International Surgery Journal
Venkatapuram MR et al. Int Surg J. 2018 May;5(5):1785-1791
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20181571

Original Research Article

A prospective study of BISAP score in assessing severity of acute pancreatitis

Mahidhar Reddy Venkatapuram, Sreeram Sateesh*, Deepthi Batchu

Department of General Surgery, Narayana Medical College, Nellore, Andhra Pradesh, India

Received: 04 April 2018
Accepted: 12 April 2018

***Correspondence:**
Dr. Sreeram Sateesh,
E-mail: mahiesweb@gmail.com

ABSTRACT

Background: Aim of study is to prospectively evaluate the ability of the Bedside Index for Severity in Acute Pancreatitis (BISAP) score to predict mortality as well as intermediate markers of severity.
Methods: 50 patients admitted from December 2015 to November 2017 with acute pancreatitis were included in the study. BISAP score is calculated in all such patients based on data obtained within 24hrs of hospitalization. Patients were assessed for organ failure according to Marshall scoring system and followed throughout hospitalization for assessment of complications. Statistical analyses were made using Fischer's exact probability test. The difference was assumed statistically significant when $p<0.05$.
Results: There was a statistically highly significant trend for increasing mortality ($p < 0.05$) and intermediate markers of severity ($p<0.05$) that is transient organ failure, persistent organ failure and pancreatic necrosis with BISAP score ≥3.
Conclusions: 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 hours of presentation.

Keywords: APACHE scoring system, Acute pancreatitis, BISAP score, Bedside index, CT grading, Modified Glasgow criteria, Ransons criteria

INTRODUCTION

Acute pancreatitis 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 underlying mechanism of injury in pancreatitis is thought to be premature activation of pancreatic enzymes within the pancreas, leading to a process of auto digestion[2,3]. Once the cellular injury has been initiated, the inflammatory process can lead to pancreatic edema, hemorrhage and, eventually necrosis. As inflammatory mediators are released into circulation, systemic complications can arise, such as Hemodynamic instability, Bacteraemia (due to translocation of gut flora), Acute Respiratory Distress Syndrome and pleural effusions, gastrointestinal haemorrhage, renal failure and Disseminated Intravascular Coagulation (DIC).

- Acute pancreatitis may be classified as mild, moderately severe or severe.
- Mild acute pancreatitis, the most common form, has

i. no organ failure,
ii. local or systemic complications and
iii. usually resolves in the first week.

Moderately severe acute pancreatitis is defined by

- the presence of transient organ failure (<48hrs)

- local complications or
- exacerbation of co-morbid disease.

Severe acute pancreatitis is defined by

- Organ failure that persists for >48hrs.
- Local complications are
- peri pancreatic fluid collections
- pancreatic and peri pancreatic necrosis (sterile or infected),
- Pseudo cyst and walled-off necrosis (sterile or infected)

80% of patients have mild attack of pancreatitis, the mortality rate is around 1%. In those who have a severe attack of pancreatitis, the mortality rate varies from 20% to 50%. About one-third of deaths occur in the early phase of attack, from multi organ failure, while deaths occurring after first week of onset are due to septic complications. Most patients of acute pancreatitis recover without complications, the overall mortality rate of this illness is between 2-5%[4,5].

Due to the risk of rapid deterioration in severe acute pancreatitis, the assessment of severity becomes crucial to a clinician. Multiple risk stratification tools for acute pancreatitis have been developed, but their clinical usefulness is limited.

In Ranson's criteria and modified Glasgow score there are multiple parameters, of which some of them are not available in majority of hospitals in India.[6] In addition, both are assessed after 48hrs, thereby missing potentially valuable early therapeutic window. The APACHE II score (Acute Physiology and Chronic Health Evaluation) is the most widely used prediction system currently, but it requires the collection of large number of parameters some of which may not be relevant to prognosis.[7,8] APACHE II was originally developed as an intensive care instrument.

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 mortality and is able to identify patients at increased risk of mortality prior to the onset of organ failure.

More over the data for BISAP score is collected within the first 24hrs of hospitalization.[9,10] The ability to stratify patients early in their course is a major step in improving future management strategies in acute pancreatitis.

BISAP Score

1. Blood urea nitrogen >25mg/dl,
2. Impaired mental status (Glasgow coma scale score<15),
3. Systemic inflammatory response syndrome (Presence of ≥2 of following criteria): Pulse rate >90/minute, Respiratory rate >20/min or PaCO2 <32 mm Hg, Temperature >38 or <36 degree Celsius, WBC count >12000 or <4000 cells/cubic mm or >10% immature neutrophils,
4. Age > 60 years,
5. Pleural effusion (on CT scan or chest x- ray or USG).

Each point on BISAP score is worth 1 point.

Various other scoring systems:[11-13]

- Ranson's criteria
- Glasgow criteria
- Apache scoring system
- CT grading

A prospective and observational study of cases attended to Narayana Medical College and Hospital from December 2015 to November 2017.

Primary aim of this study was to evaluate the ability of BISAP score to predict mortality in a prospective cohort of patients suffering from acute pancreatitis.

The secondary aim was to assess the ability of the BISAP score to predict, the intermediate markers of severity including the development of organ failure, persistent organ failure, and pancreatic necrosis.

There is a need for a simple and clinically oriented clinical scoring system that can predict mortality of acute pancreatitis within 24 hours of presentation. Early recognition of severe disease would enable the physician to consider more aggressive interventions within a time frame that could potentially prevent adverse outcomes.

BIASAP Score carries several advantages over other prognostic scoring systems in acute pancreatitis

- Simple to calculate.
- Requires only vital signs, laboratory tests and imaging that are commonly obtained at the time of presentation.
- It can predict hospital mortality, due to Acute Pancreatitis.

METHODS

All patients who presented to Narayana medical college and hospital from December 2015 to November 2017 with any 2 of the following 3 criteria forms the subjects of study.

- Characteristic abdominal pain suggestive of acute pancreatitis
- Increased levels of Serum amylase and/or lipase 3 times the normal value.

- Ultrasonography of the abdomen within first 7 days of hospitalization demonstrating changes consistent with acute pancreatitis.

50 patients were included in the study BISAP score was calculated in all such patients based on data obtained within 24hrs of entering the study.

Table 1: Individual components of the BISAP scoring system.

Parameters	Score -1	Score 0
Bloodurea nitrogen	>25mg%	<25mg%
Impaired mental status	GCS<15	GCS-15
SIRS	2/4 Present	Absent
Age	>60years	<60years
Pleural effusion	Present	Absent

SIRS (Systemic Inflammatory Response System)

- Temperature >38ºC or <36ºC
- Pulse >90/minute
- Tachypnea >24/minute
- WBC >12000/mm^3

Any two of four will be significant if present simultaneously. A score of >3 will indicate severe acute pancreatitis (early organ failure/pancreatic necrosis).

Inclusion criteria

All cases of acute pancreatitis patients diagnosed based on the afore mentioned criteria who presented to Narayana general hospital.

Exclusion criteria

Acute Pancreatitis patients, presenting with organ failure at the time of admission (or) within 24 hours of presentation.

Included patients were evaluated for local complications like pancreatic necrosis, acute fluid collections, pseudocyst, acute necrotic collections and walled off necrosis. A CT or MRI or USG of the abdomen as per indications obtained at any time in the first 7 days of hospitalization, to differentiate necrotizing pancreatitis from interstitial pancreatitis. Organ failure scores were calculated for all patients during the first 72 hours of hospitalization based on the most extreme laboratory value or clinical measurement during each 24h period. Organ failure was defined based on the Modified Marshall scoring system. A score of >2 for more than 48 hours was considered as persistent organ failure, whereas a score of <2 for less than 48 hours was considered as transient organ failure.

Statistical analysis

Discrimination of the BISAP score for predicting mortality will be evaluated in the prospective cohort, using Fischer's Exact Test.

A "P" value<0.05 was noted to be significant for all tests given the multiple testings conducted among the study cohort. Data analysis was carried out using SPSS (Statistical Package for the Social Sciences).

Table 2: Criteria for organ failure based on Marshall scoring system.

Organ system	Score o	Score 1	Score 2	Score 3	Score4
Respiratory (Pao2/Fio2)	>400	301-400	201-300	101-200	<101
Renal (s. creatinine, mg/dl)	<1.5	>1.5 to <1.9	>1.9 to <3.5	>3.5 to <5	<5
Cardiovascular (SBP, mmhg)	>90	<90, fluid responsive	<90, fluid unresponsive	<90, ph<7.3	<90 Ph<7.2

RESULTS

Table 3: Distribution of sex among study population (n=50).

Sex	No. of cases	Percentage
Male	45	90
Female	5	10

50 individuals with acute pancreatitis were admitted during the study period.

Among these individuals, 45 (90%) were males and 5 (10%) are females. Male to Female ratio was 9:1.

Table 4: Age distribution (n=50).

Age (Years)	No. of cases	Percentage
21-30	13	26
31-40	19	38
41-50	4	8
51-60	4	8
61-70	10	20

Etiology

The leading cause of acute pancreatitis was alcohol in 43 (86%) individuals. Gallstones were the cause in 4 (8%) individuals.

Other causes accounted for 3 (6%) cases.[14-16]

Table 5: Distribution of study population according to BISAP Score (n=50).

BISAP score	Cases
BISAP 0	0
BISAP 1	3 (6%)
BISAP 2	29 (58%)
BISAP 3	12 (24%)
BISAP 4	5 (10%)
BISAP 5	1 (2%)

Table 6: Distribution of causes of acute pancreatitis (n=50).

Etiology	No. of cases	Percentage
Alcohol	43	86
Gall stones	4	8
Trauma	1	2
Idiopathic	2	4

Organ failure

Out of 50 individuals, 39 (78%) had no organ failure, remaining 11 (22%) developed organ failure. Among these 11 individuals, 9 had BISAP score >3 and 2 had BISAP score <3. 6 cases had renal failure, 3 had ARDS, 1 had cardiac failure and 1 case suffered from MODS.

Table 7: Distribution of organ failure among study population.

	Renal	ARDS	Cardiac	MODS
BISAP≥3	5(10%)	2(4%)	1(2%)	1(2%)
BISAP<3	1(2%)	1(2%)	0	0
Total	6(12%)	3(6%)	1(2%)	1(2%)

Transient organ failure

Out of 50 individuals, 11 had organ failure in which 7 (14%) had transient organ failure. All had BISAP score >3 except 2 individuals who had BISAP score of <3. All these patients recovered without any mortality.

Table 8: Distribution of transient organ failure among study population according to BISAP Score (n=50).

BISAP Score	Transient organ failure
BISAP≥3	6 (12%)
BISAP<3	1 (2%)

Fischer's exact test was done, and p value was found to be significant (p= 0.006).

Persistent organ failure

Out of 50 individuals, 4 individuals developed Persistent Organ Failure. All these 4 had BISAP score>3. Fischer's exact test was done, and p value found to be significant (p=0.0133).

Mortality

3 individuals in the present study died (6%) and they all had BISAP score >3. Out of 3, 2 patients had ARDS and 1 patient developed MODS.

Table 9: Mortality among study population.

Mortality	No	Yes
No. of cases	47	3
Percentage (%)	94%	6%

Severity

The severity of acute pancreatitis was defined on the basis of BISAP score. Out of 50 individuals 18 (36%) had severe pancreatitis and 32 (64%) were classified as having mild pancreatitis.

Table 10: Distribution of severity among study population according to BISAP score (n=50).

Score	BISAP≥3	BISAP<3
No. of cases	18	32
Percentage	36%	64%

Hospital stay

Hospital stay significantly increased when the BISAP score was >3 when compared to <3. Mean duration Hospital stay was 4.8 days for mild acute pancreatitis and 8.3 days for severe acute pancreatitis.

Table 11: Hospital stay among study population (n=50).

Hospital stay	Mild pancreatitis (<3)	Severe pancreatitis (≥3)
Range (in days)	2-8	4-14
Mean (in days)	4.8	8.3

Pancreatic necrosis according to BISAP score

Out of 50 individuals, 7 (14%) developed pancreatic necrosis. Among these 7, 6 had BISAP score >3 and 1 had BISAP score <3.

Table 12: Pancreatic necrosis among study group (n=50).

BISAP Score	Pancreatic necrosis
BISAP ≥3	6 (12%)
BISAP <3	1 (2%)
Total	7 (14%)

Fischer's exact test was done and p value found to be significant (p=0.006)

DISCUSSION

Acute pancreatitis is a common cause of acute abdomen.[17,18] The severity of acute pancreatitis varies, most (80%) have a mild course and minimal hospitalization and no significant morbidity and mortality. About 20% of these cases progress to severe pancreatitis associated with pancreatic necrosis, infected necrosis, organ dysfunction and substantial morbidity and mortality. Hence it is important to predict which patient is likely to develop severe pancreatitis so that they need for intensive care and transfer to higher centres can be predicted and patients and attendents can be suitably counselled. The present study chose the BISAP Score to predict the severity of acute pancreatitis and examined its efficacy in correctly predicting the severity of the pancreatitis at the time of admission/presentation.

According to the Atlanta classification, Severe Acute Pancreatitis (SAP) is defined as an AP associated with local and/or systemic complications[19,20,21]. In the present study severity of acute pancreatitis is defined on the basis of BISAP Score.

- Mild AP BISAP Score <3,
- Severe AP BISAP Score ≥3.

Multi-organ dysfunction syndrome, the extent of pancreatic necrosis, local infection and sepsis are the major determinants of mortality.[22-24]

Identification of patients at risk for mortality early in the course of acute pancreatitis is an important step in improving outcome" write Dr. Wu B U and his colleagues, from Brigham and women's hospital and Harvard medical school in Boston, Massachusetts (USA).

The BISAP score was evaluated in 50 cases of acute pancreatitis admitted to our institution. BISAP scores were calculated in all cases using data within twenty four hours of presentation.

- In the present study, 36% (18/50) patients had BISAP score ≥ 3 and 64% (32/50) had BISAP score of <3.
- The present study group mortality was 6% and organ failure seen in 22% and pancreatic necrosis in 14% of patients.
- It is observed that individuals with BISAP score ≥3 were 4.5 times more likely to develop organ failure and 6 times more likely to develop pancreatic necrosis, than those with BISAP score <3. Thus, confirming the efficacy of the BISAP score in predicting the mortality and morbidity associated with acute pancreatitis.
- A BISAP score of less than 3 was efficient in predicting the reduced hospital stay when compared to the BISAP score of more than 3.the mean duration of hospital stay in those with BISAP score of >3 was almost twice that of those with BISAP score of <3.
- The most common etiological factor was alcoholism.

Age

The mean age of presentation in the present study is 41.7 years and is comparable to study done by Choudhuri G et al. 19 (38%) cases present between the age group of 31-40 yrs.

Table 13: Comparative mean age of presentation.

Name of the study	Age in years
Kashid A et al	35
Choudhuri G et al	44.89
Pupelis G et al	47
Buchler MW et al	55.1
Present study	41.7

Sex

In the study group, 45 (90%) were males and 5 (10%) were females. Male to female ratio was 9:1. The other studies also have a higher percentage of males, but the ratio of male to female is low.

Table 14: Comparative mean age of presentation.

	Male (%)	Female (%)
Kashid A et al	70.91	29.09
Choudhuri G et al	66.6	33.4
Pupelis G et al	73.7	26.3
Buchler MW et al	61	39
Present study	90	10

Etiology

Alcohol is the predominant etiological factor in the present study and present in 43 individuals (86%). The second most common cause is gallstones, accounting for 8% of cases. The common etiological factor of pancreatitis, found in other studies is given in the Table 15. Gall stone pancreatitis was found to be more common in other studies.[25-27]

Table 15: Comparison of etiology.

	Alcohol (%)	Gallstones (%)	Idiopathic (%)
Kashid A et al	29.1	36.4	14.5
Choudhuri G et al	45.83	26.04	19.37
Pupelis G et al	54	19	27
Buchler MW et al	33	45	22
Present study	86	8	4

Severity

In the present study, the severe pancreatitis as defined by BISAP score >3 was 36% (18 out of 50) and mild

pancreatitis as defined by BISAP score of <3 was 64% (32 out of 50).

Table 16: Distribution of severe and mild pancreatitis in other studies.

	Mild disease (%)	Severe disease (%)
Kashid A et al	52.73	47.27
Choudhuri G et al	47.27	52.3
Buchler MW et al	58	42
Present study	64	36

Severity of acute pancreatitis in the present study is comparable to above studies.[28-30]

Duration of hospital stay

The mean duration of hospital stay in mild pancreatitis (BISAP Score<3) was 4.8 days and severe acute pancreatitis was 8.3 days. In the present study, it is observed that duration of hospital stay increases, with increasing BISAP score as in other studies.[31-33]

Table 17: Duration of hospital stay (2-14 days).

Hospital Stay	Mild Pancreatitis BISAP score <3	Severe Acute Pancreatitis BISAP score≥3
Range (in days)	2-8	4-14
Mean (in days)	4.8	8.3

Organ failure

In the present study, out of 50 individuals 39 (78%) had no evidence of any organ failure whereas 11 (22%) individuals developed one or more organ failure. Out of these individuals 7 (63.63%) individuals had transient organ failure and 4 (36.36%) had persistent organ failure.

Table 18: Comparison of organ failure.

	Singh VK	Present study
Total number of patients	397	50
No organ failure	325 (82%)	39 (78%)
Organ failure	72 (18%)	11 (22%)
Transient organ failure	53 (74%)	7 (63.6%)
Persistant organ	19 (26%)	4 (36.6%)

Out of 50 individuals in the present study 7 (14%) individuals developed pancreatic necrosis, evidenced on radiological imaging using CT scan.

In those 7 individuals, 6 (85.7%) individuals had a BISAP score of more than 3 and 1 (14.3%) had a BISAP Score of less than 3 confirming that the BISAP score was efficient in predicting the severe pancreatitis and necrosis.[34-36]

Mortality

All the 3 (6%) deaths in the present study were patients with BISAP score >3 suggesting that the BISAP score is efficient in predicting the mortality in acute pancreatitis. A comparison of mortality rate and BISAP score is given in the table 20 below and is similar to the findings in the present study.[37-40]

Table 19: Comparison of mortality.

Study group	BISAP score≥3	BISAP score<3
Singh VK et al	18%	1%
Wu BU, Johannes et al	>20%	<1%
Present study	16%	None

CONCLUSION

The BISAP score is a simple and accurate method for the early identification of acute pancreatitis at increased risk for in hospital mortality.

BISAP score is efficient in identification of patients of acute pancreatitis who are at the risk of developing intermediate markers of severe pancreatitis in the first 24hours of presentation.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Venkatapuram MR, Sateesh S, Batchu D. A prospective study of BISAP score in assessing severity of acute pancreatitis. Int Surg J 2018;5:1785-91.