EVALUATION OF ACUTE PANCREATITIS BASED ON BISAP SCORING SYSTEM: A COHORT STUDY OF 50 CASES

Bhupinder Singh Walia[1], Pankaj Dugg[1], Gagandeep Singh[1], Sanjeev Sharma[1], Manjeet Singh Sandhu[2]

[1]Department of Surgery, Government Medical College, Amritsar, Punjab, India
[2] Rajan Hospital and Heart Centre, Kotakpura, Punjab, India

Abstract

Background/Aim: Acute pancreatitis is encountered in both medical and surgical specialty. Assessment of severity and grading is done using radiological investigations mostly like ultrasonography or CECT. We present a study to assess the severity of Acute Pancreatitis based on Bedside Index for Severity in Acute Pancreatitis (BISAP) scoring system.

Material & Methods: The study was conducted on 50 patients presenting with acute pancreatitis who were included as per inclusion criteria and a detailed history, clinical examination and blood investigation performed. Data like serum amylase, serum lipase, serum calcium, blood urea nitrogen (BUN), pleural effusion and systemic inflammatory response syndrome (SIRS) was collected from the patients. Based on data collected in 24 hours of hospitalization, BISAP score was calculated.

Results: Results showed that no significant temperature rise, pancreatic necrosis, SIRS or impaired mental status in patients with BISAP severity of <=3. However, patients having BISAP score >3, factors like BUN, age, pleural effusion, and organ failure show significant correlation. Also on comparative analysis of patients showed that the hospital stay, respiratory rate, pulse and laboratory markers (blood urea, serum creatinine, serum amylase, serum lipase) were significantly higher in patients with BISAP score ≥3.

Conclusion: BISAP score is an easy, quick and bedside method to assess the severity of acute pancreatitis and predict its mortality. It is easy bedside procedure that can be done in every setup.

Key words: Acute Pancreatitis, Multi organ failure, Mortality

INTRODUCTION

Acute pancreatitis (AP) is an abdominal condition caused by pancreatic inflammation and patients presents with pain in abdomen and there is rise in pancreatic enzyme levels in the blood or urine.[1] It has always been a great challenge for the treating surgeon in their routine surgical practice as AP is common entity encountered in emergencies. Although most of the cases of AP resolves spontaneously, but 30% mortality is seen in severe acute pancreatitis.[2] The etiologies and natural histories are complex and variable that makes it difficult to detect high risk patients at early stage. Incidence of pancreatitis is different in different geographical locations but common etiologies are alcohol, gallstones, metabolic factors, drugs and idiopathic.[3]

Identification of severe AP after admission is of great clinical significance as it will help in triage and starting aggressive early treatment. Many guiding principles have been followed over the years that have evolved and also borne out of certain studies. The strategies that

Corresponding author: Dr Pankaj Dugg; e-mail: dr_dugg@hotmail.com

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have been used to assess the severity of acute pancreatitis are Ranson's criteria, APACHE II (Acute Physiology and Chronic Health Evaluation II) scoring, CTSI (Computed Tomography Severity Index), Glasgow scoring systems. Although none is recognized as standard criteria, each one has its advantages and disadvantages.[4-6]

Wu et al in 2008 developed a quick and accurate method for recognition of high risk patients which is called BISAP (Bedside Index for Severity in Acute Pancreatitis) scoring system. This system provides an accurate, easy, quick, simple and reproducible description of disease severity.[7]

Since the data for BISAP score is collected within 24 hours of hospitalization, patients can be stratified early according to those who are at high risk for mortality and organ failure. As BISAP scoring is quick and bedside method, patients can be assessed in their early course and thus it can help improving future management strategies in acute pancreatitis.[8]

Individual components of BISAP Score include:

1) Blood urea nitrogen> 25mg/dl,
2) Mental status of patient (Glasgow coma scale score),
3) Systemic inflammatory response syndrome (SIRS)

Presence of more than 2 of following criteria (Score of > 3 will indicate early organ failure or pancreatic necrosis):

- Pulse >90 bpm,
- Respiration >20/min or PaCO2 <32 mm Hg,
- Temperature ≥38 degree celsius or <36 degree celsius,
- WBC >12000 or < 4000 cells/mm^3 or >10% immature neutrophils,

4) Age >60 years and
5) Pleural effusion (on CT scan or chest x- ray or USG).

Each point on BISAP score is worth 1 point. The risk of mortality increases with increase in points. BISAP score is a reliable, quick and uncomplicated method to assess severity at time of admission.[9]

Thus, in order to improve the survival accurate prediction of severity is important. To predict the prognosis and seriousness of acute pancreatitis, multiple assessment criteria are used to guide patient assessment and management. However, nothing has been shown to outperform good clinical judgment in clinical settings. Ideal predicting criteria are those which are simple, non-invasive, accurate and quantitative and assessment tests are readily available.

MATERIALS AND METHODS

This prospective cohort study was carried out between December 2020 and November 2021 at our institution after approval from the Institutional Ethical Committee. Informed consents of patients were taken. The study was conducted on 50 patients. The case of acute pancreatitis was diagnosed based on the presence of any two of the following features:

- Abdominal pain with features of acute pancreatitis (acute onset of a persistent, severe, epigastric pain often radiating to the back),
- Raised pancreatic enzymes (Serum amylase and/or lipase at least three times greater than the upper limit of normal value),
- Diagnosis of acute pancreatitis on transabdominal ultrasonography or CECT.

Inclusion criteria include:

Based on mentioned criteria all diagnosed cases of acute pancreatitis will be included.

Exclusion criteria include:

- Refusal to participate,
- Organ failure (At the time of admission and/or within 24 hours of presentation),
- Presentation >48 hours of onset of pain and
- Hyperamylasemia of other causes
- Carcinoma pancreas

A detailed history like age, gender, etiologies for pancreatitis, past history of alcohol intake was collected. Clinical examination and blood investigation were performed. Presenting symptoms like fever, abdominal pain, abdominal distension, nausea and vomiting were noted for each patient along with

1) Physical examination
2) Clinical evaluation of patient
3) Appropriate diagnostic procedures.

Data like serum amylase, serum lipase, serum calcium levels, BUN (blood urea nitrogen), pleural effusion and features of SIRS (systemic inflammatory response syndrome) were collected in all the patients. Based on data obtained within 24hr of hospitalization, BISAP score was calculated.

Statistical analysis:

Statistical analysis was done on Microsoft excel sheet (2010) and SPSS software version 21. Chi square test was used for finding association between variables. P value of <.05 was considered significant.

RESULTS

Table 1 shows the baseline characteristics of the patients. Figure 1 shows that most common etiological factor was idiopathic (32%, n=16) followed by gall stone (28%, n=14) and alcohol (24%, n=12). In 8% (n=4) cases hyper triglyceridemia was the cause. Drug induced and post ERCP contributed 4% (n=2) cases each. In present study 24% (n=12) cases presented with pancreatic necrosis and the mortality rate was 2%. Figure 2 shows that 64% (n=32) cases have BISAP score ≤2 while 36% (n=18) cases have BISAP score ≥3. However there was no significant correlation found between etiology and BISAP score of pancreatitis (Table 2).

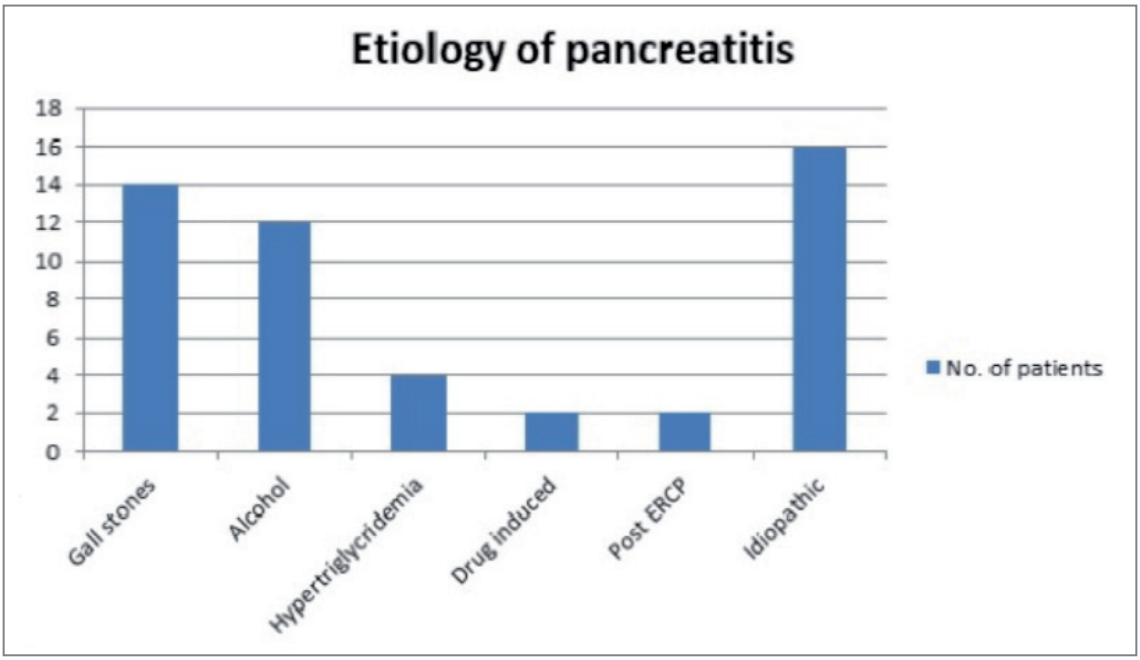


Fig. 1 Etiology of Pancreatitis

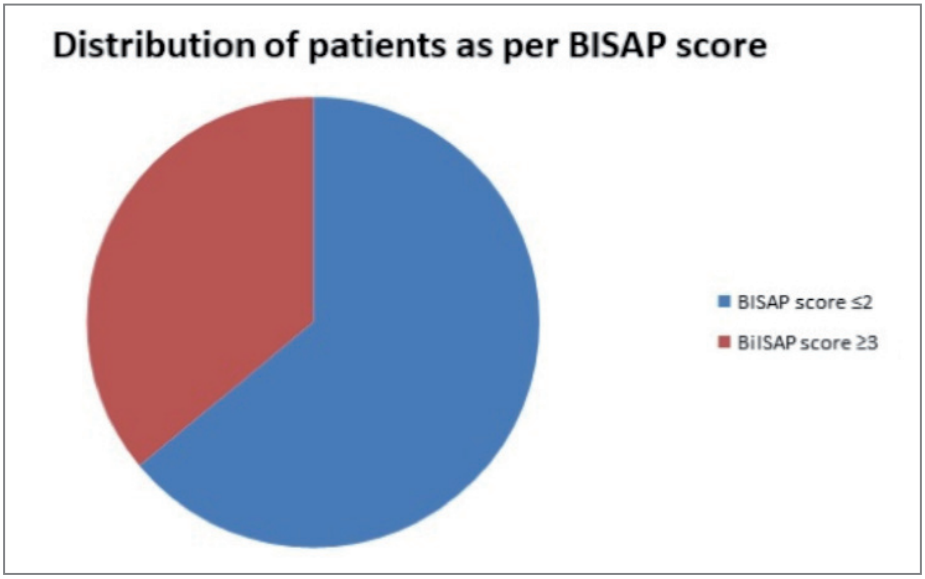


Fig. 2 Patients with BISAP score of <2 and >3

Statistically significant values were observed for BUN, age, pleural effusion, and organ failure in patients with BISAP score >3 (Table 3).

In table 4 the comparative analysis of patients having BISAP score ≤2 (n=32) and ≥3 (n=18) is shown It was observed that significantly higher values for hospital stay, respiratory rate, pulse, blood urea, serum creatinine, serum amylase, and serum lipase is present in patients with BISAP score ≥3.

Table 1 Baseline characteristics of the patients

Parameters(n=50)	Mean/n	Std. Deviation/%
AGE (YEARS)	41.92	15.018
SEX (male)	25	50%
HOSPITAL STAY(DAYS)	11.34	3.497
TEMPERATURE (Degree C)	38.34	0.626
RESPIRATORY RATE (breaths per minute)	17.48	1.182
PULSE (beats per minute)	94.14	2.483
TLC/mm^3	12942.06	1723.282
NEUTROPHILS	78.16	4.287
LYMPHOCYTES	47.54	9.072
BASO	0.04	0.198
MONOCYTES	2.58	0.785

Continuation of table 1

EOSINOPHIL	5.06	1.812
BLOOD UREA (mg/dL)	88.72	88.005
SERUM CREATINE mg/dL	1.588	0.9323
SERUM AMYLASE (U/L)	359.92	111.241
SERUM LIPASE(U/L)	698.48	195.474
SERUM CALCIUM (mg/dL)	8.69	0.7726

Table 2 RELATIONSHIP OF BISAP SCORE SEVERITY WITH ETIOLOGY

BISAP	**≤2**		**≥3**		**Total**		**Chi square value**
Etiology	n	%	n	%	n	%	647
Hypertriglyceridemia	3	9.40	1	5.60	4	8.00	
Gall stones	7	21.90	7	38.90	14	28.00	
Idiopathic	10	31.30	6	33.30	16	32.00	
Alcoholic	9	28.10	3	16.70	12	24.00	
Drug induced	2	6.30	0	0.00	2	4.00	
Post ERCP	1	3.10	1	5.60	2	4.00	
Total	32	100	18	100	50	100	

Table 3 Relationship of BISAP score severity with various parameters

BISAP	≤2		≥3		Total		Chi Square
	N	%	N	%	N	%	P-Value
Temperature (≥39)	12	37.50%	9	50.00%	21	42.00%	.390
Pancreatic Necrosis	6	18.75%	6	33.30%	12	24.50%	.273
BUN(>25)	2	6.30%	16	88.90%	18	36.00%	.001
Age(>60)	0	0.00%	8	44.40%	8	16.00%	<.001
Pleural Effusion	17	53.10%	17	94.40%	34	68.00%	.003
Impaired Mental Status	0	0	0	0	0	0	-
SIRS	32	100.00%	18	100.00%	50	100.00%	.515
Organ Complication							
No Complication	32	100.00%	0	0.00%	32	64.00%	<.001
ARDS	0	0.00%	2	11.10%	2	4.00%	
Cardiac	0	0.00%	1	5.60%	1	2.00%	
Mods	0	0.00%	2	11.10%	2	4.00%	
Renal	0	0.00%	13	72.20%	13	26.00%	
Total	32	100.00%	18	100.00%	50	100.00%	

Table 4 Comparison of mean in according to severity of BISAP score with different parameters

BISAP	≤2 (n=32)		≥3(n=18)		t-value	p-Value
	Mean	Std. Deviation	Mean	Std. Deviation		
HOSPITAL STAY(DAYS)	10.28	2.738	13.22	3.96	-3.094	0.003
TEMPERATURE (Degree C)	38.28	0.63	38.44	0.61	-0.88	0.38
RESPIRATORY RATE (breaths per minute)	17.19	1.12	18	1.13	-2.44	0.01
PULSE (beats per minute)	93.5	2.12	95.28	2.71	-2.56	0.01
TLC/mm^3	12652.97	1873.79	13456	1311.53	-1.60	0.11
NEUTROPHILS	77.63	4.61	79.11	3.54	-1.18	0.24
LYMPHOCYTES	46.91	8.49	48.67	10.16	-0.65	0.51
BASO	0	0	0.11	0.32	-1.9	0.056
MONOCYTES	2.47	0.76	2.78	0.80	-1.34	0.18
EOSINOPHIL	4.84	1.81	5.44	1.79	-1.12	0.26
BLOOD UREA (mg/dL)	39.72	5.68	175.83	98.53	-7.85	<0.001
SERUM CREATININE mg/dL	1.022	0.25	2.594	0.843	-9.84	<0.001
SERUM AMYLASE (U/L)	329.63	63.20	413.78	153.57	-2.73	0.009
SERUM LIPASE(U/L)	624.16	171.58	830.61	166.02	-4.13	<0.001
SERUM CALCIUM (mg/dL)	8.6	0.87	8.85	0.54	-1.10	0.27

Table 5 Comparison of BISAP score between different studies

BISAP SCORE	SCORE≤2	SCORE ≥3
Present study (2021)	64%	36%
Chittipotula et al(2020)[8]	64%	36%
Hagjer et al(2017)[9]	80%	20%
Chandrashekhar et al[11]	82%	18%
Venkatapuram MR et al. (2018)[12]	64%	36%
Veena P et al (2020)[14]	64%	36%
Katta et al (2016)[15]	74.51%	25.49%

DISCUSSION

The study was conducted to assess efficacy of BISAP score in correctly evaluating severity of acute pancreatitis at time of admission/presentation.

Maximum patients were of age group <40 years (54%) and the mean age was 41.92±15.01 years. Range of age varied from 38.62-46.31 years. The results are comparable to previous studies.[9-12] Equal number of male and female was observed with male: female ratio of 1:1. However male predominance is seen in most studies but ratio varies from 2:3 to 9:1.[11-15]

In present study the commonest cause was idiopathic (32%) followed by gallstone disease (28%). Similar results were shown by Kanase et al, where 31% patients had idiopathic cause while 28% patients had gall stone disease.[16] In study conducted by Singh et al, 27% patients had gall bladder stones as etiological factor which was most common cause followed by alcohol (21.4%) and idiopathic (15.1%).[17] However Venkatapuram et al, reported alcohol as most common etiological factor (80%) followed by gall bladder stones (8%).[12] Gall bladder stones and alcohol are common etiological factors for acute pancreatitis. However present study showed idiopathic as most common cause.

In 76% (38) cases pancreatic necrosis was absent while in 24% (12) cases it was present. The incidence of pancreatic necrosis was seen between 14%–35% in various studies.[8,9,12,14,17] Similar findings were seen in present study.

In our study 98% patients were discharged in satisfactory condition while mortality rate was 2%(n=1). However, the mortality rate varies from 3.5%-16%.[8,9,12,15,17] Small sample size could be the reason for low mortality rate in present study.

In present study it was seen that 64% (n=32) cases have BISAP score ≤2 while 36% (n=18) cases have BISAP score ≥3. Mostly in all the studies majority of the patients have mild pancreatitis, which was also observed in present study. BISAP score of present study is compared with other studies (Table 5).

It was observed that there is significant association between age group and BISAP score (p=.002). Also patients with BISAP score ≤2 has age ≤60 years while among the cases with BISAP score ≥3, 55.60% have age ≤60 years and 44.40% have age >60. This association was statistically significant.

There is no significant association observed between pancreatic necrosis and BISAP severity score in both the groups. There is significant association between organs complications and BISAP score as all complications were seen in patients with BISAP score ≥3. Singh et al, also found significant increase in organ failure and pancreatic necrosis with increase in BISAP score.[17] Senapati et al found the same results with significant association between pancreatic necrosis and BISAP score. [18] Khanna et al also observed that

patients with ≥3 BISAP score have more pancreatic necrosis and organ failure compared to other. [19]

Senapati et al, also observed that organ failure and pancreatic necrosis is higher among patients with BISAP scores of 3 as compared to those with score od <3.[18] Although persistent organ failure and pancreatic necrosis are two important predictors of outcome in acute pancreatitis but presence of both factors have greater effect than either determinant alone. According to Senapati et al organ failure and infected necrosis are two independent and equivalent determinants of mortality in acute pancreatitis and there is two fold increase in mortality when both are present.[18]

It has been reported that BISAP scores of ≥3 carry a 7.4-fold higher risk of developing organ failure and 12.7-fold higher risk for persistent organ failure. Organ failure is considered as much stronger predictor of mortality than the extent of necrosis.[17] Overall mortality rate reported by Perez et al, was 14% among 99 patients with pancreatic necrosis but it was 50% when there is concomitant presence of organ failure at or during hospitalization.[20] Rau et al, observed a 19-fold increased risk of mortality in patients having sterile necrosis and multisystem (>2) organ failure, treated either operatively or conservatively.[21] Persistence of organ failure is a major determinant of mortality in acute pancreatitis than organ failure.[22,23]

In 93.80% (n=30) cases with BISAP score ≤2 have BUN≤25 and majority patients with BISAP score ≥3 have BUN >25 i.e. 88.89% (n=16). This association was statistically significant (p<.001). Also, in present study the average BUN for severe pancreatitis was 175.83mg/dl and for mild it was 39.72 mg/dl with highly significant difference between the two. Pre-renal azotemia caused by initial hypovolemia lead to rise in the BUN level at admission in patients with acute pancreatitis. Acute pancreatitis, and impairment of renal function lead to increased protein catabolism that cause negative nitrogen balance which further leads to azotemia.[24,25] Elevated BUN at time of admission is increases the risk of mortality which makes it an independent risk factor in acute pancreatitis.[7,25] Koutroumpakis et al. observed in their study that rise in BUN at 24 hour is better predictor of persistent organ failure and pancreatic necrosis in acute pancreatitis than other laboratory markers.[26] Our results are in accordance with these studies with respect to initial increased BUN level at admission and its association with the development of SAP in acute pancreatitis.

Also, in patients with BISAP score of ≥3, 94.40% patients had pleural effusion while in those with BISAP score of ≤2, 53.10% had pleural effusion. This association was statistically significant (p=.003). The cause of pleural effusion observed during acute pancreatitis could be due to leakage of pancreatic secretions directly into the pleural cavity via the trans diaphragmatic lymphatic channels due to pancreatic duct disruption. Maringhini et al, in their study observed an increased in incidence of pseudocyst formation related to acute pancreatitis when there is associated pleural effusion.[27] Heller et al, also showed association between pleural effusion on chest x-ray and severity as per BISAP score.[28] The present study suggests that pleural effusion is a strong individual predictor of severe acute pancreatitis according to BISAP criteria.

It was observed that hospital stay, respiratory rate, pulse, BUN, serum creatinine and pancreatic enzymes (serum amylase, serum lipase) were significantly more in patients with BISAP score ≥3.

The mean hospital stay for the patients was 11.34±3.4 days. Chandrashekhar et al, in their study found that hospital stay was 7.16 days which was less than the present study.[11] In present study it was seen that with increase in BISAP score the duration of hospital stay increases. Mean hospital stay was 10.28 days for mild acute pancreatitis while it was 13.5 days for severe acute pancreatitis which was longer then the study by Chittipotula et al where mean duration of hospital stay was 4.8 days and 8.3 days for mild acute pancreatitis severe acute pancreatitis respectively.[8] According to a study by Hagjar et al the mean hospital stay in patients with BISAP score of ≤2 was 7.52 ± 3.053 days while it was 10.429 ± 5.872 days for BISAP score ≥3 days.[9]

The study had certain limitations that include small sample size and short duration of study. Moreover being a more clinical and indirect method, many would prefer to opt for CECT early.

But still BISAP score is effective in finding out the severity and predicting mortality in patients with acute pancreatitis. It is a very useful tool to triage patients into mild and severe disease. Being easy to perform and as bedside procedure, it can be done in every setup. In conclusion, the ability of the BISAP score to predict mortality and severity in acute pancreatitis is evaluated. In our opinion, BISAP score can be used to stratify patients at risk of mortality within 24 hours of presentation and it can help to improve clinical care and facilitate enrolment of appropriate patients with acute pancreatitis in future prospective trials. However it is indirect method to assess the severity of pancreatitis but useful in places where facilities of CECT and other diagnostic procedures are absent.

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