ORIGINAL RESEARCH ARTICLE

A Comparative Study of Ranson's Criteria and APACHE II Scoring System in Prediction of Severity in the Patients of Acute Pancreatitis

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ABSTRACT

Introduction: Acute pancreatitis (AP) is an inflammatory process due to auto-digestion of the gland by pancreatic digestive enzymes, leading to impairment of function or any morphologic changes. It can re-occur intermittently, contributing to ongoing insult, referred to as 'Chronic Pancreatitis' (CP). Severe AP (SAP) develops in about 25.0% of patients with AP. The average mortality rate in SAP approaches 2.0–10.0%.

Materials and Methods: This prospective, comparative study was conducted in the Department of General Surgery in a Tertiary Care Hospital of North India from 01.02.2021 - 31.07.2022 in SRMSIMS, Bareilly, U.P. A total of 105 patients were evaluated using RANSON'S and APACHE criteria when presented with a clinical history of pain abdomen. After due consent from the patients, the demographic details, clinical examination, laboratory and radiological Investigations, and final diagnosis were noted during the hospital stay.

Results: In our study, which was reported for acute pancreatitis sensitivity, specificity and accuracy of Ranson's score, it was found that 75.0, 67.01 and 67.6% and that for APACHE II is 92.31, 82.28 and 84.76% sensitivity, specificity and accuracy of APACHE II score, respectively

Conclusion: According to our study, APACHE II scoring was found to be more sensitive and specific than RANSON'S score to predict better prognosis in patients of acute pancreatitis

Keywords: Ranson's criteria, APACHE II scoring system, Acute pancreatitis.

INTRODUCTION

Acute pancreatitis (AP) is an inflammatory process due to auto-digestion of the gland by pancreatic digestive

enzymes, leading to impairment of function or any morphologic changes.[1] It can re-occur intermittently, contributing to ongoing insult, referred to as 'chronic pancreatitis' (CP).[2] Severe AP (SAP) develops in about 25.0% of patients with AP. The average mortality rate in SAP approaches 2.0 to 10.0%.[3] Very few diseases on the surgical floor have as vast a spectrum of clinical presentations as acute pancreatitis. Acute pancreatitis is considered the most terrible of all the calamities that occur in connection to the abdominal viscera. Sudden onset, severe agony accompanying it, and mortality attendant upon it render it the most formidable of catastrophes. Most cases of acute pancreatitis are mild.[4]

The Ideal scoring system should be simple, non-invasive, accurate and quantitative, with the criteria readily available at the time of diagnosis. The most well-known scoring systems are the Ranson score, APACHE II Scoring system (Acute Physiology and Chronic Health Evaluation II), Glasgow scales, SAPS II[5], MPM II[6], SOFA[7], LODS[8], MODS[9] and POP1.[10] In recent years, to predict the severity of AP. Balthazar described a computed tomography severity index (CTSI) as an alternative method.

MATERIALS AND METHODS

This prospective, comparative study was conducted in the Department of General Surgery in a Tertiary Care Hospital of North India from 01.02.2021 to 31.07.2022 in, SRMSIMS, Bareilly, U.P after taking ethical clearance from the Institution to evaluate the patient records. All patients admitted to the surgery ward with acute pancreatitis were included in this study based on predefined inclusion and exclusion criteria. The study was done after obtaining clearance from the Institutional Ethical Committee. Detailed and informed written consent was obtained from them.

A total of 105 patients were evaluated using RANSON'S and APACHE criteria when presented with a clinical history of pain in the abdomen.

After due consent from the patients, the demographic details, clinical examination, laboratory and radiological investigations, and final diagnosis were noted during the hospital stay.

Microsoft Excel was used to create the database and produce graphs, while data were analyzed using the Statistical Package for the Social Sciences (SPSS)version 23 for Windows.

RESULTS

Majority of patients were less than 44 years age (Table 1). On the basis of the clinical presentation of the patient, it was observed that tenderness was the most common presenting sign, which was found in the majority of the cases. Tenderness (94.3%) was followed by signs of dehydration (4.8%) and guarding (4.8%), which were seen in equal number of patients (Table 2).

When 105 patients were correlated between Ransons's score at admission and APACHE II Score, it was found that Ranson and APACHE showed mild pancreatitis in 79 cases and 8 cases were severe according to APACHE and RANSON's where there were 0 cases where the patient was diagnosed as mild on the basis of APACHE and severe according to RANSON. There were 18 such cases where the patient was diagnosed as severe on the basis of APACHE And was categorized as mild according to RANSON. Only 8 cases were found out to be following the severe category, according to ransons and APACHE II (Table 3).

When the patient underwent treatment, we found out that the complications which developed after acute pancreatitis was paralytic ileus in a majority of a patient (97.1%) followed by pancreatic necrosis (19.0%) and SIRS/MODS (10.5%) (Table 4).

When 105 patients were correlated between Ransons's score at admission and APACHE II score, it was found that Ranson and APACHE showed mild pancreatitis in 79 cases and 8 cases were severe according to APACHE and Ranson's whereas there were 0 cases where the patient was diagnosed as mild based on APACHE and severe according to ransons. There were 18 such cases where the patient was diagnosed as severe based on APACHE And was categorized as mild according to Ransons. Only 8 cases were found out to be following in severe category, according to ransons and APACHE II (Table 5).

DISCUSSION

Acute pancreatitis is a relatively common condition that causes a significant risk of morbidity, and mortality.[11]

Table 1: Distribution of the studied patients on the basis of their age

Age group (Years)	Frequency (n=105)	Percentage(%)
≤44	66	62.9
45-54	39	37.1
Mean ± SD	42.0 ± 9.41 (24–54 years)	

Above table shows all cases were in the age group less than 44 years (62.9%) with mean age 42.0 ± 9.41 years

Table 2: Abdominal examination

Variables	Frequency (n=105)	Percentage (%)
Tenderness	99	94.3
Signs of dehydration	5	4.8
Guarding	5	4.8
Epigastric mass	0	0.0
Retroperitoneal hemorrhage	0	0.0

Table 3: Correlation between Ransons's score at admission and APACHE II Score

		Ransons's Score		Total
		Mild	Severe	
APACHE II Score	Mild	79	0	79
	Severe	18	8	26
Total Count		97	8	105
p-value		<0.001		

Table 4: Complications

Complications	Frequency (n=105)	Percentage
Pancreatic Necrosis	20	19.0
Paralytic ileus	102	97.1
Renal Failure	2	1.9
ARDS	1	0.9
SIRS/MODS	11	10.5

Table 5: APACHE II v/s Ranson's comparison

	APACHE II (%)	RANSONS (%)
Sensitivity	92.31	75.0
Specificity	82.28	67.01
Positive predictive value	63.16	15.8
Negative predictive value	97.01	97.0
Accuracy	84.76	67.6

In the majority of the patients, acute pancreatitis has self-limiting course, but in approximately 20% of the patients, the disease could take a severe course with the development of pancreatic necrosis, and organ failure.[12]

In the present study, the majority of the studied cases were below 44 years of (62.8%) with a mean age 42.0 ± 9.41 years and male predominance (50.5%) and females (49.5%). The duration of fever was between 3 to 5 days (55.2%) and vomiting for 1 to 2 days (70.5%). The most common clinical presentation were found to be tenderness (94.3%) followed by signs of dehydration (4.8%).

The study on 60 patients by Lankisch PG, and Burchard RS showed the maximum incidence of acute pancreatitis in age group of 31 to 40 years, which was comparable to our study.[13]

Most common clinical presentation was found to be tenderness (94.3%) followed by signs of dehydration (4.8%). In the study of Thandassery RB, Yadav TD, Dutta

U, *et al.*, the majority of a patient suffering from acute pancreatitis presented with sign of tenderness in the whole abdomen.[14]

Surati K, Suthar K, Shah J, *et al.* also reported the average hospital stay for 50 patients in their study was approximately 7 days.[15]

In the present study all the patients survived, and no one expired. Zhu AJ, Shi JS, Sun XJ also found the majority of patients survived in their study.[16]

Shaheen MA and Akhtar AJ reported 14.0% mortality, which was in contrast to our study. This may be because of the sample size as they have recruited 760 patients in their study,[17] whereas compared to Barreto SG and Rodrigues J study, the overall mortality was 12.0 and 14.0%.[18]

Surati K, Suthar K, Shah J, *et al.* reported no mortality among 50 studied patients.[15]

In their study, Negi N, Mokta J, and Sharma B depict overall mortality as 5.7%.[19] Out of 7 patients who died, 5 had severe pancreatitis and 2 had moderate pancreatitis which was in accordance the present study. It correlates with a study by Bota S, where the overall mortality rate was 4.6%.[20]

Modi JV and Sheth J reported that out of these BISAP, Ranson's and APACHE II scores, the mortality among the patients with severe pancreatitis were 75.0, 50.0 and 100.0%, respectively.[21]

The incidence of acute severe pancreatitis in this study was 24.8% (26 cases), the APACHE II score showed 75.2% mild (79 cases) and Ranson score showed 7.6% (8 cases) mild and 92.4% (97 cases) severe. These results were probably due to APACHE II system having more variables and also including the chronic health status of the patient than the Ranson scoring system, resulting in APACHE II being more accurate in predicting the severity of pancreatitis (APACHE II score >8 was considered severe, and ranson score>3 was severe).

After studying all the 105 cases which were reported for acute pancreatitis sensitivity, specificity, and accuracy of Ranson's score, it was found that 75.0, 67.01 and 67.6%.and that for APACHE II is 92.31, 82.28 and 84.76% sensitivity, specificity and accuracy of APACHE II score, respectively.

CONCLUSION

This study concluded that an APACHE II score of ≥8 on admission was a better predictor of complicated outcome and mortality rate in patients with acute pancreatitis than RANSON'S.

Most common complication in such patients was found to be paralytic ileus followed by pancreatic necrosis that, too in the majority of male population.

In our study, the most common presenting sign was abdominal tenderness followed by signs of dehydration and guarding in patients of acute pancreatitis. Scores below 8 predicted an uncomplicated outcome.

According to our study, APACHE II scoring was found to be more sensitive and specific than ranson's score to predict better prognosis in patients of acute pancreatitis. Patients with APACHE II scores >8 benefitted from initial ICU care with aggressive therapy aimed at disease cure and dealing with the complications. Hence APACHE II scoring can be used as a reliable tool in predicting the severity and prognosis than ranson scoring in patients with acute pancreatitis as APACHE II system is the only system that takes into account all the major risk factors that influence outcome from disease, including the acute physiological derangements as well as patient ability to recover which may be diminished by advancing age or chronic disease.

REFERENCES

1. Klöppel G and Maillet B. Pathology of acute and chronic pancreatitis. Pancreas 1993;8:659-670.
2. Witt H, Apte MV, Keim V and Wilson JS. Chronic pancreatitis: Challenges and advances in pathogenesis, genetics, diagnosis, and therapy. Gastroenterology 2007;132:1557-1563.
3. Surbatovic M and Radakovic S. Tumor necrosis factor-α levels early in severe acute pancreatitis: is there predictive value regarding severity and outcome? J Clin Gastroenterol 2013;47:637-643.
4. Moynihan B. Acute pancreatitis. Ann Surg. 1925;81:132-42
5. Le Gall, JR; Lemeshow, S; Saulnier, F (1993). "A new Simplified Acute Physiology Score (SAPS II) based on a European/North American multicenter study". JAMA. **270** *(24): 2957–63.*
6. Lemeshow S *et al.* Mortality probability models (MPM II) based on an international cohort of intensive care patients. JAMA 1993;270:2478-86.
7. Vincent JL, Moreno R, Takala J, Willatts S, De Mendonça A, Bruining H, Reinhart CK, Suter PM, Thijs LG. The SOFA (Sepsis-related Organ Failure Assessment) score to describe organ dysfunction/failure. On behalf of the Working Group on Sepsis-Related Problems of the European Society of Intensive Care Medicine. Intensive Care Med. 1996 Jul;22(7):707-10.
8. Le Gall JR, Klar J, Lemeshow S, Saulnier F, Alberti C, Artigas A, Teres D. The Logistic Organ Dysfunction system. A new way to assess organ dysfunction in the intensive care unit. ICU Scoring Group. JAMA. 1996 Sep 11;276(10):802-10.
9. Deitch EA. Multiple organ failure. Pathophysiology and potential future therapy. Ann Surg. 1992 Aug;216(2):117-34.
10. Moynihan B. Acute pancreatitis. Ann Surg. 1925;81:132-425 Adam G, Koçak E, Çınar C, Adam F, Bor C, Korkmaz M. Evaluation of CT severity index, Ranson and APACHE II and Ranson scores for clinical course and mortality in mechanically ventilated patients depend to severe pancreatitis. Van TıpDerg 2017;24(4):238-243
11. Raraty MG, Connor S, Criddle DN, *et al.* Acute pancreatitis and organ failure: pathophysiology, natural history, and management strategies. CurrGastroentrol Rep. 2004;6(2):99-103.

12. Malangoni M, Martin A. Outcome of severe acute pancreatitis. Am J Surg. 2005;189(3):273-277.

13. Lankisch PG, Burchard RS. Petersen M. Etiology and age have only a limited influence on the course of acute pancreatitis. Pancreas. 1996;13(4):329-473

14. Thandassery RB, Yadav TD, Dutta U, Appasani S, Singh K & Kochhar R. Dynamic nature of organ failure in severe acute pancreatitis: the impact of persistent and deteriorating organ failure. HPB. 2012;15:523-528

15. Surati K, Suthar K, Shah J, Parekh B. Study Of Recent Trends In Acute Pancreatitis. International Journal of Medical Science and Public Health . 2014;3(1):63-68

16. Zhu AJ, Shi JS, Sun XJ. Organ failure associated with severe acute pancreatitis. World J Gastroenterol 2003;9(11):2570-2573

17. Shaheen MA and Akhtar AJExtrapancreatic manifestations of acute pancreatitis in African-American and Hispanic patients. Pancreas. 2004 Nov 1;29(4):291-7.

18. Barreto SG, Rodrigues J. Comparison of APACHE II and Imrie Scoring Systems in predicting the severity of Acute Pancreatitis. World J Emerg Surg. 2007 Dec 9;2:33.

19. Negi N, Mokta J, Sharma B, Sharma R, Jhobta A, Bodh V, Ranjan A. Clinical Profile and Outcome of Acute Pancreatitis: A Hospital-Based Prospective Observational Study in Subhimalayan State. Journal of the association of physicians of India. 2018;66:22-24

20. Bota S. Predictive factors for severe evolution in acute pancreatitis and a new score for predicting a severe outcome. Ann Gastroenterol 2013; 26:156-162.

21. Modi JV, Sheth J. Observational study of comparison of BISAP score with Ranson's score and APACHE II scores in assessing severity and prognosis in patients of acute pancreatitis. Int Surg J 2019;6: