Original Research Article

Evaluation of BISAP Score in Predicting Outcome of Acute pancreatitis in a tertiary centre

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Abstract

Introduction: Acute pancreatitis is an acute inflammation of the prior normal pancreas. Its pathogenesis involves activation of intrapancreatic digestive enzymes and injury of acinar cells. Many scoring systems are available to assess the severity of acute pancreatitis, e.g., Ranson's criteria, Glasgow score index, APACHE II and CTSI, but they have important limitations. BISAP score appears cheap, quick, simple and hence we conducted this study**Material and methods**: This prospective observational study was carried out in 83 patients, in SGT Medical college, Gurugram, from September 2018 to March 2021.**Results**: In our patients with BISAP score of 0,1 and 2, there was no organ failure or mortality. At score of 3, there was 1 (07.1%) organ failure and 1 (07.1%) mortality. At score of 4, 4 (80.0%) patients had organ failure and 1(20.0%) patient died. We observed that higher the BISAP score, higher the percentage of severity, necrosis, organ failure, mortality and hospital stay. Our study revealed that with the cutoff value set at3, BISAP score is having 39.6 % sensitivity, 92.8 % specificity, 60.3% PPV and 84.7% NPV.

Conclusion: Our study recommends that at the time of admission, if BISAP score is low, our worry is less, if BISAP score is high, we should counsel the patient and attendants about possible severity, necrosis, organ failure and mortality in acute pancreatitis. Patients should be meticulously managed. Present study concludes the increased accuracy of BISAP score for risk stratification.

Keywords: Acute pancreatitis, BISAP score, organ failure, mortality.

Introduction

Acute pancreatitis is an acute inflammation of the prior normal pancreas. Gall stones are its leading cause (30-60%), followed by alcohol (15-30%), other etiological factors are hyperlipidemia, hereditary, hypercalcemia and post ERCP etc. [1].

Its pathogenesis involves three phases. First phase is characterized by activation of intrapancreatic digestive enzymes and injury of acinar cells. In second phase there is activation, chemoattraction and sequestration of leucocytes and macrophages in the pancreas causing increased intrapancreatic inflammatory reaction. Third phase is due to the effects of activated proteolytic enzymes and cytokines released by the inflamed pancreas, on various organs [2]. As a result of the cascade of local and distant effects, the systemic inflammatory response syndrome (SIRS), acute respiratory distress syndrome (ARDS), as well as multiorgan failure may occur.

Patients present with mild to severe steady and boring pain in epigastrium and periumbilical region. Pain may radiate to flanks, back, chest and lower abdomen. Nausea, vomiting, and abdominal distension frequently accompany [3]. Physical examination reveals an anxious patient with low grade fever, tachycardia, with or without hypotension. Jaundice is infrequent. Abdominal examination may reveal tender, guarded abdomen. Cullen's sign and Turner's sign may be present in severe cases. Pancreatitis is broadly classified into mild and severe varieties. Mild pancreatitis is usually self-limiting. Severe acute pancreatitis has high mortality (about 20%-30% as compared to overall mortality of 2-5% in acute pancreatitis) [4]. Since there is high mortality in severe acute pancreatitis hence, we should determine the severity in the emergency ward itself so that patient triage can be done. Patients with mild disease can be treated in general ward and those with severe diseases can be managed by more aggressive treatment in specialized center with good intensive care facilities, anesthesia, endoscopic lab and surgical facilities. Therefor arose the necessity of prognostic factors that allow the clinician to accurately predict the severity of disease.Now a days many scoring systems are available to assess the severity of acute pancreatitis, e.g., Ranson's criteria [5], acute physiology and chronic health evaluation (APACHE II) [6,7] and computed tomography severity index (CTSI) [8]. These scoring methods of risk stratification in acute pancreatitis have important limitations especially in developing countries like ours. Our most hospital cannot afford the requirements of Ranson's and Modified Glasgow Score index. In addition, both these scoring systems take 48 hours for complete evaluation. APACHE II, determines the disease severity on the day of admission but it is very complex [9,10]. CTSI is based on the use of CECT abdomen. CECT is not available in all hospitals in our country. Moreover, it is not used as a basis of clinical decision making. Thus, there is a need to find a scoring system which can prognosticate the disease at the earliest, which is cheap, quick, simple, accurate and easily reproducible and can be used comfortably

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in our country.In 2008, Wu et al [11] developed a clinical scoring system using classification and regression tree analysis for prediction of in hospital mortality of acute pancreatitis. This is Bedside Index for Severity in Acute Pancreatitis (BISAP) score. On this score, several studies have been done in Western countries. In India only few studies have been done. We conducted this prospective observational study, to evaluate BISAP score in predicting outcome of acute pancreatitis, in our part of country.

Material and methods

Study design: Prospective observational study

Study site: SGT Medical college, SGT University, Budhera, Gurugram, Haryana, India.

Study period: September 2018 to March 2021.

Study population: 83 consecutive patients who were admitted with diagnosis of acute pancreatitis in various surgery wards of SGT Medical College were considered for study.

Inclusion criteria- Patients with established diagnosis of acute pancreatitis as per revised Atlanta classification and definition by international census 2012, were included in the study.

Exclusion criteria- Patients of chronic pancreatitis were excluded from surgery

Operational definitions

Acute pancreatitis- as per revised Atlanta classification and definition by international census 2012, is defined as patients having two of the following three features a) characteristic abdomen pain, b) elevation of pancreatic enzymes more than three times the normal values, c) characteristic findings in CECT i.e., oedema of pancreas, altered fat and fascial planes, fluid collections, necrosis (non-enhancement area more than 30% or 3cm) [12].

Severity grading: includes the following. Mild acute pancreatitis (MAP)- is defined as when there is no organ failure, no local or systemic complications. Severe acute pancreatitis (SAP)- is defined as when there are local or systemic complications with or without persistent organ failure. Transient organ failure- is the organ failure that resolves in 48 hours. Persistent organ failure- when organ failure persists for more than 48 hours. It may be single or multiple organ failure. Organ failure- three organ systems should be assessed to define organ failure. a) Pulmonary insufficiency- when arterial PO_2 is less than 60 mm Hg in room air or there is a need for ventilator, b) renal failure- serum creatininelevel more than 2 mg % after rehydration or hemodialysis, c) shock- systolic blood pressure less than 90 mm Hg. As per Modified Marshall scoring system, a score of 2 or more for one of these three organ systems, suggests organ failure.

BISAP score- incorporates five clinical and lab parameters obtained within the first 24 hours of admission. a) Blood urea nitrogen (BUN) >25 mg%, b) impaired mental status, c) Glasgow coma score < 15, d) age >60 years, e) systemic inflammatory response syndrome (SIRS) – when two or more of the followings are present i.e., i core body temperature <36℃ or >38℃, ii heart rate >90/minute, iii respiratory rate >20/minute, iv WBC count <4000 cells/mm^3 or > 12000 cells/mm^3. Each score is given 1 point. A score of zero was awarded in case of absence of any of these factors. Total BISAP score was calculated within 24 hours. Various possible outcomes of the study were severity, necrosis, organ failure and death.

Procedure & Data collection

Patients presenting with features of acute pancreatitis were admitted, detail history was taken and thorough local and systemic examinations were made. Patients were investigated for complete blood count, blood glucose level, kidney function tests, liver function tests, serum calcium, serum amylase, C-reactive protein, plain radiograph of abdomen and chest, and ultrasound scan of abdomen. If ultrasound findings were doubtful or diagnosis could not be established, contrast enhanced computed tomography (CECT) abdomen was done. We did not do CECT in all the patients to minimize the expenditures. BISAP scores were calculated from laboratory values and radiological findings. If BISAP score was low, patients were managed in general ward, if score was higher, patient were admitted in intensive care units and managed.

Analysis Plan

The data were collected properly and entries were made. Numeric data are presented as mean ± SD. Simple mathematical expressions like percentage was also used. Statistical analyses were performed using statistical package for social science (SPSS) software, latest version. Sensitivity, specificity, positive predictive value (PPV) and negative predictive values (NPV) were calculated.

Quality Assurance: was ensured at each and every step. Patients were enrolled in unbiased fashion.

Ethical considerations: The institutional ethics committee's approval for research on human subject was taken. Throughout the study strict ethical norms were maintained. Written informed consent was taken from patients in their local language (mother tongue).

Results

The study was carried out on 83 patients. In 79 patients, diagnosis could be established as per the definition of acute pancreatitis. In 4 patients help of CECT was taken to establish the diagnosis. 18 patients were 60 years or more than 60 years old and 65 patients were less than 60 years of age. Median age of patients was 55.8 ± 20.7 years in severe acute pancreatitis and 52.8 ± 16.3 in mild acute pancreatitis.

Table 1: Age distribution

Age in years	Numbers of patients	MAP*	SAP**	Significance(p value)
Less than 20	1 (1.2%)	1 (100%)	0	0.0783
20-29	9 (10.8%)	8 (88.9%)	1 (11.1%)	
30-39	20 (24.1%)	17 (85%)	3 (15.0%)	
40-49	23 (27.7%)	20 (87.0%)	3 (13.0%)	
50-59	12 (14.4%)	10 (83.3%)	2 (16.7%)	
60 or more	18 (21.7%)	10 (55.6%)	8 (44.4%)	

*MAP: Mild Acute Pancreatitis **SAP: Severe Acute Pancreatitis

46 (55.4%) patients were men and 37 (44.6%) patients were women. 66 (79.5%) patients had mild acute pancreatitis and 17(20.5%) patient had severe acute pancreatitis. There were no statistically significant differences in age, sex and etiology distributions with p value of >0.05 for all.

Table 2: Characteristics of patients (n=83)

Characteristics		SAP	MAP	P
Sex(number)	Male	9 (52.9%)	37 (66.0%)	0.287
	Female	8 (47.1%)	29 (34.0%)	
Etiology (number)	Gall Stone	10 (58.8%)	43 (65.2%)	0.009
	Alcohol	4 (23.5%)	13 (19.7%)	
	Post ERCP	1 (6.0%)	4 (6.0%)	
	Idiopathic	2 (11.7%)	6 (9.1%)	

Table 3: Distributions of cases according to BISAP point scores.

BISAP score		Numbers of cases
BUN*	≥ 25 mg%	14 (16.8%)
	< 25 mg%	69 (83.2%)
Impaired mental status	Present	1 (01.2%)
	Absent	82 (98.8%)
SIRS**	Present	34 (40.9%)
	Absent	49 (59.1%)
Age	≥ 60 years	18 (21.7%)
	< 60 years	65 (78.3%)
Pleural effusion	Present	24 (28.9%)
	Absent	59 (71.1%)

*BUN: blood urea nitrogen, **SIRS: systemic inflammatory response syndrome,

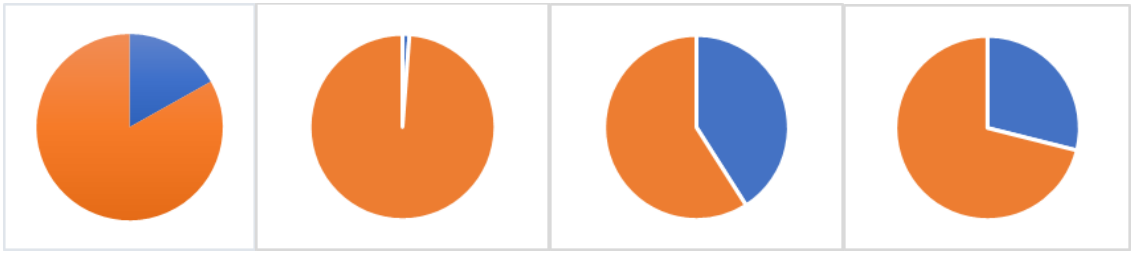

Figure 1: Distribution of cases according to BISAP point scores

A: BUN: 14(16.8%), 69(83.2%); B: Impaired mental status: 1(01.2%), 82(98.8%);
C: SIRS 34(40.9%), 49(59.1%); D: Pleural effusion: 24(28.9%), 59(71.1%).

We have observed that the percentage of severity, necrosis, organ failure, mortality and hospital stay were more in severe acute pancreatitis as compared to mild acute pancreatitis (Table 4). Present study reveals that as the BISAP score increases, the severity, necrosis, organ failure and mortality also increase.

Table 4: Clinical Characteristics and outcomes of patients (n=83)

Characteristics		Data
Severity	SAP	17 (20.5%)
	MAP	66 (79.5%)
Necrosis	Present	22(26.5%)
	Absent	61(73.5%)
Organ failure	Present	05(06.0%)
	Absent	78(94.0%)
Hospital stay (days)	SAP	11.02±5.64
	MAP	6.78±3.29
Mortality		2 out of 17 patients of SAP (11.8%)

In our patients with BISAP score of 0,1 and 2, there was no organ failure or mortality. At score of 3, there was 1 (07.1%) organ failure and 1 (07.1%) mortality. At score of 4, 4 (80.0%) patients had organ failure and 1(20.0%) patient died. We had no patient with BISAP score of 5 (Table 5).

Table 5: BISAP point scores and distribution of severity, necrosis, organ failure and mortality

BISAP Score	Severity (Number, %)	Necrosis(Number, %)	Organ failure(Number, %)	Mortality (Number, %)	Total (Number, %)
0	0	3(9.1)	0	0	33(39.7)
1	1(04.7)	4(19.0)	0	0	21(25.3)
2	3(30.0)	4(40.0)	0	0	10(12.0)
3	8(57.1)	7(50.0)	1(07.1)	1(07.1)	14(16.8)
4	5(100)	4(80.0)	4(80.0)	1(20.0)	5(06)
5	0	0	0	0	0(00)
Total	17	22	5	2	83 (100)

Our statistical analysis revealed that with the cutoff value set at 3, BISAP score is having 39.6 % sensitivity, 92.8 % specificity, 60.3% PPV and 84.7% NPV (Table 6).

Table 6: Sensitivity, specificity, PPV and NPV of BISAP scoring system in predicting SAP

Sensitivity	39.6 %
Specificity	92.8 %
PPV	60.3%
NPV	84.7%

Discussion

In our study we evaluated BISAP score in predicting outcome of acute pancreatitis. There are many existing prognostic scoring systems. But these have many problems especially for hospitals in our country which cannot afford to fulfill all the criteria included in these scores. Ranson's and Glasgow's score need 48 hours for calculation, and these scores require data which is not easily available in small centers [13,14,15,16]. APACHE II requires many parameters but some of these parameters are not useful. It was basically designed as an intensive care unit instrument [11] The chronic health profile portion of this score requires knowledge of patient history and medication detail which may not be available if the patient is unconscious, intubated or transferred from outside hospital with few medical records. It is also difficult to remember this score [17,18]. These require data collected at the time of admission and then at 48 hours. CTSI also has limitations as told in introduction part. So, there is need to find a scoring system which can prognosticate the diseases at the earliest which is easily reproducible, cheap and can be used at every step of health care especially in country like ours. BISAP scoring system is probably comfortable in all these respects. Both the BISAP and APACHE II scores incorporate systemic inflammatory response syndrome, age and Glasgow coma score [19] BISAP score has many advantages. Here, data can be easily obtained at the time of admission. It also warns us of increased risk to patients with high BISAP scores [4, 20]. Acute pancreatitis affects all ages and most of the cases are in age group 21 to 50 years, which is the age where a person earns the bread and butter in the family. Thus, the disease affects a person in other ways also besides illness itself. Many patients were more than 40 years of age. This is explained by the fact that the biliary tract diseases are an important cause of pancreatitis and has higher prevalence in this part of country. We had 17 patients of severe acute pancreatitis. Many of these were more than 60 years old. Thus, age is an important parameter. Raised BUN is independent predictor of severe pancreatitis. There may be several mechanisms for this. Initial BUN values may reflect the volume depletion and pre-renal azotemia. A persistent elevation may reflect failure to adequate volume replacement. We had raised BUN in 14 (82.3%) out of 17 (100%) patients of severe pancreatitis. There was 1(01.2%) patient of impaired mental status. This may be due to our small sample size and further that mental impairment in acute pancreatitis is uncommon. SIRS is an important factor in determining outcome of the case. In our study all the patient with severe acute pancreatitis had positive SIRS. In addition, some patients from mild disease also had positive SIRS. We had 17 patients of severe acute pancreatitis. Presence of pleural effusion should make us more vigilant and aggressive in managing patients (Table 3). In our study most of the patient suffering from severe acute pancreatitis had pleural effusion. We have found in our study that patients with BISAP score ≥3 carries higher risk of severity, necrosis, organ failure and mortality, than BISAP score of <3 (Table 4). We had 1 organ failure and 1 mortality in patients with BISAP score 3. In patients with BISAP score 4, we had 4 organ failure (1 patient had shock, 1 had pulmonary insufficiency and 3 patients had renal failure (Table 5). Our study reveals that at cutoff value set at 3, BISAP score is having 39.6 % sensitivity, 92.8 % specificity, 60.3% PPV and 84.7% NPV (Table 6). A study by Papachristou et al [21] reported that with same cutoff value, BISAP score had sensitivity of 37.5%, a specificity of 92.4%, a PPV of 57.7% and an NPV of 84.3% in predicting severe acute pancreatitis. Thus, our results are comparable with this study.

Our study recommends that at the time of admission, if BISAP score is low, our worry is less, if BISAP score is high, we should counsel the patient and attendants about possible severity, necrosis, organ failure and mortality in acute pancreatitis. We should be meticulous in managing such patients. We conclude that BISAP score is a reliable means of predicting the severity, necrosis, organ failure and mortality in patients with acute pancreatitis. There is an increasing trend in these outcomes with increasing BISAP scores. Present study concludes the increased accuracy of BISAP score for risk stratification in our patients.

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References

1. Kasper Dennis L, Hauser Stephen L, Jameson J Larry, Fauci Anthony S, Longo Dan L, Loscalzo Joseph. Harrison's Principles of Internal Medicine. 19th Ed. New York: McGraw Hill Education, 2015.
2. Cochior D, Constantinoisu S. Factors involved in the pathogenesis of acute pancreatitis. Chirurgia (Bucur). 2010;105(4):445-53.
3. Gao YJ, Li YQ, Wang Q, Li SL, Li GQ, Ma J, Zeng XZ, Huang LY, Yuan SA, Liu CA, Wang FX. Analysis of clinical features of acute pancreatitis in Shandong Province, China. JGastroenterolHepatol. 2007;22(3):340-44.
4. VikeshK. Singh et al. A prospective evaluation of the bedside index for severity in acute pancreatitis score in assessing mortality and intermediate markers of severity in acute pancreatitis. Am. J. Gastroenterol. 2009; 104(4):966-971.
5. Ranson JH, Rifkind KM, Roses DF, Fink SD, Eng K, Spencer FC. Prognostic signs and the role of operative management in acute pancreatitis. SurgGynecol Obstet. 1974;139(1):69-81.
6. McMahon MJ et al. APACHE-II score for assessment and monitoring of acute pancreatitis. Lancet. 1989;2(8656):201-5.
7. Johnson CD, Toh SK, Campbell MJ. Combination of APACHE-II score and an obesity score (APACHE-O) for the prediction of severe acute pancreatitis. Pancreatology. 2004;4(1):1-6.
8. R. Pezzilli, et al. Practical guidelines for acute pancreatitis. Pancreatology. 2010; 10(5):523-535.
9. Yeung YP, Lam BY, Yip AW. APACHE system is better than Ranson system in the prediction of severity of acute pancreatitis. HepatobiliaryPancreat Dis Int. 2006;5(2):294-299.
10. Larvin M, McMahon MJ. APACHE II score for assessment and monitoring of acute pancreatitis. Lancet. 1989;2(8656):201-205.

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):1698-1703.
12. SriramBhat. SRB's Manual of Surgery. 5th edition. New Delhi: Jaypee Brothers Medical Publishers, 2016.
13. Park, Ji Young, et al. Bedside index for severity in acute pancreatitis: comparison with other scoring systems in predicting severity and organ failure. Hepatobiliarypancreat. Dis, Int. 2013; 12(6):645-650.
14. Peter A. Banks, Martin L, Freeman. Practice guidelines in acute pancreatitis. Am. J, Gastroenterol. 2006; 101(10):2379.
15. J.H.C. Ranson, prognostic signs and the role of operative management in acute pancreatitis. Surg. Gynecol. Obstet. 1974; 139:69-81.
16. John HC, Ranson, Berard S, Pasternack. Statistical methods for quantifying the severity of clinical acute pancreatitis. J. Surg. Res. 1977; 22(2):79-91.
17. Young-Seok Cho et al. Usefulness of the Bedside index for severity in acute pancreatitis in the early prediction of severity and mortality in acute pancreatitis. Pancreas. 2013; 42(3):483-487.
18. William A, Knauset at. Apache II: A severity of disease classification system. Crit Care Med. 13(10):818-829.
19. Singh VK, Wu BU, Bollen TL, Repas K, Maurer R, Johannes RS, Mortele KJ, Conwell DL, Banks PA. A prosoective evaluation of the bedside index for severity in acute pancreatitis score in assessing mortality and intermediate markers of severity in acute pancreatitis. AM J Gastrroenterol. 2009; 104(4): 966-71.
20. Bechien U. Wu, et al. The Early prediction of mortality in acute pancreatitis: A large population-based study. Gut2008:1698-1703.
21. Papachristou GI, Muddana V, Yadav D, O'Connell M, Sanders MK, Slivka A et al. Comparison of BISAP, Ranson's, APACHE II and CTSI scores in predicting organ failure, complications, and mortality in acute pancreatitis. Am J Gastroenterol 2010; 105(2):435-441.

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