed tomography (CECT) and less commonly magnetic resonance imaging (MRI) or trans-abdominal ultrasonography.[6,7]

If Acute Pancreatitis is diagnosed on the basis of the first two criteria with no systemic sign of severe systemic inflammatory response syndrome or persistent organ failure, contrast material-enhanced CT may not be necessary for determining patient care.

Table 1: Bedside index for severity of acute pancreatitis (BISAP) score components.

Parameter	Definition	Score
Blood urea nitrogen	>25mg/dl	1
Impaired mental status	Glasgow Coma Score <15	1
SIRS (any 2 out of 4)		
Pulse	>90 bpm	1
Respiration	>20 cpm or PaCO2 <32 mm Hg	
Temperature	>38° or <36° Celsius	
WBC count	>12000 or <4000 cells/cu.mm3 and/or >10% immature neutrophils	
Age	> 60years	1
Pleural effusion	on CT scan or chest x-ray or USG	1

SIRS: systemic inflammatory response syndrome USG: ultrasonography CT: computed tomography, cpm: cycles per minute.

Table 2: Marshall scoring system for organ failure.

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	>1.5to<1.9	>1.9to<3.5	>3.5to<4.9	>4.9
Cardiovascular (SBP, mm hg)	>90	<90, fluid responsive	<90, fluid unresponsive	<90, ph<7.3	<90, ph<7.2

Patients with Onset of abdominal pain more than 24hours and all cases of acute pancreatitis with organ failure at or within 24hr of presentation were excluded from study. Patients were subjected to routine blood investigations, chest X-ray at 24 hours of onset of AP and close monitoring of patient's vital status was done. BISAP (Table 1) score is calculated in all such patients based on data obtained within 24 hours of onset of AP. A CT or MRI or USG of the abdomen, obtained at any time in the first 7 days of hospitalization, is required to differentiate necrotizing from interstitial pancreatitis.

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 (Table 2)[5] FiO2 estimation for Non-ventilated patients in (Table 3). Organ failure scores will be calculated for all patients during the first 72 hours of hospitalization based on the most extreme laboratory value or clinical measurement during each 24-hour period. Duration of organ failure was defined as transient (≤ 48 hours.) or persistent (>48 hours) from the time of presentation.

Table 3: FiO2 estimation for non-ventilated patients.

Supplemental oxygen (l/min)	FiO2 (%)
Room air	21
2	25
4	30
6-8	40
9-10	50

BISAP score >3 was considered as Severe Acute Pancreatitis[4], its correlation with local complications, organ failure, ICU stay and mortality was studied. A p-value of <0.05 was considered statistically significant.

RESULTS

Mean age in present study was 45.51 year and Male: Female ratio was 3:1 Table 4.

Table 4: Depicting gender distribution among our study population.

Sex	No. of patients	Percentage
Male	45	75%
Female	15	25%

The leading cause of acute pancreatitis in present study was alcohol in 32 (53.4%) patients and Gallstones were in 23 (38.34%) patients and others in 5 (8.33%).

According to Revised atlanta classification of AP, in the study 43 patients were classified as Mild Acute Pancreatitis (MAP), 14 as Moderately Severe Acute Pancreatitis (MSAP), and 3 as Severe Acute Pancreatitis (SAP) (Table 5).

Table 5: RAC classification and complications.

Mild AP (SAP)	Moderately severe AP (MSAP)	Severe AP (SAP)
• 43 patients • No Signs of local or systemic complications or no organ failure	• 14 patients • 9 had transient organ failure: of them 2 had pancreatic necrosis, 2 had ANC,1 developed PP.1 patient developed SVT • 1 had ANC;1 had PN;2 developed PP.1 had APFC	• 3patients • Developed persistent organ failure • PN and ANC was seen in 1 each. • 1/3 had SVT and PVT

ANC-acute necrotic collection, APFC- acute pancreatic fluid collection, PN- pancreatic necrosis, PP-pancreatic pseudocyst, PVT-portal vein thrombosis, SVT-splenic vein thrombosis.

As per predefined BISAP criteria, 45 patients had BISAP <3 and 15 had BISAP >3 hence they were classified as MAP and SAP with respect to BISAP Score <3 and >3 respectively Table 6.

Table 6: Distribution of severity in study population according to BISAP.

Severity	No. of patients	Percentage
MAP (BISAP <3)	45	75%
SAP (BISAP >3)	15	25%
Total	60	100%

Complications seen in the study

Local complication in form of Pancreatic necrosis was seen in 8 patients, peri-pancreatic fluid collection, pancreatic pseudocyst in 5 and 3 patients respectively. Splenic vein thrombosis and\or Portal Vein Thrombosis was seen in 2 patients. Organ Failure was seen in 12 patients of which 9 patients had transient and 3 had persistent organ failure. There was overlapping of complications in many patients as seen, 2/3 with persistent organ failure had pancreatic necrosis, and one in persistent organ failure group also had splenic and portal vein thrombosis (Table 5).

Organ failure

12 patients who developed Organ failure had BISAP score more than 3, except 1 patient who developed Renal Failure with BISAP SCORE <3. In organ failure, renal failure 6 (10%) was most common and Respiratory 3 (5%), MODS 2 (3.33%), Cardiac failure 1 (1.67%) (Table 7).

9 patients (15%) with Transient Organ Failure all had BISAP >3 except one who had renal failure with BISAP 2. Persistent Organ Failure was seen in 3 patients and all had BISAP>3, chi-square results of organ failure at BISAP 3 have been tabulated in Table 8.

Pancreatic Necrosis was diagnosed in 8 (13.44%) patients of which 6 (10%) had BISAP score >3 and 2 (3.3%) had BISAP score (Table 9).

Table 7: Organ failure and its correlation with BISAP score.

			BISAP score		Total
			<3	>3	
Organ failure	ARDS*	Count	0	3	3
		% within organ failure	0.0%	100.0%	100.0%
		% of Total	0.0%	5.0%	5.0%
	Cardiac	Count	0	1	1
		% within organ failure	0.0%	100.0%	100.0%
		% of Total	0.0%	1.7%	1.7%
	MODS^	Count	0	2	2
		% within organ failure	0.0%	100.0%	100.0%
		% of Total	0.0%	3.3%	3.3%
	No	Count	44	4	48
		% within organ failure	91.7%	8.3%	100.0%
		% of Total	73.3%	6.7%	80.0%
	Renal failure	Count	1	5	6
		% within organ failure	16.7%	83.3%	100.0%
		% of Total	1.7%	8.3%	10.0%
Total		Count	45	15	60
		% within organ failure	75.0%	25.0%	100.0%
		% of Total	75.0%	25.0%	100.0%

Table 8: Chi-square tests of organ failure.

	Value	Df*	Asymptotic significance (2-sided)
Pearson Chi-Square	36.000	4	0.000
Likelihood ratio	34.537	4	0.000
No of valid cases	60		

p-value < .05 which is highly significant, *degree of freedom.

Table 9: Pancreatic necrosis in the study population.

Pancreatic necrosis	BISAP >3	BISAP<3	Total
Yes	6 (10%)	2 (3%)	8 (13%)
No	9 (15%)	43 (72%)	52 (87%)
Total	15(25%)	45 (75%)	60 (100%)

Pancreatic necrosis and its correlation with the BISAP Score: There is a strong co-relation between the BISAP Score >3 and occurrence of Pancreatic necrosis, as observed in present study 6/8 patients who developed pancreatic necrosis had BISAP >3 and it was statistically highly significant with p-value 0.0004 (Table 10). Fisher's exact test when applied to demonstrate the relation between Pancreatic necrosis and BISAP score it yielded p-value (two tailed) 0.00205 which is statistically significant. ICU stay: 7 patients required ICU stay more than 5 days and 53 Patients required ICU stay less than 5 days. Mean ICU stay in present study was 2.89+/- 0.76 days. ICU stay and BISAP score correlation was statistically significant with p-value <0.05 (Table 11).

Table 10: Chi square test depicting relation between pancreatic necrosis and BISAP.

Chi square test depicting relation	
Chi-square (observed value)	12.308
Chi-square (critical value)	3.841
DF	1
p-value	0.0004

Table 11: ICU stay and BISAP score correlation.

ICU stay	BISAP >3	BISAP<3	Total
>5 days	5 (8%)	2 (3%)	7 (11%)
<5 days	10 (17%)	43 (72%)	53 (89%)
Total	15 (25%)	45 (75%)	60 (100%)

Mortality in present study was seen in one patient (2%), who had BISAP score of 5 and he had developed MODS.

DISCUSSION

Acute pancreatitis (AP) remains a serious 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.[1] The majority of patients present with a mild disease, however approximately 20% run a severe course and require appropriate management in an intensive care unit.

According to RAC AP has been defined as in, mild, moderate and severe form.

Definition of severity of acute pancreatitis[6,7]

Mild acute pancreatitis

Mild acute pancreatitis is characterized by the absence of organ failure and the absence of local or systemic complications.

Moderately severe acute pancreatitis

Moderately severe acute pancreatitis is characterized by the presence of transient organ failure or local or systemic complications in the absence of persistent organ failure.

Severe acute pancreatitis

Severe acute pancreatitis is characterized by persistent organ failure.

Multi-organ dysfunction syndrome, the extent of pancreatic necrosis, infection and sepsis are the major determinants of mortality in AP.[2,3] Pancreatic necrosis is considered as a potential risk for infection, which represents the primary cause of late mortality. The occurrence of acute respiratory (ARDS), cardiovascular (CVD) and renal failures (RF) can predict the fatal outcome in SAP.[4] A wide range of mortality (20%-60%) has been reported in SAP.[8] Early diagnosis and prognostic evaluation are extremely important and may reduce the morbidity and mortality associated with SAP. Because differences in outcome between patients with the mild and severe disease, it is important to define that group of patients who will develop severe pancreatitis, predicting which still represents a challenge for the clinician. Interestingly, when seeking medical attention (usually 12 to 24 hours after the onset of pain) most patients do not exhibit multiple organ dysfunctions, which is likely to emerge by the second or third day. Identification of patients at risk for mortality early in the course of acute pancreatitis is an important step in improving outcome" write Dr. Wu BU, from Brigham and women's hospital and Harvard medical school in Boston, Massachusetts, and colleagues, "current methods of risk stratification in acute pancreatitis have important limitations". Most patients with AP recover without complications, the overall mortality rate of this illness is between 2-5%.[9,10]

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.[11] The APACHE II score is the most widely used prediction system currently but it requires the collection of a large number of parameters.[2] 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. For this purpose, a simple and accurate clinical scoring system that is bedside index for severity in acute pancreatitis (BISAP) scoring system was developed.[4] This scoring system used for stratifying patients according to their risk of hospital mortality and can identify patients at increased risk of mortality prior to the onset of organ failure. Data for BISAP score collected within the first 24 hours of hospitalization. The ability to stratify patients early in their course is a major step to improving management strategies in acute pancreatitis. The severity of acute pancreatitis was defined based on BISAP score. In present study Out of 60 patients, 15 (25%) had severe pancreatitis that is they had BISAP score more than or equal to 3 and 45 (75%) were classified as having mild pancreatitis having BISAP score of less than 3. The majority of patients, the disease was self-limiting.

Among 60 patients in present study, 45 (75%) were males and 15 (25%) were females. Male to female ratio was 3:1. The mortality rate of present study was 2% i.e. one patient had died from MODS with persistent organ failure with BISAP score of 5. We found that majority of patients who had BISAP score more than 3 were above 40 years of age. With respect to etiological factors of acute pancreatitis, we found alcohol being the most common cause of acute pancreatitis, accounting for 53.33% of cases, gallstones being the second most common, accounting for 38.34% of cases. The proportion of two main causes greatly depends on the geographical and cultural variations. Alcohol is the main cause in the united states of America and Finland, gallstones in southern Europe, whereas central and northern Europe sees a similar frequency of the two factors or a predominance of alcohol.[12,13]

In present study, out of 60 patients, 48 (80%) had no organ failure, 12 (20%) patients developed organ failure. Out of 12 patients, 9 (75%) patients had transient organ failure and 3 (25%) had persistent organ failure. In transient organ failure group, 6 patients had a transient renal failure. A study done by Singh VK et al, out of 397 patients, 325 (82%) had no organ failure,72 (18%) patients developed organ failure, 53 (74%) had transient and 19 (26%) had persistent organ failure. We found comparable results compare to studies done by Vikesh k Singh et al.[8]

Out of 60 patients in present study, 8 (13%) developed pancreatic necrosis and in those 8 patients, 6 (75%) patients had BISAP score more than 3 and 2 (25%) patients had BISAP score less than 3. The mortality rates of patients with acute pancreatitis vary from 2 to 9 % while in severe cases, it is estimated at 30%. According to a recent study, the mortality rates among severe acute pancreatitis patients have decreased from 50-58% in

1978-1982 to 12-18% in 1993-1997. Also, early deaths of patients with acute pancreatitis were rare: nine out of ten deaths occurred later than 3 weeks after disease onset. The overall mortality in present study was 2% which is comparable with other studies.

CONCLUSION

BISAP score represents a less cumbersome way to identify patients at risk of increased mortality and the development of intermediate markers of severity within 24 hours of presentation and it can be useful in emergency settings and its simplistic manner of application makes its user friendly with better results compared to APACHE or RANSON's Score. BISAP Scores of ≥ 3 represent a straightforward way to identify patients at risk of increased mortality and the development of intermediate markers of severity within 24 hours of presentation.

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