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Original Article

Surgery Section

A Prospective Study to Evaluate BISAP Score in Acute Pancreatitis

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ABSTRACT

Introduction: Acute Pancreatitis (AP) is among leading cause of acute abdomen in the study institution. There is a need of simple criteria to stratify patients in Emergency Department. The Bedside Index for Severity in Acute Pancreatitis (BISAP) score is one such score.

Aim: This study evaluates the BISAP score to predict organ failure, pancreatic necrosis and moderately severe/severe AP in tertiary health care center in India and promote its use.

Materials and Methods: This prospective observational study was conducted on 50 consecutive patients diagnosed as AP from May 2019 to April 2020 and admitted in Emergency Department of DMC Hospital, Ludhiana, India. BISAP score was calculated based on data obtained within 24 hours of hospitalisation. Severity of AP was defined according to the Revised Atlanta Classification, 2012. Organ failure was defined using the Modified Marshall scoring system. Data was expressed in terms of median, frequencies (number of cases) and relative frequencies (percentages); range; mean±Standard Deviation (±SD). All statistical calculations were done in Microsoft Windows Statistical Package for the Social Science (SPSS) version 21.0.

Results: The leading cause of AP in present study is gall stones, with maximum 26 (52%) cases. Second most common cause is alcohol with 11 (22%) cases. Systemic Inflammatory Response Syndrome (SIRS) is the most common component of BISAP score, present in 47 (94%) cases. Pancreatic necrosis present in 12 (24%) cases. Incidence of pancreatic necrosis rises at score ≥3 which is statistically significant (p-value- 0.008). Transient organ failure was present in 14 (28%) cases, persistent organ failure was present in 9 (18%) cases and 27 (54%) cases had no organ failure. At score ≥3, there is increased risk of organ failure and it is statistically significant (p-value ≤0.001). There are 27 (54%) mild, 14 (28%) moderately severe and 9 (18%) severe cases of AP. At score ≥3, there is increased risk of moderately severe and severe pancreatitis and it is statistically significant (p-value ≤0.001).

Conclusion: There is statistically significant trend of increasing incidence of organ failure, pancreatic necrosis and moderately severe/severe AP at BISAP score ≥3. Thus, BISAP score is simple yet accurate scoring system to improve early risk stratification in AP.

Keywords: Gall stones, New scoring method, Organ failure, Pancreatic necrosis, Tertiary care centre

INTRODUCTION

The AP is defined as an inflammatory process of the pancreatic parenchyma. It is among the leading cause of acute abdomen. AP requires hospitalisation, early evaluation and risk stratification. Mostly, AP follows mild course and but few patients may develop a severe disease course. In severe disease, parts of pancreatic tissue and adjoining tissue become necrotic. It can progress from Systemic Inflammatory Response Syndrome (SIRS) to multiorgan failure. An early and accurate risk stratification protocol in AP would help in early initiation of appropriate therapy for patients with severe AP to prevent adverse outcomes and thus improving survival rates among patients.

The revised 2012 Atlanta classification is a valuable tool to assess AP. It has improved present understanding about AP, its course and classify pancreatic and peripancreatic fluid collections. It divides AP into two phases, early phase which is first one or second weeks and late phase. It also classifies AP as interstitial edematous pancreatitis or necrotising pancreatitis. Severity of the AP divided as mild, moderately severe and severe AP [1].

A model score should allow an early, accurate, quick and reliable risk stratification of the severity of disease. Multiple scores have been defined to evaluate the severity of disease, including Ranson criteria [2], Glasgow-imrie prognostic criteria, Acute Physiology And Chronic Health Evaluation (APACHE) II [3], and Computed Tomography Severity Index (CTSI) [4]. However, all of them have their pros and cons. The limitation of Ranson criteria is that it needs data that require 48 hours of hospitalisation, which may lead to missing an early therapeutic window and increased mortality [5]. Also, Ranson criteria is accurate at extreme scores (<3 indicate mild and >6 predicts severe disease) but not at intermediate scores [6]. APACHE II allows determination of severity of AP at admission but it is complex and needs number of parameters to calculate, some of which are not relevant to prognosis [7,8]. CTSI score is based upon CT findings of local complications and does not reflect the systemic inflammatory response [9,10].

Wu Bu et al., in 2008, proposed BISAP scoring system, a prognostic scoring system for early prediction of morbidity and mortality in AP [11]. Aim of the present study was to predict organ failure, pancreatic necrosis and moderately severe/severe AP in tertiary health care centre in India and promote its use.

MATERIALS AND METHODS

This prospective observational study was conducted on 50 consecutive patients diagnosed as AP from May 2019 to April 2020 and admitted through emergency in Dayanand Medical College and Hospital (DMC&H), Ludhiana, Punjab, India. Ethical clearance was taken from Research and Ethics Committee of this hospital (DMCH/P/2019/1762). BISAP score was calculated based on data collected within 24 hours of hospitalisation of patient, and then patients were followed throughout hospitalisation for development of severe AP. BISAP score was calculated using data of patients collected within first 24 hours of admission in this hospital.

Inclusion criteria: Patients diagnosed as case of AP, admitted in Emergency Department of DMC&H and willing to participate in

study after informed consent from patient/family were included in this study.

Exclusion criteria: Patient having history/features of chronic pancreatitis and acute on chronic pancreatitis were excluded from this study.

BISAP Score

1. Blood Urea Nitrogen (BUN) >25 mg/dL
2. Impaired mental status defined by Glasgow Coma Scale (GCS) score <15)
3. Systemic Inflammatory Response Syndrome (SIRS)

If more than two of following criteria present

-Pulse >90 bpm

-Respiration Rate (RR) >20/min or $PaCO_2$ <32 mmHg

-Temperature >38°C (100.4°F) or <36°C (96.8°F)

-Total Leucocyte Count (TLC) >12000 or <4000 cells/mm^3 or >10% immature neutrophils

4. Age >60 years
5. Pleural effusion (on chest X-ray or ultrasound or CT scan)

Each point on BISAP score is given 1 point.

Diagnosis [12]

If any two of the following three were present, patient was considered as case of AP.

- Characteristic pain that is epigastric and/or periumblical pain that radiates to back and relived by sitting and leaning forward.
- Serum amylase and/or lipase level at least three times above normal.
- Findings on ultrasound abdomen and/or Computerised Tomography (CT) scan abdomen and/or Magnetic Resonance Imaging (MRI) scan of abdomen characteristic of AP.

Pancreatic Necrosis, i.e. focal or diffuse area of dead pancreatic tissue with peripancreatic fat necrosis. It contains abscess like material and may be sterile or infected. In the present study, all the subjects were confirmed by radiological investigation or by guided aspiration and was associated with Bisap score.

Revised Atlanta Classification, 2012 [13]

It is an update of the 1992 Atlanta classification. It is a multidisciplinary, international classification of the severity of AP. The severity grading of Acute Pancreatitis (AP) is classified as mild, moderately severe or severe [13].

Mild AP: It is absence of organ failure and absence of local or systemic complications. These patients usually got discharge during the early phase and do not require pancreatic imaging, and risk of mortality is very low.

Moderately severe AP: It is transient organ failure that is presence of organ failure for less than 48 hours. Any local and systemic complications may or may not be present. It may resolve without intervention or it may need prolonged intensive care. Mortality is less in moderately severe when compared to that of severe AP.

Severe AP: It is persistent organ failure that is presence of organ failure for more than 48 hour. If patient develop persistent organ failure within first few days, risk of death increases with high mortality rate.

Organ Failure

Organ failure was defined as a score of two or more for one among the following three systems (respiratory, cardiovascular, and renal) as per Modified Marshall scoring system as shown in [Table/Fig-1] [13]. Duration of organ failure was taken as either transient (≤48 hours) or persistent (>48 hours). If failure occurs in more than one organ, it was termed as Multiple Organ Failure (MOF). Organ failure score was calculated for all cases of AP during each 24 hour duration or on the basis of clinical measurement and maximum laboratory results within 72 hours of admission to present hospital. Duration of organ failure was taken as either transient (≤48 hours) or persistent (>48 hours). MOF was defined as organ failure affects more than one organ system.

	SCORE				
Organ system	0	1	2	3	4
Respiratory (PaO_2/FiO_2)	>400	301-400	201-300	101-200	<101
Renal (serum creatinine, mg/dL)	<1.4	1.4-1.8	1.9-3.6	3.6-4.9	>4.9
Cardiovascular (SBP, mmHg)	>90	<90, fluid responsive	<90, fluid unresponsive	<90, ph <7.3	<90, ph <7.2

[Table/Fig-1]: Modified Marshall scoring system.
PaO_2: Arterial oxygen partial pressure; FiO_2: Fractional inspired oxygen; SBP: Systolic blood pressure

STATISTICAL ANALYSIS

Data was expressed in terms median, frequencies (number of cases) and relative frequencies (percentages); range; mean±standard deviation (±SD). All statistical calculations for this study were done in Microsoft Windows SPSS 21.0 version.

RESULTS

In present study, range of age was from 17-76 years with a mean age of 41.8 years with standard deviation of 15.7 years. Patients in age group <30 are 14 (28%), 31-50 years are 21 (42%), and >50 years are 15 (30%). Mean age of patients increase with increase in BISAP score with significant p-value (0.016) as summarised in [Table/Fig-2].

There was a male predominance among study population. Out of 50 patients, 33 (66%) were males and 17 (34%) were females. All the 50 patients presented with pain abdomen with or without pain radiation to back. Symptoms of nausea/vomiting present in 17 (34%) patients. Aetiology of pancreatitis in present study summarised in [Table/Fig-3]. The leading cause of AP in present study is gall stones, with maximum 26 (52%) cases.

The BISAP score was calculated based on data obtained within 24 hours of hospitalisation. Cases with Score 1 are 11 (22%), Score 2 is 18 (36%), Score 3 is 14 (28%), Score 4 is 5 (10%) and Score 5 is 2 (4%).

Out of 50 cases, there are 27 (54%) mild, 14 (28%) moderately severe and 9 (18%) severe cases according to revised Atlanta classification.

In present study, SIRS is most common component of BISAP score, present in 47 (94%) cases. Three patients have MOF. One patient has score of four and two patients have score of five. Pleural effusion, especially left-side is common in AP, 27 (54%) patients have pleural effusion.

In present study, pancreatic necrosis present in 12 (24%) cases. Distribution of pancreatic necrosis among study group according to BISAP score shown in [Table/Fig-4]. At <3 score, necrosis presents only in three cases, while at ≥3, necrosis present in nine cases. Thus, incidence of pancreatic necrosis rises at score ≥3. This correlation has significant p-value (0.008).

	1		2		3		4		5	
BISAP	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age (years)	35.09	11.95	40.11	11.72	41.07	17.99	53.40	18.32	70.00	0.00

[Table/Fig-2]: Mean age among study group according to BISAP Score.

Aetiology	No. of cases	Percentage
Biliary	26	52.0%
Alcohol	11	22.0%
Drug	2	4.0%
Hypercalcaemia	1	2.0%
Autoimmune	1	2.0%
Trauma	1	2.0%
Idiopathic	8	16.0%
Total	50	100.0%

[Table/Fig-3]: Distribution of acute pancreatitis on the basis of aetiology.

Pancreatic necrosis	BISAP score				Total	Chi-square value	p-value
	<3		≥3				
Yes	3	10.3%	9	42.9%	12	7.059	0.008
No	26	89.7%	12	57.1%	38		
Total	29	100.0%	21	100.0%	50		

[Table/Fig-4]: Distribution of pancreatic necrosis among study group according to BISAP score.
Significant p-value ≤0.05

Among 50 cases in present study, transient organ failure present in 14 (28%) cases, persistent organ failures present in 9 (18%) cases and 27 (54%) cases have no organ failure. Distribution of transient/persistent organ failure at BISAP scores <3 and ≥3 shown in [Table/Fig-5]. Thus, at score ≥3, there is increased risk of organ failure and it is statistically significant (p-value ≤0.001). In this study, 22 (44%) cases have respiratory, 3 (6%) cases have renal and 2 (4%) cases have cardiovascular organ failure. Prognosis of patient according to BISAP score shown in [Table/Fig-6,7]. Thus, at score ≥3, there is increased risk of moderately severe and severe pancreatitis and it is statistically significant (p-value ≤0.001).

Organ failure	BISAP score				Total	Chi-square value	p-value
	<3		≥3				
Transient	4	13.8%	10	47.6%	14	30.669	<0.001
Persistent	0	0.0%	9	42.9%	9		
No	25	86.2%	2	9.5%	27		

[Table/Fig-5]: Distribution of transient/persistent organ failure at BISAP score <3 and ≥3.
Significant p-value ≤0.05

Prognostic value	BISAP score					Total
	1	2	3	4	5	
Mild	11	14	2	0	0	27
Moderately severe	0	4	9	1	0	14
Severe	0	0	3	4	2	9
Total	11	18	14	5	2	50

[Table/Fig-6]: Prognosis of patients according to BISAP score.

Severity and prognosis	BISAP score				Total	Chi-square value	p-value
	<3		≥3				
Mild	25	86.2%	2	9.5%	27	30.669	<0.001
Moderately severe	4	13.8%	10	47.6%	14		
Severe	0	0.0%	9	42.9%	9		

[Table/Fig-7]: Prognosis of patients at BISAP score <3 and ≥3.
Significant p-value ≤0.05

DISCUSSION

The most remarkable feature of BISAP score is that it is easy and quick to calculate. It needs vital signs, general and abdominal examination, laboratory values and radiology to detect presence of pleural effusion that is routine work-up for any acute abdomen.

The mean age of present study population is 41.8 years. It is comparable to study by Pupelis G et al., that has 47 years as mean age [14]. Patient's mean age of presentation increases with increasing BISAP score with significant p=0.016.

The AP has variable presentation from mild disease requiring few days of hospital admission to life threatening course with significant morbidity and mortality. BISAP was found to be a simple bedside method to predict the severity of AP on admission and thus helps in triaging and prognostication of patients of AP presenting to the ED.

There was a male predominance in the present study with 33 (66%) male and 17 (34%) females. It is comparable to study by Buchler MW et al., (61% male) [15].

All cases presented with pain abdomen with or without pain radiation to back. Tenderness on abdominal palpation present in 27 (54%) patients while guarding/rigidity present in 6 (12%) cases. Gall stone (52.0%) is most common cause of AP in the present study. Second most common cause is alcohol with 22% cases. Gall stone is also most common cause in study by Buchler MW et al., (45%) and Chen L et al., (66%) [15,16]. SIRS is the most common component of BISAP score, present in 47 (94%) cases. There are 58% cases at <3 score and 42% cases at ≥3 score. It is comparable to study by Buchler MW et al., (58% at <3 and 42% at ≥3) [15]. Pancreatic necrosis present in 12 (24%) cases. Incidence of pancreatic necrosis rises at score ≥3 which is statistically significant (p-value-0.008). It is comparable to study by Chen L et al., 36 (25.7%) and Khanna AK et al., (23.6%) [16,17]. There is one case having mortality present in this study, at BISAP score of four. In this study, 46% patient had organ failure. At score ≥3, there is increased risk of organ failure and it is statistically significant (p-value <0.001). It is comparable to study by Khanna AK et al., (43% organ failure) and Maheshwari N et al., (50.7% organ failure) [17,18].

Limitation(s)

Present study consists of small portion of patients and the difference in duration of presentation of patients after onset of symptoms may interfere with assessment of the scoring systems.

CONCLUSION(S)

We conclude that BISAP score ≥3 is significantly predictive of organ failure, pancreatic necrosis and moderately severe/severe AP. It is an accurate means of risk stratification and prognostic prediction. It helps us to improve early risk stratification and do appropriate interventions in patients having severe pancreatitis.

REFERENCES

[1] Sarr MG. 2012 revision of the Atlanta classification of acute pancreatitis. Pol Arch Med Wewn. 2013;123(3):118-24.
[2] Ranson JH, Rifkind KM, Roses DF, Fink SD, Eng K, Spencer FC. Prognostic signs and the role of operative management in acute pancreatitis. Surg Gynecol Obstet. 1974;139(1):69-81.
[3] Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: A severity of disease classification system. Crit Care Med. 1985;13(10):818-29.
[4] Balthazar EJ, Robinson DL, Megibow AJ, Ranson JH. Acute pancreatitis: Value of CT in establishing prognosis. Radiology. 1990;174:331-36. Doi: 10.1148/radiology.174.2.2296641
[5] Ranson JH, Pasternack BS. Statistical methods for quantifying the severity of clinical acute pancreatitis. J Surg Res. 1977;22(2):79-91.
[6] Mofidi R, Patil PV, Suttie SA, Parks RW. Risk assessment in acute pancreatitis. Br J Surg. 2009;96(2):137-50.
[7] Yeung YP, Lam BY, Yip AW. APACHE system is better than Ranson system in the prediction of severity of acute pancreatitis. Hepatobiliary Pancreat Dis Int. 2006;5:294-99. PMID: 16698595
[8] Larvin M, McMahon MJ. APACHE-II score for assessment and monitoring of acute pancreatitis. Lancet. 1989;2(8656):201-05.
[9] Ju S, Chen F, Liu S, Zheng K, Teng G. Value of CT and clinical criteria in assessment of patients with acute pancreatitis. Eur J Radiol. 2006;57(1):102-07.
[10] Kaya E, Dervisoglu A, Polat C. Evaluation of diagnostic findings and scoring systems in outcome prediction in acute pancreatitis. World J Gastroenterol. 2007;13(22):3090-94.
[11] Wu BU, Johannes RS, Sun X, Tabak Y, Conwell DL, Banks PA. The early prediction of mortality in acute pancreatitis: A large population based study. Gut. 2008;57(12):1698-703.

[12] Banks PA, Freeman ML; Practice Parameters Committee of the American College of Gastroenterology. Practice guidelines in acute pancreatitis. Am J Gastroenterol. 2006;101(10):2379-400.
[13] Banks PA, Bollen TL, Dervenis C, Gooszen HG, Johnson CD, Sarr MG, et al. Classification of acute pancreatitis-2012: Revision of the Atlanta classification and definitions by international consensus. Gut. 2013;62(1):102-11.
[14] Pupelis G, Zeiza K, Plaudis H, Suhova A. Conservative approach in the management of severe acute pancreatitis: Eight-year experience in a single institution. HPB (Oxford). 2008;10(5):347-55.
[15] Buchler MW, Gloor B, Muller CA. Acute necrotising pancreatitis: Treatment strategy according to the status of infection. Ann Surg. 2000;232(5):619-26.
[16] Chen L, Lu G, Zhou Q, Zhan Q. Evaluation of the BISAP score in predicting severity and prognoses of acute pancreatitis in Chinese patients. International Surgery. 2013;98(1):06-12.
[17] Khanna AK, Meher S, Prakash S, Tiwary SK, Singh U, Srivastava A, et al. Comparison of Ranson, Glasgow, MOSS, SIRS, BISAP, APACHE-II, CTSI Scores, IL-6, CRP, and procalcitonin in predicting severity, organ failure, pancreatic necrosis, and mortality in acute pancreatitis. HPB Surg. 2013;2013:367581. Doi: 10.1155/2013/367581
[18] Maheshwari N, Kumar A, Iqbal ZA, Mandal AK, Vyas A, Wig JD. Organ failure in acute pancreatitis and its impact on outcome in critical care. Southwest J Pulm Crit Care. 2015;10(5):253-64.

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