

Original Research Article

Efficacy of BISAP score versus Ranson's score to determine the severity index of acute pancreatitis

Shrikant B. Kuntoji, Shaik Karimulla*

Department of General Surgery, S. Nijalingappa Medical College and HSK Hospital, Bagalkot, Karnataka, India

Received: 17 March 2021

Revised: 24 April 2021

Accepted: 30 April 2021

***Correspondence:**

Dr. Shaik Karimulla,

E-mail: drkarimshaik@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Acute pancreatitis has widely variable clinical and systemic manifestations spanning the spectrum from a mild, self-limiting episode of epigastric pain to severe, life-threatening, multiorgan failure posing a significant therapeutic challenge for the health care providers. Bedside index of severity in acute pancreatitis (BISAP) is a scoring system that would precisely predict severity as early as within the first 24 hours of the course of acute pancreatitis. This study aims to compare BISAP and Ranson's score to establish the validity of a simple and accurate clinical scoring system for stratifying patients.

Methods: All 84 cases admitted at HSK Hospital and SNMC, Bagalkot and diagnosed as acute pancreatitis were included in this study, from January 2019 to June 2020. Clinical evaluation in the form of detailed history, per abdominal, systemic examination and laboratory investigations, both BISAP and Ranson's score were applied and compared, based upon data obtained at admission, within 24 hours and at 48 hours of hospitalization.

Results: Out of 84 cases with a male to female ratio of 16:1, majority belonged to age group 31-40 years (42%) and most common etiological factor being alcohol consumption (74%); 19% patients had severe acute pancreatitis and 68% patients had length of hospital stay less than a week. Major organ failure and pancreatic necrosis, severity of BISAP and Ranson's score were found to be significantly correlated, ($p < 0.001$); mortality was found to be 1.2%.

Conclusions: Compared to Ranson's score, BISAP score is equally effective in finding out the frequency of severity and predicting mortality in patients with acute pancreatitis. The values in BISAP score are instantaneous with no time delay.

Keywords: Acute pancreatitis, BISAP score, Ranson's score, BISAP versus Ranson's, Severity index of acute pancreatitis

INTRODUCTION

Acute pancreatitis (AP) is the most common gastrointestinal disease for which patients are acutely hospitalized and its incidence is rising. Almost 80% of patients with acute pancreatitis have a mild disease course where symptoms usually resolve within 1 week. Nearly 20% of patients develop severe acute pancreatitis with organ failure and/or necrotizing pancreatitis. Necrotizing pancreatitis is defined by pancreatic parenchymal necrosis and/or peri-pancreatic fat necrosis. Those patients are at

risk for a persistent systemic inflammatory response syndrome and/or multiple organ failure. Sterile pancreatic necrosis and sterile peri-pancreatic collections can usually be treated successfully with conservative measures. However, 30% of patients develop secondary infection of necrosis, most often 3 to 4 weeks after the onset of disease. When secondary infection of necrosis occurs, morbidity and mortality increase dramatically. Overall mortality in severe pancreatitis is high (15% to 30%) compared with mild pancreatitis (0% to 1%).¹

Accurate prediction of severity is important in order to improve survival. There are several assessment criteria in order to predict prognosis and severity of acute pancreatitis, which help in guiding patient triage and management. However, nothing proven to perform significantly better in clinical settings than good clinical judgment. Ideal predicting criteria should, therefore, be simple, non-invasive, accurate and quantitative and assessment tests are easily available. The Ranson's score, modified Glasgow score and acute physiology and chronic health evaluation (APACHE) II are amongst many scoring systems employed for assessment of the severity of acute pancreatitis and have been most widely used in clinical practice since 1980s. However, these methods have important limitations. The Ranson's score and modified Glasgow score contain data not routinely collected at the time of hospitalization and require 48 hours to complete. Ranson's score is accurate at extreme of scores (<3 predicts survival and >6 predicts death) but not at intermediate scores. Recently, a new scoring system has been developed and validated to address these issues. This system of bedside index for severity in acute pancreatitis (BISAP) helps to identify patients at increased risk of mortality prior to the onset of organ failure. BISAP score is accurate and reliable means of classifying patients with acute pancreatitis for clinical care and research. This system is simpler than the Ranson's score and APACHE II screening and predictive accuracy of BISAP score did not differ significantly from that of the APACHE II score. BISAP scoring system offers an uncomplicated and quick assessment of disease severity on admission and there was significant trend towards higher mortality with increasing BISAP score, thus it will furnish valuable information in this regard and will help improve the management of these patients. Therefore, was to investigate the prognostic significance of BISAP score in patients with acute pancreatitis and to compare the accuracy of Ranson's and BISAP scoring system in predicting the severity of disease.²

Aims and objectives of the study were to assess the accuracy of BISAP scoring system versus Ranson's scoring system in predicting severity index in acute pancreatitis; to compare predictability of organ failure and pancreatic necrosis between BISAP scoring and Ranson's scoring system; and to compare the predictability of mortality between BISAP scoring and Ranson's scoring system.

METHODS

Study place

The study was conducted at the Hanagal Shri Kumareshwar Hospital and Research Centre, S. Nijalingappa Medical College, Bagalkot, Karnataka.

Study design

The design of the study was a case series study.

Study period

The period of the study was 18 months (January 2019 to June 2020).

Sample size

The study consisted of 84 cases.

Parameter

The parameter of the study was prevalence of organ failure or deterioration of organ function in acute pancreatitis (P=50-60% at 5% level of significance, error-11% and by open epi software version 2.

The following formulae was used (sample size, n=84).

$$n = [DEFF \times Np(1 - p)] / [(d^2 / Z_{1-\alpha/2}^2 \times (N - 1) + p \times (1 - p)]$$

Inclusion criteria

All patients admitted to HSK Hospital inpatient department (IPD) and casualty with history and clinical findings suggestive of acute pancreatitis; age of patients above 18 years; patients whose ultrasonography (USG)/computed tomography (CT)/biochemical investigations suggest features of acute pancreatitis; and patients who were willing to participate in the study and follow up were included in the study.

Exclusion criteria

Patients with chronic pancreatitis or relapsing pancreatitis; age below 18 years; and patients with pancreatic malignancy were excluded from the study.

All patients who present at HSK outpatient department (OPD) and casualty and diagnosed as AP were admitted and included in this study.

All the patients were subjected to clinical evaluation in the form of detailed history, per abdominal, systemic examination and laboratory investigations.

Both BISAP and Ranson's score will be applied and compared to predict the severity of AP.

AP is defined as 2 or more of the following: characteristic abdominal pain; increased levels of serum amylase and/or lipase 3 times the normal value; and ultrasonography (USG) of the abdomen within first 7 days of hospitalization demonstrating changes consistent with acute pancreatitis.

BISAP score and Ranson's score is calculated in all such patients based on data obtained within 24 hours of hospitalisation and at 48 hours.

Components of the BISAP scoring system

Components of the BISAP scoring system include: blood urea nitrogen (BUN) >25 mg/dl; impaired mental status (GCS<15); systemic inflammatory response syndrome (SIRS); age >60 years; and a score of ≥ 3 indicates a severe pancreatitis with substantially increased risk for in-hospital mortality.

SIRS is defined as two or more of the following: temperature of <36 or >38 °C, respiratory rate >20 breaths/min or PaCO₂ <32 mm Hg (pleural effusion detected on imaging and one point is assigned for each variable within 24 hours of presentation), pulse >90 beats/min, and white blood cells (WBCs) <4,000 or >12,000 cells/mm³ or >10% immature bands.

Components of Ranson's scoring system

Ranson's criteria

At admission

At admission the criteria was: age >55 years, WBC count >16000 cells/mm³, blood glucose >11.11 mmol/l (>200 mg/dl), serum aspartate aminotransferase (AST) >250 IU/100 ml, serum lactate dehydrogenase (LDH) >350 IU/l

Within 48 hours

Within 48 hours the criteria was serum calcium <2.0 mmol/l (<8.0 mg/dl), hematocrit decreased by >10%, oxygen (hypoxemia with PaO₂ <60 mm Hg), BUN increased by 1.8 or more mmol/l (5 or more mg/dl) after intravenous (IV) fluid hydration, base deficit (negative base excess) >4 mEq/l, and sequestration of fluids >6 l.

Interpretation of scores

If the score was ≥ 3 , severe pancreatitis is likely, if the score was <3, severe pancreatitis is unlikely or score 0 to 2 indicates 2% mortality, score 3 to 4 indicates 15% mortality, score 5 to 6 indicates 40% mortality, and score 7 to 8 indicates 100% mortality.

Each patient will undergo above investigations, with those results BISAP score is calculated, in the same patient Ranson's score is also calculated and both the scores are compared in determining severity of AP.

A computed tomography (CT) or magnetic resonance imaging (MRI) or ultrasonography (USG) of the abdomen, obtained at any time in the first 48 hours to 7 days of hospitalization, is required to differentiate necrotizing 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 24 hours period.

Duration of organ failure was defined as transient (≤ 48 hours) or persistent (>48 hours) from the time of presentation.

Investigations

The following investigations were carried out: complete blood count (CBC), random blood sugar (RBS), aspartate aminotransferase (AST), lactate dehydrogenase (LDH), WBC count, BUN, arterial blood gas (ABG), chest x-ray (CXR), USG-abdomen, serum amylase, serum lipase, serum calcium, serum electrolytes and contrast enhanced computed tomography (CECT)-abdomen.

Statistical analysis

Categorical data was represented in the form of frequency and percentage. Association between variables were assessed with Chi square test.

Quantitative data was represented as mean and standard deviation (SD). Between groups comparison of variables has been done with unpaired t test.

Diagnostic accuracy was assessed with sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV). Receiver operating characteristic curve (ROC) curve was plotted to see the area covered.

A p value of <0.05 was considered statistically significant. Data was analyzed with IBM statistical package for the social sciences (SPSS) version 22 for windows.

RESULTS

In our study 42% of patients were belonging to 31-40 year age group,

Male: female ratio was 16:1, alcohol consumption is the most common etiological factor, 67% of patients had hospital stay <7 days.

Out of 73 mild cases as per BISAP score, 6 had complication in the course of disease and out of 11 severe cases 8 had complications which was highly significant with p<0.001.

Out of 68 mild cases as per Ranson score, 4 had complication in the course of disease and out of 16 severe cases 10 had complications which was highly significant with p<0.001.

In this study, 13% of patients had BISAP score ≥ 3 which indicates severe pancreatitis. 86.9% patients had mild disease and 13.1% patients had severe pancreatitis as per BISAP score.

In this study 16.8% of patients had Ranson score ≥ 3 which indicates severe pancreatitis, 81% patients had mild

disease and 19% patients had severe disease according to Ranson score.

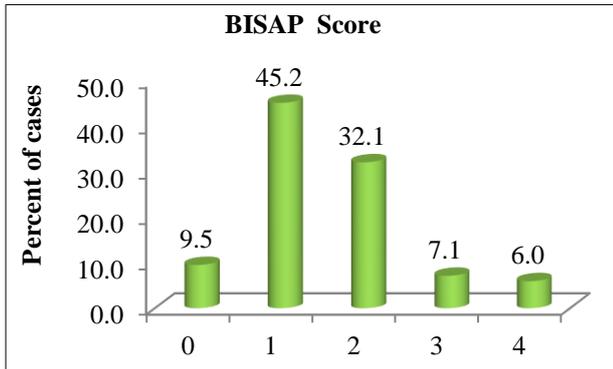


Figure 1: Distribution of patients as per BISAP score.

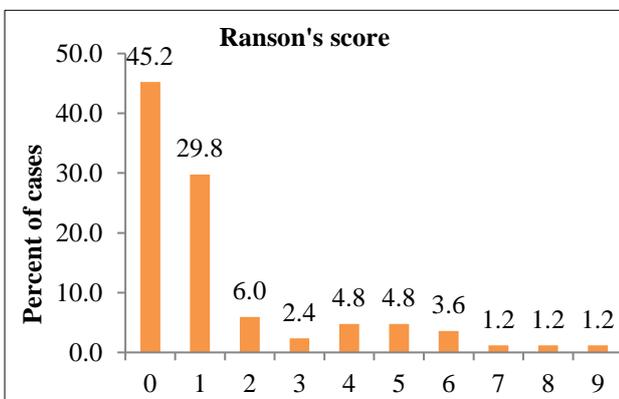


Figure 2: Distribution of cases as per Ranson severity.

In our study, 14 out of 84 cases had complications, in which most common complication was pseudocyst (7%).

Table 1: Distribution of cases as per nature of complications.

Nature of complications	No of cases	Percent
Modis	1	1.2
Pancreatic necrosis	3	3.6
Portal vein, splenic vein thrombosis	2	2.4
Pseudocyst	6	7.1
Splenic vein thrombosis	1	1.2
Won	1	1.2
Nil	70	83.3
Total	84	100.0

In this study, 73 mild cases, 25 patients had SIRS and out of 11 severe cases, 9 had SIRS during the course of disease which was highly significant with $p < 0.004$.

In relation to Ranson's score, 68 mild cases, 21 patients had SIRS and out of 16 severe cases, 14 had SIRS during the course of disease which was highly significant with $p < 0.001$.

Table 2: Analysis of BISAP score in predicting organ failure.

Major organ failure	Severity of BISAP		Total
	Severe	Mild	
Yes	11	6	17
No	0	67	67
Total	11	73	84

Chi square test $p < 0.001$, highly significant; specificity 100%, PPV 65%, NPV 100%, diagnostic accuracy 93%

Table 3: Analysis of Ranson score in predicting organ failure.

Major organ failure	Severity of Ranson's		Total
	Severe	Mild	
Yes	16	1	17
No	0	67	67
Total	16	68	84

Chi square test $p < 0.001$, highly significant; sensitivity 100%, specificity 100%, PPV 94%, NPV 100%, diagnostic accuracy 99%

Table 4: Analysis of BISAP score in predicting necrosis.

Pancreatic necrosis	Severity of BISAP		Total
	Severe	Mild	
Present	3	0	3
Absent	7	4	11
Total	10	4	14

Fisher's exact test, $p > 0.05$, not significant; sensitivity 38%, specificity 100%, PPV 100%, NPV 54%, diagnostic accuracy 64%

Table 5: Analysis of Ranson score in predicting necrosis.

Pancreatic necrosis	Severity of Ranson's		Total
	Severe	Mild	
Present	3	0	3
Absent	7	4	11
Total	10	4	14

Fisher's exact test, $p > 0.05$, not significant; sensitivity 30%, specificity 100%, PPV 100%, NPV 36%, diagnostic accuracy 50%

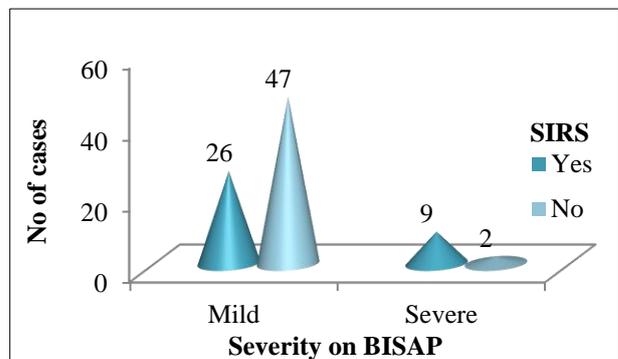


Figure 3: Analysis of BISAP score in predicting SIRS.

There were 16 cases severe on Ranson's severity assessments. Out of these 16 cases 11 cases were diagnosed to have severe on BISAP severity assessment, 5 cases were missed with BISAP as mild. There were 68 cases had mild severity on both. There is a strong agreement between Ranson's and BISAP severity assessment (Kappa $p < 0.001$). In conclusion we can say that BISAP's is equally good in detecting severity of the condition.

In our study mortality rate is 1.2%.

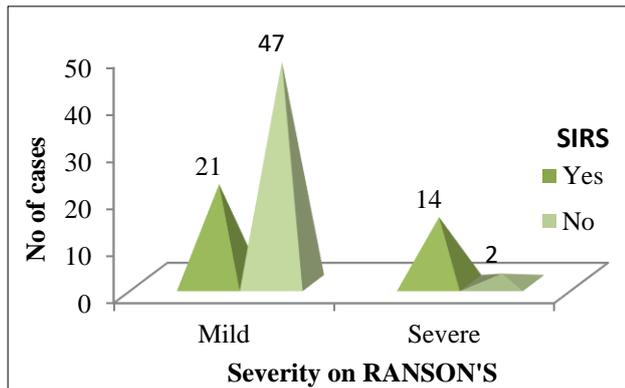


Figure 4: Analysis of Ranson's score in predicting SIRS.

Table 6: Correlation of BISAP and Ranson with severity.

Severity of BISAP	Severity of Ranson		Total
	Severe	Mild	
Severe	11	0	11
Mild	5	68	73
Total	16	68	84

Kappa agreement $p < 0.001$, highly significant; sensitivity 89%, specificity 100%, PPV 100%, NPV 7%, diagnostic accuracy 94%

DISCUSSION

According to Wu, identification of patients at risk for mortality early in the course of AP is an important step in improving outcome, from Brigham and Womens hospital and Harvard medical school in Boston, Massachusetts, and colleagues.⁴

Most patients of acute pancreatitis recover without complications, the overall mortality being is between 2-5%.⁵ Though, multiple risk stratification tools for acute pancreatitis do exist, yet their usefulness in clinical settings is limited. Older measures and modified Glasgow score, use the data that is not routinely collected at the time of hospitalization and potentially miss valuable early therapeutic window, as both require 48 hours.⁶

A simple and accurate clinical scoring system was developed, that is, BISAP. This scoring system allows identification of patients at increased risk of mortality prior

to the onset of organ failure and helps in stratification of patients according to their risk of hospital mortality.

Our study includes 84 patients with acute pancreatitis. Data for BISAP score collected within the first 24 hour of hospitalization while Ranson score was calculated within 48 hours. The ability to stratify patient's early disease course, is a major step in improving management strategies in AP.

In this study, the maximum number of patients were in age group of 31-40 years with mean age of 37.51 ± 12.25 years which matches Singh et al (49.6 years), and Papachristou et al (51.7 years).⁷

AP found to be 16 times more common in males than females in this study. This result didn't match with previous study results, Singh et al (6:1) and Papachristou et al (5.1:1).^{7,8} This could be explained by the fact that, in this study alcohol has found to be most common etiological factor, which was more than Bidarkundi et al (46.67%), and not correlating with results of Singh et al (21.4 %) and Papachristou et al (14%).⁷⁻⁹

Most common cause for AP in our study was alcohol (73.8%) followed by other causes in decreasing order such as idiopathic cause (14.1%), gall stone disease (7.1%), alcohol and smoking (3.6%) and trauma (1.2). While one study reported by Gullo et al, cholelithiasis and alcohol abuse were the most frequent etiologic factors 37.1 and 41.0% respectively.¹⁰ Other study by Zheng et al found that biliary (55.75%), alcoholism (10%), hypertriglyceridemia (10.36%), and the others (23.89%), biliary AP being the most frequent primary cause.¹¹

The mean length of hospital stay was 6.70 ± 5.6 days in this study out of which as much as 68% of patients stayed in hospital for 1-7 days.

27 (32%) patients required a prolonged length of stay (LOS >8 days) and 57 patients stayed in the hospital for <8 days. In this study, increasing BISAP and Ranson's scores correlated well with the duration of hospital stay as seen in other study by Singhet al.¹²

Out of 84 patients in our study, according to BISAP score mild and severe pancreatitis was seen in 87% and 13% respectively; while according to Ranson score mild and severe pancreatitis was seen in 81% and 19% respectively.

In our study, patients with severe AP according to BISAP (57%) and Ranson (71%) scores, progressed to various complications, namely, pancreatic necrosis, pseudocyst, MODS, portal and splenic vein thrombosis and WON. These complications were more likely seen in patients with BISAP ≥ 3 , and Ranson's > 3 , hence concluded that these represent the high-risk group of patients, which may require early intervention and intensive monitoring for better management.

In our study, out of 84 patients, as large as 20% (n=17) patients developed organ failure. Out of 17 patients 14 (16.7%) patients had transient organ failure and 3 (3.6%) had persistent organ failure. The prevalence of organ failure was 40% in study by Petrov et al.¹³

In this study, 73 patients were diagnosed to have mild acute pancreatitis and 11 patients found to have severe AP. All the 11 patients were correctly predicted by BISAP score. The scores were assessed by correlating the scores with three factors: organ failure, necrosis and mortality.

The analysis for organ failure showed BISAP score has sensitivity of 100%, specificity of 100%, PPV of 65%, NPV of 100%, diagnostic accuracy of 93%; whereas Ranson's score has sensitivity of 100%, specificity of 99%. Whereas, in the study by Papachristou et al, it was found that sensitivity of (70.42%, 80.41%), specificity of (92.4%, 71.9%), PPV of (57.7%, 40%), NPV of (84.3%, 90.1%), for BISAP and Ranson's respectively.⁷ Thus by using Chi square test, BISAP ≥ 3 and Ranson's >3 has significant correlation with prediction of the occurrence of organ failure ($p < 0.01$), which matches well with study by Singh et al and Wu et al.^{4,8}

In this study, 3 out of 8 patients with BISAP >3 and 3 out of 10 patients with Ranson's >3 , developed pancreatic necrosis. The statistical analysis for the prediction of necrosis has sensitivity of (38%, 30%), specificity of (100%, 100%), PPV of (100%, 100%), NPV of (54%, 36%), diagnostic accuracy of (64%, 50%) for BISAP and Ranson's respectively. This correlates well with the study by Papachristou et al where sensitivity of (80.01%, 87.65%), specificity of (95%, 79.51%), PPV of (56.2%, 38.9%), NPV of (84.9%, 90.1%), for BISAP and Ranson's respectively.⁷ Thus, by using Fisher's exact test $p > 0.05$, BISAP ≥ 3 has no significant correlation with prediction of the occurrence of pancreatic necrosis, which does not match with study by Singh et al and Wu et al.^{4,8}

Mortality was seen in 1 patient, who presented with persistent organ failure. According to a recent study, the mortality rates among severe AP patients have decreased from 50-58% in 1978-1982 to 12-18% in 1993-1997. The overall mortality in our study was 1.2 % which is similar compared to a study by Bung et al where mortality was found to be 2%. This decreasing trends of mortality can be attributed to scales such as BISAP and Ranson, which have proven to be useful in predicting the prognosis and aiding the management of the patient.¹⁴

In our study, SIRS and severity according to both BISAP and Ranson's score was found significantly correlated. SIRS was present in 42% (n=35) patients, in mild and severe intensity, according to BISAP score 26 and 9, respectively and according to Ranson's score in 21 and 14, respectively. While another study, quoted presence of SIRS as high as 62% in pancreatitis patients.¹⁵

Both Ranson score and BISAP score were equal in predicting the severity of AP. Both were equally efficacious in assessing the predictability of organ failure.

The limitation of the study is need for larger sample size and multicentre data to conclude the results as it is.

CONCLUSION

From this study, we can conclude that BISAP scoring system is not inferior to Ranson's scoring system in predicting the severity of acute pancreatitis. BISAP scoring system is very simple, cheap, easy to remember and calculate. BISAP scoring system accurately predicts the outcome in patients with AP. Moreover the values in BISAP score are instantaneous and there is no time delay. Ranson's score takes a minimum of 48 hours. Thus, BISAP score has proved to be a powerful tool in predicting the severity of acute pancreatitis on par with Ranson's score.

ACKNOWLEDGEMENTS

Authors would like to thank guide, HOD and the senior professors in the department of general surgery, S. Nijalingappa medical college and colleagues, friends and family who helped in completing this study.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Yeo CJ. Shackelford's surgery of the alimentary tract. 8th ed. Philadelphia, PA: Elsevier. 2019.
2. Shabbir S, Jamal S, Khaliq T, Khan ZM. Comparison of BISAP score with Ranson's score in determining the severity of acute pancreatitis. J Coll Physicians Surg Pak. 2015;25(5):328-1.
3. Imrie CW. Prognostic indicators in acute pancreatitis. Canad J Gastroenterol. 2003;17(5):325-8.
4. Wu BU, Johannes RS, Sun X. Early prediction of mortality in acute Pancreatitis: a large population-based study. Gut. 2008;57:1698-703.
5. Freeman ML. Practice guidelines in acute pancreatitis. Am J Gastroenterol. 2006;101:2379-400.
6. Ranson JH, Rifkind KM, Roses DF. Objective early identification of severe acute pancreatitis. Am J Gastroenterol. 1974;61:443-51.
7. 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):435-41.

8. Singh V, Wu B, Bollen TL, Repas K, Maurer R, Johannes R, 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;104:966-971.
9. Bidarkundi GK, Wig JD, Bhatnagar A, Majumdar S. Clinical relevance of intracellular cytokines IL-6 and IL-12 in acute pancreatitis, and correlation with APACHE III score. *Br J Biomed Sci.* 2002;59(2):85-9.
10. Gullo L, Migliori M, Oláh A, Farkas G, Levy P, Arvanitakis C, Lankisch P, Beger H. Acute pancreatitis in five European countries: etiology and mortality. *Pancreas.* 2002;24(3):223-7.
11. Zheng Y, Zhou Z, Li H, Li J, Li A, Ma B, Zhang T, Liao Q, Ye Y, Zhang Z, Yang Y. A multicenter study on etiology of acute pancreatitis in Beijing during 5 years. *Pancreas.* 2015;44(3):409-14.
12. Singh H, Gougol A, Mounzer R, Yadav D, Koutroumpakis E, Slivka A, Whitcomb DC, Papachristou GI. Which patients with mild acute pancreatitis require prolonged hospitalization? *Clin Translational Gastroenterol.* 2017;8(12):129.
13. Petrov MS, Shanbhag S, Chakraborty M, Phillips AR, Windsor JA. Organ failure and infection of pancreatic necrosis as determinants of mortality in patients with acute pancreatitis. *Gastroenterology.* 2010;139(3):813-20.
14. Bung YK, Neeralagi CS, Suggaiah L, Rathnam U, Kesari C. A prospective study to predict the severity of acute pancreatitis by BISAP score. *Int Surg J.* 2017;4(7):2221-6..
15. Singh VK, Wu BU, Bollen TL, Repas K, Maurer R, Mortelet KJ, Banks PA. Early systemic inflammatory response syndrome is associated with severe acute pancreatitis. *Clin Gastroenterol Hepatol.* 2009;7(11):1247-51.

Cite this article as: Kuntoji SB, Karimulla S. Efficacy of BISAP score versus Ranson's score to determine the severity index of acute pancreatitis. *Int Surg J* 2021;8:1826-32.