Section: General Surgery

Original Research Article

SCORE BASED SEVERITY ASSESSMENT AND RISK STRATIFICATION OF ACUTE PANCREATITIS IN A TERTIARY CARE CENTRE: AN OBSERVATIONAL, COHORT STUDY

Ritvik D. Jaykar[1], Santoshkumar N. Deshmukh[1], Aakanksha A. Giri[1]

[1]*Department of General Surgery, Dr. V. M. Govt. Medical College, Solapur, Maharashtra, India*

Received *: 01/01/2026*
Received in revised form *: 20/02/2026*
Accepted *: 07/03/2026*

Corresponding Author:
Dr. Ritvik D. Jaykar,
Department of General Surgery, Dr. V. M. Govt. Medical College, Solapur, Maharashtra, India.
Email: ritvikjaykar1712@gmail.com

DOI: 10.70034/ijmedph.2026.2.127

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (2); 740-744

ABSTRAC

Background: Acute pancreatitis outcomes are scored on the basis of bedside index of severity in acute pancreatitis (BISAP), Ranson criteria, acute physiology and chronic health evaluation (APACHE-II) and modified CT severity index (CTSI) score. The utility of these parameters is limited by their result related variability. We studied these scores along with the clinical characteristics of patients admitted to our tertiary care centre with acute pancreatitis.

Materials and Methods: Patients with acute pancreatitis were included based on clinical features, pancreatic enzyme levels, and radiology. Data about clinical features, investigations and outcomes (mortality and complications) was obtained. Ranson criteria, BISAP, APACHE-II and modified CTSI scores too were assessed where feasible.

Results: Of the 100 patients included, 52% were male with a median age of 51 years. Nearly one-fifths (21%) of the patients had an in-hospital mortality of which 71.43% were females. Common complications were shock (44%), pleural effusion (43%) and acute respiratory distress syndrome (ARDS) (37%). Regression analysis of Ranson criteria at admission showed higher odds of complications in tertile 1 and 2 (crude OR: 1.62, 3.6) even after adjustment for covariates (adjusted OR: 1.63, 4.81). Ranson criteria at 48 hours could predict mortality risk in tertile 2 and 3 (unadjusted OR: 4.17, 3.2; adjusted OR: 5.98, 1.25).

Conclusion: The modified Ranson criteria has proven to be useful in predicting the complications based on the admission score and in-hospital mortality based on the cumulative 48-hour score. Other scores like modified CTSI, BISAP and APACHE-II also showed consistent association with poor outcomes.

Keywords: Pancreatitis, complications, mortality, organ dysfunction scores, outcome assessment.

INTRODUCTION

Our understanding of the outcomes of pancreatitis has advanced greatly since the introduction of the Ranson criteria for pancreatic mortality nearly half a century ago.[1] In spite of great advances in the acute and emergent care of patients with acute pancreatitis their foot fall continues to rise both in India and in the western countries.[2,3] A recent study comparing the Indian burden of acute pancreatitis with global figures showed an incidence as high as 5,23,074 in India based on the Global Burden of Disease (GBD) 2021 data.[3] An elevated morbidity and mortality rate in the elderly patients with a complicated course of disease (nearly 10-20%) in a study conducted in the United States in 2008. These rates seem to have reduced to 3.3% in India based on a study of the APPRENTICE registry, however with the high incidence rate even the number of deaths is staggeringly high.[4] Hospitalization, ICU occupancy and need for surgery emburden the healthcare system and are associated with elevated overall cost of care

in patients with acute pancreatitis.[5] Further the high financial burden on the patients in terms of productive days lost and cost of hospitalization and post-hospitalization care especially in countries where the health insurance cover is narrow are definitely a reason of concern.[5] Alcoholism accounts for nearly 15.22% of the pancreatitis related deaths worldwide.[6]

Hence it is important for an intensivist and a surgeon to predict the outcomes of a patient with acute pancreatitis esp. in a resource deficient setting. Several risk assessment scoring systems have cropped up over the years. These include the Bedside Index for Severity in Acute Pancreatitis (BISAP) score, Ranson criteria, Acute Physiology and Chronic Health Evaluation (APACHE-II), Computed Tomography Severity Index (CTSI) score, etc. While these scores have been reliably used in clinical settings,[7] a 2023 systematic review and meta-analysis by Capurso et al compared BISAP, APACHE-II and Ranson criteria for their value in prediction of severe acute pancreatitis. They showed a pooled overall prevalence of 18.6% for these scores but showed considerable result related variability (48-50% for positive scores, 5-7% for negative scores) which hindered the value of these scoring criteria in overall decision making.[8]

The evident burden of acute pancreatitis definitely necessitates research in the field. The unpredictable nature of clinical progression of acute pancreatitis along with slight uncertainty in the prognostic assessment scores to address poor outcomes makes their revaluation important esp. in lower middle income countries like ours where resources are limited. In this study, we have studied the etiologies and outcomes of patients admitted with diagnosis of acute pancreatitis in our tertiary care teaching hospital.

MATERIALS AND METHODS

In this prospective observational cohort study we studied patients with a diagnosis of acute pancreatitis admitted to the department of General Surgery in our tertiary care teaching hospital. After obtaining a written informed consent the patient was inducted to the study. We included patients with acute pancreatitis diagnoses based on two out of the three criteria: abdominal pain consistent with pancreatic origin, three-fold elevated pancreatic amylases or lipases or both and radiological evidence of pancreatitis. Patients unwilling to participate in the study, below the age of 18 years, with a diagnosis of chronic pancreatitis, having any malignancy or those who were immunocompromised were excluded from the study.

After inclusion, a detailed account of their clinical symptoms, their severity, order of appearance and duration were noted. We also noted history relevant to the common causes of acute pancreatitis. History of upper abdominal and back pain, nausea, vomiting, jaundice, etc. was noted. Vitals were monitored for identifying early signs of shock and sepsis. Patients Glasgow coma score (GCS), signs of abdominal distension, etc. too were noted.

Among laboratory investigation, complete blood count, serum electrolytes (sodium, potassium, chlorides, calcium), liver function test (aspartate transaminase or serum glutamate oxaloacetate transaminase (AST/SGOT), alanine transaminase or serum glutamate pyruvate transaminase (ALT/SGPT), serum bilirubin, alkaline phosphatase), renal function tests (serum creatinine, blood urea nitrogen), pancreatic enzymes (serum amylase, serum lipase), fasting and postprandial blood glucose and HbA1c), C reactive protein (CRP), serum lactate dehydrogenase (LDH), arterial blood gases (Partial Pressure of Oxygen (PaO2), base excess, pH), lipid profile (triglycerides, serum cholesterol) were obtained.

Radiological investigations included AP View, ultrasound (USG) of abdomen, pelvis and Thorax (where needed), contrast enhanced computed tomography (CECT) of abdomen and pelvis, and magnetic resonance imaging (MRI).

Ranson criteria stratifies severity and mortality risk in patients with acute pancreatitis based on 11 parameters noted at admission or at 48 hours. At admission we note: age (> 55 years), total leukocyte count (> 16,000 cells/mm^3), blood glucose (> 200 mg/dL), serum lactate dehydrogenase (LDH) (> 350 IU/L) and serum aspartate transaminase (AST) (> 250 IU/L); At 48 hours: hematocrit fall (> 10%), BUN increase (> 5 mg/dL despite fluid resuscitation), serum calcium (< 8 mg/dL), arterial PO2 (< 60 mmHg) and base deficit (> 4 mEq/L). The BISAP score is a prognostic system for assessment of severity of acute pancreatitis, based on five components: age >60 years, BUN (>25 mg/dL), impaired mental status, SIRS, and pleural effusion. The CTSI is a radiologic scoring system for acute pancreatitis using CT based Balthazar grade with a total score ranging from 0 to 10 and assessment of the extent of pancreatic inflammation, necrosis and extrapancreatic complications. APACHE-II score is a standard intensive care unit (ICU) risk stratification tool with scores ranging between 0 and 71.

For computation of the APACHE-II score we computed the acute physiology score (APS) (worst values recorded during the first 24 hours of ICU admission for 12 variables: heart rate, mean arterial pressure, temperature, respiratory rate, oxygenation, arterial pH, serum sodium, potassium, creatinine, hematocrit, white blood cell count, and GCS), age points, chronic health evaluation points indication of severe organ dysfunction (liver, cardiovascular, respiratory, renal). The patient was prospectively observed for complications including pancreatic necrosis, pseudocyst of pancreas, acute respiratory distress syndrome, pleural effusion, shock, multiple organ dysfunction syndrome and mortality.

Categorical variables were presented as percentage and quantitative variables were presented as mean or

median depending upon normality of the data. Normality was determined based on the Shapiro Wilk test. Correlation analysis was performed to determine linear relations between quantitative variables. Univariate and multivariate logistic regression were performed to determine predictive performance of scores like Ranson criteria (calculated on admission and on 48 hr), BISAP score, CTSI score, Glasgow score for predicting risk of complications (mentioned above) and death. The statistical analysis was carried out by SPSS (Statistical Package for Social Sciences) version 16. Microsoft Word and Excel were used to generate graphs, tables, etc.

RESULTS

Baseline characteristics: We studied an overall 100 patients of which 52% were male and their median age was 51 (IQR: 22, 80) years. Nearly one-fifths (21%) of the patients had an in-hospital mortality of which 71.43% were females. A majority of these patients had one or the other complications, i.e. 44% had shock, 43% had pleural effusion while 37% patients had acute respiratory distress syndrome (ARDS). ARDS was reported twice as frequently in males (46.15%) than females. Their baseline clinical characteristics overall have been summarized in [Table 1].

Alcohol (34%), idiopathic (34%) and gall stones (32%) were equally responsible for acute pancreatitis. Epigastric pain, nausea, vomiting and jaundice were seen in nearly two-fifths of patients in this study.

Among these mortality was most frequently seen in alcoholic pancreatitis (42.9%) and least idiopathic (38.1%). However, complications were seen least in gall stones (19%). Patients with mortality had higher proportions of raised CRP, serum amylase, lipase, AST, and lactate dehydrogenase.

Risk scores in patients with acute pancreatitis

Median Ranson criteria at admission and 48 hours were 3 and 5, respectively, in the mortality group. On admission, Ranson score was greater than or equal to 3 in 54% of patients. An APACHE-II score of greater than or equal to 8 was seen in 55% patients. Three quarter (75%) patients had an elevated BISAP score, while the Glasgow score was raised in as many patients. The average Ranson criteria at admission in patients with complications was 2.44 and the average Ranson criteria at 48 hours in patients with mortality was 5.43. The Atlanta classification of acute pancreatitis for 94 patients showed severe disease in 20 patients, moderate in 52 patients and mild disease in 22 patients. Among patients with mortality as their outcome, 15 received CT scans where 66.67% qualified as severe or with a higher risk. The mortality rate was high in groups with poor scores admission Ranson criteria (greater than 3: 57.14%, less than 3: 42.85%) and Glasgow score (greater than 3: 33.33%, less than 3: 19.04%).

Relationship between Ranson criteria at admission and complications

Ranson criteria were assessed using a tertile approach for complications based on their admission values [Table 2]. Initial univariate analysis revealed crude odds of 1.62 (0.50-5.21) for tertile 1 and 3.6 (0.88-14.75) for tertile 2. We further followed a multivariate regression analysis approach for factoring in covariate like age, gender, serum creatinine, and triglyceride. Based on this analysis the adjusted odds were 1.63 and 4.81 for tertile 1 and 2 respectively.

Relationship between 48 hr Ranson criteria and in hospital mortality

Subsequently a cumulative Ranson criteria till 48 hr of admission could significantly predict the risk of complications for tertile 2 (OR: 4.17) and mortality for tertile 2 (OR: 3.2). Multivariate analysis, after adjusting for confounders, demonstrated high predictive value for prediction of mortality in both tertile 2 and tertile 3 (OR: 5.98, and 1.25) [Table 3].

Table 1: Baseline characteristics

Characteristics	Subclass	Count
Age	20–40	30
	40–60	32
	60–80	38
Sex	Male	52
	Female	48
Etiology	Alcoholic	34
	Idiopathic	34
	Gall stones	32
Symptoms	Epigastric pain	42
	Nausea and vomiting	47
	Jaundice	45
Signs	Tachycardia	49
	Low BP	43
Complications	Shock	44
	Pleural effusion	43
	ARDS	37
APACHE-II	<8	45
	>8	55
Ranson criteria (at admission)	<3	46
	>3	54

BISAP score	<2	25
	>2	75
Glasgow score	<3	25
	>3	75
Mortality	Deaths	21

Table 2: Multivariate logistic regression analysis for complications

Ranson Score at admission (for complications)	Univariate		Multivariate	
	Odds Ratio	p	Odds Ratio	p
Ranson score admission (tertile 1)	1.62	0.418	1.635	0.486
Ranson score admission (tertile 2)	3.6	0.075	4.807	0.043
Ranson score admission (tertile 3)	Ref	Ref	Ref	Ref

Table 3: Multivariate logistic regression analysis for mortality

Ranson score cumulative at 48 hrs (for mortality)	Univariate		Multivariate	
	Odds Ratio	p	Odds Ratio	p
Ranson score cumulative at 48 hr (tertile 1)	Ref	Ref	Ref	Ref
Ranson score cumulative at 48 hr (tertile 2)	3.2	0.055	5.98	0.025
Ranson score cumulative at 48 hr (tertile 3)	0.75	0.685	1.25	0.831

DISCUSSION

In this tertiary care centre level study in a teaching hospital in India (lower and middle income country) there was a higher mortality rate as compared with the global average.[3] Further, the risk of mortality and complications could be predicted using Ranson's 48 hour and admission scores respectively.

Acute pancreatitis presents with a wide spectrum of clinical severity. While the majority of cases 80-90% are self limiting with near complete recovery. 5-10% of these can have mortality.[9] In cases where there is diffuse pancreatic necrosis or multisystem organ failure, mortality risk can rise manifold.[10,11] Conservative management, fluid resuscitation and nutritional support are vital in such cases of severe pancreatitis and deterioration needs to be monitored stringently. The standard severity classification system for acute pancreatitis in the 90s called the Atlanta classification of acute pancreatitis showed initial promise but failed as it didn't account for organ failure duration, neither did it factor in the added influence of local complications on mortality.[9,12,13] The 2012 modification, however, considered the more objective and easily identifiable clinico-radiologic criteria that provided better insight into severity of acute pancreatitis.[12,13] While milder disease was limited to clinical signs suggestive of acute pancreatitis without any local complications or organ failure, moderate and severe acute pancreatitis constituted transient and persistent organ failure features respectively. Most scoring systems that have been used till now including APACHE-II, BISAP score, CTSI have variable and limited sensitivity and specificity.[8] Further it may be needed to wait for 48-72 hours as a requirement for computing these scores to make reliable predictions.[14]

Incidentally, our study showed an equal proportion of males and females, though male prevalence was higher in most previous studies.[15,16] In our study, the proportions of etiologies viz., alcohol, gall stones and idiopathic was similar thus aiding in a balanced understanding of the complications and outcomes. A previous study showed higher prevalence of gall stone etiology to acute pancreatitis,[12] they mention that the prevalence of gall stones is higher in northern India. Our study conducted in the southern part of India doesn't concur with this pattern.

The original Ranson criteria were more diagnostic than prognostic.[17] They were raised in alcoholic acute pancreatitis.[18] The prognostic value was limited because one of the parameters of fluid sequestration was subjective while the classical radiological confirmatory signs were not factored in while computing it.[19] A modified Ranson criteria of 0-2 indicates a mortality risk of less than or equal to 3%, 3-4 indicates risk of up to 15%, 5-6 the risk of 40% and for 7-11 the risk is nearly 100%.[20] Observation of attenuation of pancreatic parenchyma on a Computerized Tomography (CT) scan is suggestive of a pancreatic necrosis and indicates severity of local disease. With advances in imaging and introduction of Contrast enhanced CT (CECT) a CTSI score has become possible. Over the years CTSI that superseded the APACHE-II has further been superseded by modified CTSI score.[12] Previous reports have shown that modified CTSI is slightly superior to Ranson's criteria for mortality risk prediction because it can directly comment on the extent of tissue inflammation and necrosis based on radiological findings. The CTSI lacks in determining the extra-pancreatic and organ failure outcomes. Comparison of modified CTSI within 48 hours since it is the time bracket of Ranson criteria reduces its sensitivity of predicting delayed complications like the pseudocyst and peri-pancreatic necrosis.[19]

The Glasgow score has shown more sensitivity than the Ranson criteria despite having lesser parameters under consideration.[21] The BISAP score requires fewer variables than the Ranson criteria but the requirement of baseline mental status makes it both cumbersome and subjective.[19] The risk of development of complications was significantly higher in patients in the first and second tertiles of modified Ranson criteria when measured at

admission. The 48 hour cumulative modified Ranson criteria could more strongly predict the odds of mortality in the second and third tertile. These findings remained consistent even after multivariate regression analysis and concur with findings of our prior studies.[22,23] A prior study in Bengaluru also showed that alcohol accounted for the highest number of cases of acute pancreatitis.[24] This etiologic heterogeneity essentially raises curiosity on whether a particular cause of acute pancreatitis affects its outcomes. In a prior study, Ranson score showed high sensitivity and BISAP high specificity in predicting organ failure outcomes.

In nearly 50 years that Ranson criteria has been in practice, no score has accurately predicted the severity of severe acute pancreatitis at an early stage. A Chinese simple scoring system (CSSS) a six parameter 48 hour scoring system came close with an area under the curve better than APACHE-II, modified CTSI, Ranson, etc. in specific populations.[25,26]

Our study is not without limitations. This was conducted in a single centre, with a relatively small sample size and hence the results cannot be generalized. Further the cause effect relationship cannot be established here. Longer duration of study can help gather a larger sample and also follow up on the predictive value of complications. Comparison with APACHE-II scores that are the current standards of predicting hospital mortality, however, we were not able to compute them for a few patients.

CONCLUSION

The modified Ranson criteria has proven to be useful in predicting the complications based on the admission score and in-hospital mortality based on the cumulative 48-hour score. Other scores like modified CTSI, BISAP and APACHE-II also showed consistent association with poor outcomes.

REFERENCES

1. Ranson JH, Rifkind KM, Roses DF, Fink SD, Eng K, Localio SA. Objective early identification of severe acute pancreatitis. Am J Gastroenterol. 1974;61(6):443-51.
2. Fagenholz PJ, Castillo CF, Harris NS, Pelletier AJ, Camargo CA Jr. Increasing United States hospital admissions for acute pancreatitis, 1988-2003. Ann Epidemiol. 2007;17(7):491-7.
3. Ahmed HS. Assessing the burden and trends of pancreatitis in India from 1990-2021: an analysis of the global burden of disease database. Indian J Gastroenterol. 2025 Sep 1.
4. Matta B, Gougol A, Gao X, et al. Worldwide variations in demographics, management, and outcomes of acute pancreatitis. Clin Gastroenterol Hepatol. 2020;18(7):1567-1575.e2.
5. Pokras S, Ray M, Zheng S, Ding Y, Chen CC. The short- and long-term burden of acute pancreatitis in the United States: a retrospective cohort study. Pancreas. 2021;50(3):330-40.
6. Li CL, Jiang M, Pan CQ, Li J, Xu LG. The global, regional, and national burden of acute pancreatitis in 204 countries and territories, 1990-2019. BMC Gastroenterol. 2021;21(1):332.
7. Cho JH, Kim TN, Chung HH, Kim KH. Comparison of scoring systems in predicting the severity of acute pancreatitis. World J Gastroenterol. 2015;21(8):2387-94.
8. Capurso G, Ponz de Leon Pisani R, Lauri G, Archibugi L, Hegyi P, Papachristou GI, et al. Clinical usefulness of scoring systems to predict severe acute pancreatitis: a systematic review and meta-analysis with pre and post-test probability assessment. United European Gastroenterol J. 2023;11(9):825-36.
9. Bradley EL 3rd. A clinically based classification system for acute pancreatitis. Summary of the International Symposium on Acute Pancreatitis, Atlanta, Ga, September 11 through 13, 1992. Arch Surg. 1993;128(5):586-90.
10. Balthazar EJ. Complications of acute pancreatitis: clinical and CT evaluation. Radiol Clin North Am. 2002;40(6):1211-27.
11. Kyosola K, Fock G. Complications in acute pancreatitis. Ann Chir Gynaecol Suppl. 1976;65(1):7-12.
12. Harshit Kumar A, Singh Griwan M. A comparison of APACHE II, BISAP, Ranson's score and modified CTSI in predicting the severity of acute pancreatitis based on the 2012 revised Atlanta Classification. Gastroenterol Rep (Oxf). 2018;6(2):127-31.
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. Bollen TL, Singh VK, Maurer R, Repas K, van Es HW, Banks PA, et al. Comparative evaluation of the modified CT severity index and CT severity index in assessing severity of acute pancreatitis. AJR Am J Roentgenol. 2011;197(2):386-92.
15. Zhu J, Wu L, Wang Y, Fang M, Liu Q, Zhang X. Predictive value of the Ranson and BISAP scoring systems for the severity and prognosis of acute pancreatitis: a systematic review and meta-analysis. PLoS One. 2024;19(4):e0302046.
16. Singh VK, Wu BU, Bollen TL, Repas K, Maurer R, Johannes RS, 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):966-71.
17. 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.
18. Jain D, Bhaduri G, Jain P. Different scoring systems in acute alcoholic pancreatitis: which one to follow? An ongoing dilemma. Arq Gastroenterol. 2019;56(3):280-5.
19. Luo X, Wang J, Wu Q, Peng P, Liao G, Liang C, et al. A modified Ranson score to predict disease severity, organ failure, pancreatic necrosis, and pancreatic infection in patients with acute pancreatitis. Front Med (Lausanne). 2023;10:1145471.
20. Basit H, Ruan GJ, Mukherjee S. Ranson criteria. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan–. 2022 Sep 26.
21. 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.
22. Aktaş AA, Taşar P, Sığirli D, Kiliçturgay SA. Comparison of the effectiveness of different scoring systems and biochemical markers in determining the severity and complications of acute pancreatitis. Turk J Med Sci. 2025;55(2):451-60.
23. Venkatesh NR, Vijayakumar C, Balasubramaniyan G, Chinnakkulam Kandhasamy S, Sundaramurthi S, G S S, et al. Comparison of different scoring systems in predicting the severity of acute pancreatitis: a prospective observational study. Cureus. 2020;12(2):e6943.
24. Teja BSS, Narilla NSSH, Reddy RGH, Tanuja S, Kankipati A, Prasuja BN, et al. Clinical profile of acute pancreatitis in a tertiary care hospital: a comparative study of bedside index of severity in acute pancreatitis and Ranson's score in predicting severity. Ann Afr Med. 2026 Jan 23.
25. Li M, Xing XK, Lu ZH, Guo F, Su W, Lin YJ, et al. Comparison of scoring systems in predicting severity and prognosis of hypertriglyceridemia-induced acute pancreatitis. Dig Dis Sci. 2020;65(4):1206-11.
26. Li Y, Zhang J, Zou J. Evaluation of four scoring systems in prognostication of acute pancreatitis for elderly patients. BMC Gastroenterol. 2020;20(1):165.