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# Comparative Study between BISAP score and RANSON'S score in Predicting Severity of Acute Pancreatitis

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#### Abstract

**Introduction:** Acute pancreatitis is an acute inflammation of the pancreas which poses a major challenge to treating surgeon in its management. Various scoring systems has been developed for predicting severity of acute pancreatitis however none of them are accurate. The aim of this study was to assess the accuracy of BISAP scoring system vs Ranson's scoring system in prediciting severity in an attack of acute pancreatitis and to compare predictability of organ failure, necrosis and mortality between BISAP scoring and Ranson's scoring system.

**Methods:** This is a prospective comparative study conducted for a period of 22 months. . BISAP score and Ranson's score were calculated in all diagnosed cases of acute pancreatitis. Data were obtained within 24 hours and 48 hours of hospitalization. Sensitivity, Sensitivity, PPV, NPV of both scoring system was calculated and compared.

**Results:** A total of 81 patients with diagnosis of acute pancreatitis were included during the study period. 45(55.6%) were male and 36(44.4%) were female. Median age is 46 yr. Most common etiology was biliary 67(82.7%) followed by alcohol 10 (12.35\%).15 (18.52\%) patients were categorized as severe pancreatitis according to Atlanta classification. 19 (23.5%) patients had a Ranson's score of >3 and 21 (25.9%) patients had a BISAP score of  $\geq$ 3. Both Ranson's and BISAP scoring system was statistically significant in determining SAP (p-value <0.001). Sensitivity, specificity, positive predictive value and negative predictive value of Ranson's and BISAP score was calculated to be 73.3%, 87.9%, 57.9%, 93.5% and 80%, 86.4%, 57.1%, 95% respectively.

**Conclusion:** Both Ranson's and BISAP scoring system is similar in predicting SAP. However, BISAP has the advantage due to its simplicity.

Keywords: Acute Pancreatitis, Bisap, Ranson's score, Atlanta classification.

#### Introduction

Acute pancreatitis is defined as a pancreatic inflammatory process, with peripancreatic and multi-organ involvement causing multi-organ dysfunction syndrome (MODS), with increased mortality rate.<sup>1</sup>Severe acute pancreatitis accounts for about 20 % of the cases, and it can be associated with pancreatic necrosis, distant organ failure, or development of local complications like haemorrhage, pancreatic necrosis, pseudocyst etc. Mortality in severe acute pancreatitis is 15-30 % and is only 0-1 % in case of mild acute pancreatitis.<sup>2</sup>

Severe pancreatitis is typically associated with multi organ failure originating from local and systemic complications and requires intensive, often specialized, inter-disciplinary management including complex interventions. On the other hand, most patients with acute pancreatitis have a mild, uneventful and uncomplicated course, characterized by absence of organ failure or deaths. In these patients, unnecessary (over) treatment should be avoided in the interest of the patient and the health resources. Since the morbidity and mortality of Acute Pancreatitis differ markedly between mild and severe disease (mild < 5% versus severe 20– 25%), it is very important to assess severity as early as possible.

RANSON's criteria predicts the severity of the disease, which is based on 11 parameters that are obtained at the time of admission and after 48 hours. Ransons's score has a low positive predictive value (50%) and a high negative predictive value (90%). Hence its main use is to

rule out acute pancreatitis and also predicts a severe attack.<sup>3</sup> The major disadvantage of

Ranson's and as well as older Glasgow criteria being, many of the parameters which are components of this scoring, are not collected at admission, on a routine basis. Also, it does not predict the severity of the disease at admission, as six of the parameters are assessed only after 48 hours. Hence an early therapeutic window is missed.

Hence, an accurate, and relatively simple bedside scoring system BISAP was developed. This scoring system identifies patients with high morbidity as well as risk of mortality, before organ failure sets in within 24 hours of hospitalization, which helps in identifying patients who are risk of developing a severe disease very early, and helps in managing the same effectively, thus decreasing the mortality and morbidity.BISAP has the advantage over Ranson's score of being calculated within 24 hrs of admission.

Acute Pancreatitis is a common emergency presentation, being responsible for 3% of all hospital admissions with acute abdominal pain.<sup>4</sup> Although it often has a mild and selflimiting course, it may be severe, resulting in local and systemic complications carrying a significant risk of death.<sup>5</sup>Acute pancreatitis (AP) caused approximately 275,000 hospitalizations in 2009(an increase of more than 2fold since 1988 ) and is the single most frequent gastrointestinal cause of hospital admissions in the US.<sup>6</sup> The annual incidence of AP ranges from 13 to 45/100,000 persons.<sup>7</sup> There are also regional differences in demographic distributions: Alcohol-related pancreatitis is more common in the West and Japan, compared with other Asian countries. The increasing incidence of obesity is likely to contribute to that of AP, because obesity promotes gallstone formationthe most common cause of AP. Currently, Acute Pancreatitis represents as 14th most common gastrointestinal cause of death, with an overall mortality of 5%, which can be as high as 47% in those with multi-organ failure.<sup>8</sup>

About 70%-80% of AP takes a mild course and is associated only with minimal organ dysfunctions. The initial 2-4 d after onset of symptoms are most important, when about 15%-25% of patients with AP take the course of a severe disease local and extra-pancreatic complications. Based on clinical and experimental data, this period is characterized by an initial hypovolemic state.<sup>2</sup>

In SAP, hypotension or even shock occurs as a consequence of sequestration of protein-rich fluids into the pancreas, the retroperitoneal spaces and the abdominal cavity. The initial systemic inflammatory response syndrome causes a hyperinflammatory reaction exerting systemic organ dysfunctions of the lungs, kidneys, cardiocirculatory system and splanchnic intestinal compartments.<sup>10</sup> Thus, close examination to assess early fluid losses, hypovolemic shock and symptoms suggestive of organ dysfunction is crucial.

# Methods and Methodology

**Inclusion criteria:** All cases admitted with clinical diagnosis of first episodes of acute pancreatitis.

**Exclusion criteria:**Patients with carcinoma of pancreas, chronic pancreatitis, pregnancy

Patients with chronic liver disease, chronic kidney disease. Those patients who did not give consent

Patient with presence of a severe debilitating illness such as neoplasm, acquired immunodeficiency syndrome, or collagen vascular disease or illnesses that could compound the interpretation of the investigations such as known anemia, presence of pleural effusion on chest radiograph preceding the development of AP, a comorbid medical condition that could lead to effusion (such as congestive heart failure)

# **Material and Methods**

This is a prospective comparative study that was conducted from September 2016 to July 2018 after obtaining approval from institutional review committee (IRC). A total of 81 cases were included in this study. BISAP score and RANSON's score is calculated in all such patients based on data obtained within 48 hours of hospitalization.

The diagnosis of AP is based on the presence of two of the following three features:

- 1. Abdominal pain characteristic of AP,
- 2. serum amylase and / or lipase  $\geq$  3 times the upper limit of normal, and
- 3. Characteristic findings of AP on USG of abdomen or abdominal CT scan.

Extensive demographic, radiographic, and laboratory data from consecutive patients with AP admitted to our institution was collected.

Gender, age, weight and height on hospital admission was recorded. AP etiology, previous history of any surgery (like ERCP), trauma was recorded.

Diagnosis of biliary AP is sustained by ultrasonographic findings of gallstones or bile duct dilatation and/or serum liver chemistry compatible with obstructive jaundice, without other obvious cause of the attack. Alcohol is considered as the cause of AP when a history of heavy ethanol intake before the episode was documented. When no obvious cause was found then it was considered as idiopathic.

Clinical evidence of acute pancreatitis was assessed. Blood Urea Nitrogen (BUN), impaired mental status (Glasgow Coma Score), Systemic Inflammatory Response Syndrome (SIRS), age, pleural effusion was used to calculate BISAP score for each individual participant.

The components of Ranson's score were recorded at the time of admission and within 48 hours of admission.

All laboratory investigations and radiological investigations like CECT abdomen/pelvis was performed in Universal College of Medical Sciences Teaching Hospital

Patients are classified as mild AP or severe AP, based on the Atlanta classification 1992 and the presence of organ failure for more than 48 h. Modified Marshall scoring system for organ dysfunction was used to assess presence of organ failure. PNec is assessed by CECT. Evidence of PNec on CT is defined as lack of enhancement of pancreatic parenchyma with contrast. All CT scans was reviewed by radiologists dedicated to abdominal imaging, who was blinded to laboratory data and clinical course.

Eventually, the outcome of the disease and the prediction of the severity of the disease by BISAP score was compared to Ranson's score and the sensitivity, specificity and positive and negative predictive value of these two-scoring system was calculated and compared.

# Statistical analysis

Categorical values were evaluated using Chi square test or Fisher's exact test.

Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) was calculated for individual scoring systems.

# **Ethical clearance**

Ethical clearance was taken from the Ethical committee of Universal College Of Medical Sciences, Bharahawa, Nepal

- All the patients participitated voluntarily. Patients was treated with utmost respect & dignity of the patient was maintained.
- Patient was informed about the study and consent was taken before any procedure.
- No investigation other than in the standard protocol was prescribed.
- No patient was forced to undergo a test/procedure

he/she does not consent for or cannot afford

- Patient was not biased towards any treatment.
- All the data about the patients was kept confidentially.

# Results

A total of 81 patients with first episodes of acute pancreatitis were included in the study. Among them 45(55.6%) were male and 36(44.4%) were female. Median age is 46 yr with the minimum being 15 years, maximum being 83 years (range 15- 83). 25-45 age groups are the most common affecting groups. The age distribution of the patient is shown in Fig.1.



Fig. 1: Age Distribution.

Fig. 2 shows the etiology of the patients with acute pancreatitis admitted to UCMSTH who participated in our study. The most common cause is due to Bililary 67 (82.7%), then alcohol 10 (12.35%). 1 patient who underwent had pancreatitis due to hypertriglyceridemia.1 patient develop

pancreatitis due to trauma. This patient had history of bicycle injury and had developed traumatic pancreatitis but had no other associated intra-abdominal organ injuries. In 2 patients, no obvious cause was identified.



Fig. 2: Etiology of AP.

Twenty (24%) patients underwent CECT early in their hospitalization. Six (7.4%) of them had evidence of PNec on CECT. 29 (35.8%) patients developed transient organ failure. Laparoscopic cholecystectomy was performed in 30 (37%) cases after stabilization and prior to discharge on the same hospital admission. 2 patients died during hospitalization (mortality 2.47%). (Table 1)

Both the patients who died had Ranson's and BISAP score > 3 and were categorized as severe according to Atlanta classification.

Table 1:Mortality patients observed.

Age/Sex	Aetiology	Ranson's	BISAP	Atlanta
77/M	Biliary	9;Severe	4;Severe	Severe
65/F	Biliary	10;Severe	4;Severe	Severe

According to Atlanta classification 15 (18.52%) patients were categorized as severe pancreatitis. Mean age of the patients diagnosed as severe pancreatitis according to Atlanta Classification is  $53.27 \pm 4.87$ . 19 (23.5%) patients had a Ranson's score of >3 and 21 (25.9%) patients had a BISAP score of  $\geq 3$ .

### **Ranson's Score**

The Ranson's variables were recorded as coordinate

variables. The variables were recorded as total score ranging from 0-11, and maximum score recorded was 10 as shown in Table 2.62 (76.54%) patients were mild and 19 (23.5%) were severe according to Ranson's criteria (Figure 3).



Fig.3: Ranson's grading of AP.

Table 2: Number of patients and their proportion of variables stratified by Ranson's point score.

<b>Ranson'S Grading</b>	Frequency
0	0
1	35
2	19
3	8
4	11
5	3
6	3
9	1
10	1
Total	81

Table 3: Ranson's score vs. Atlanta Classification cross tabulation.

	Atlanta			
		Mild	Severe	Total
	Mild	58 (87.9%)	4 (26.7%)	62 (76.5%)
Ranson's Score	Severe	8 (12.1%)	11 (73.3%)	19 (23.5%)
	Total	66	15	81

Pearson chi<sup>2</sup> (1) =25.506p-value = < 0.001

The observed incidence of severe disease stratified by the Ranson's score has (p < 0.001) which is statistically significant (Table 3). Ranson's score > 3 is present in 4 patients (66.67%) out of six who developed pancreatic necrosis (p-value= 0.009) which is statistically significant. Ranson's score >3 is present in 12 patients out of 14 patients who developed persistent organ failure. Ranson's score in predicting organ failure had p- value of <0.001 which is statistically significant.

### **BISAP Score**

Similarly, the BISAP variables were also recorded as coordinate variables. The variables were recorded as total score of 0-5 and maximum score recorded was 4 as shown in Table 4. 60(74.1%) patients were categorized as mild and 21 (25.9%) patients as severe pancreatitis according to BISAP Grading (Figure 4).



Fig. 4: BISAP Grading of AP.

Table 4: Number of patients and their proportion of variables stratified by the BISAP point score.

<b>Bisap Score</b>	Frequency
0	0
1	51
2	9
3	14
4	7
Total	81

	Atlanta			
		Mild	Severe	Total
	Mild	57	3	62
	Milia	(86.4%)	(20%)	(76.5%)
Bisap Score	Severe	9 (13.6%)	12 (80%)	19 (23.5%)
	Total	66	15	81

Table 5:BISAP score vs. Atlanta Classificationcross tabulation.

Pearson chi2 (1) =28.029p-value = < 0.001

Similarly, incidence of severe disease stratified by BISAP score has (p < 0.001) which is also statistically significant (Table 5). BISAP Score  $\ge 3$  is present in five (83.3%) out of six patients who developed pancreatic necrosis (p-value =0.001) which is statistically significant. BISAP score  $\ge 3$  is

present in 11 patients out of 14 patients who developed persistent organ failure. BISAP score in predicting organ failure had p- value of <0.001 which is statistically significant

Scoring System		Number of patients	SAP according to Atlanta	
	≤2	60	3	
BISAP	≥3	22	12	
	≤ <b>3</b>	62	4	
Ranson's	>3	19	11	

Fable 7: BISAP score v	s. Ranson's score	cross tabulation
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	Ranson's Score			
		Mild	Severe	Total
		54	6	62
	Mild	(87.1%)	(31.6%)	(76.5%)
BISAP Score	Severe	8 (12.9%)	13 (68.4%)	19 (23.5%)
	Total	62	19	81

Pearson chi<sup>2</sup> (1) = 23.341p-value = < 0.001

While comparing BISAP with Ranson's, p-value < 0.001 which is statistically significant (Table 7).

Sensitivity, specificity, positive predictive value and negative predictive value of Ranson's score was calculated

to be 73.3%, 87.9%, 57.9%, 93.5% respectively. Similarly, the sensitivity, specificity, positive predictive value and negative predictive value of BISAP score was calculated to 80%, 86.4%, 57.1%, 95%. (Table 5)

Table 8:Sensitivity, specificity, PPV and NPV of the scoring systems in predicting SAP.

	Sensitivity	Specificity	PPV	NPV
BISAP	80%	86.4%	57.1%	95%
Ranson's	73.3%	87.9%	57.9%	93.5%

### Discussion

Acute pancreatitis is a common disorder with wide spectrum of illness. Severe acute pancreatitis having high morbidity and mortality rate, multiple interventions have been tried to prevent this. Early hospitalization may be beneficial to identify those who require aggressive interventions to prevent the severe attack of pancreatitis.<sup>11</sup> Eighty percent of patients with AP show mild self-limiting courses of the disease with no need for special intensive therapy. 20% of patients develop a severe AP with a mortality of up to 30%.<sup>12</sup> The need for early aggressive treatment in these patients in intensive care units (ICUs) by a team of specialized physicians shows the importance of early separation between patients with mild disease and those with severe disease.

The oldest scoring system Ranson's Score, represents a major advance in evaluating the severity of AP and had been used for long time to assess the severity in AP, but has the disadvantage of requiring a full *48* hrsto be completed hence missing a potentially valuable early therapeutic window.

BISAP score is asimple prognostic tool which uses findings of physical examination, vital signs, routine laboratory data and imaging findings to derive a five-point score within 24 hrs of presentation andhelps classify patients with acute pancreatitis into mild and severe groups with advantage of early assessment. Each of the parameters can be easily obtained early in the course of general hospital admission with mental status assessment being the only subjective parameter. In this study, the two different scoring systems (BISAP and RANSON's) were compared and analyzed to assess the severity in patients with acute pancreatitis.

In this study, 45(55.6%) were male and 36 (44.4%) were female, median age was 46 years. In this study, most of the patients were in the 2<sup>nd</sup> to 4<sup>th</sup> decades of life. The mean age of non- survivors in this study was found to be 71 years as compared to survivors being 46 years.

The most common etiological factor in this study was gallstone (82.7%) followed by Alcoholic (12.35%). The mean length of hospital stay was  $7.49 \pm 3.012$  days. In this

study, 66 patients were diagnosed to have mild acute pancreatitis and 15 patients found to have severe acute pancreatitis. 12/15 and 11/15 patients were correctly predicted by BISAP and RANSON Score respectively. The severity was assessed by correlating the scores with three factors: organ failure, necrosis and mortality. Set cut off of BISAP score  $\geq$ 3 was used to assess disease severity, based on previous studies done in this regard. In this study, six patients (7.4%) had pancreatic necrosis out of which 2(33.33%) patients expired.

In this study, the Ranson's score performed well (sensitivity of 73.3%, specificity 87.9%, PPV 57.9%, and NPV 93.5%), as we used a definition of SAP based on Atlanta classification.

Bisap had a sensitivity of 80%, specificity of 86.4%, PPV 57.1% and NPV 95% which was similar to Ranson's score.

. BisaP has the advantage over Ranson's score of being calculated within 24 hr of admission. BISAP appears to be more heavily weighted toward the immune response to injury and older age (>60 vs. >55 years with higher likelihood of elderly being confused or disoriented), whereas Ranson's scoring system seems to perform with higher accuracy in the prediction of persistent organ dysfunction over 48 hr.<sup>13</sup> Thus, BISAP may be disadvantaged in that it cannot easily distinguish transient organ dysfunction from persistent organ dysfunction at 24 hr.

## Conclusion

BISAP score is equally effective in finding out the frequency of severity and predicting mortality in patients with acute pancreatitis as Ranson's score. Moreover, its components are easily available and it does not require 48 hours for completion of assessment as compared to Ranson's score. It is an accurate tool to classify patients into mild and severe disease; it is easy to perform and can be done on the bedside of patients with acute pancreatitis in every setup.

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