Original Research Article

The Role of Ranson's Score at Admission and After 48 Hours in Predicting Mortality and Morbidity in Acute Pancreatitis

Humayun Amjad (Corresponding Author)
Nishtar Hospital, Multan, Pakistan
Email: humayunamjad22@gmail.com

Abstract

Objective: To evaluate the role of the Ranson scoring system in predicting acute pancreatitis at the time of admission and after 48 hours.

Study Design: Cross-sectional study

Place and duration: Department of General Surgery, Nishtar Hospital, Multan, from August 2022 to August 2023.

Methodology: A total of 106 patients diagnosed with pancreatitis were enrolled in the study. The primary variables included age, gender, Ranson score at the time of admission and after 48 hours, complication rates, and mortality. Patients were assessed and categorized using Ranson criteria. Data analysis was performed using SPSS version 23, with a p-value ≤ 0.05 considered statistically significant.

Results: The distribution of complications in relation to the Ranson score at admission (RSA) showed no significant association ($p = 0.159$). However, the mortality rate associated with RSA was 8.4%, with a significant correlation observed between RSA and mortality ($p = 0.000$). The Ranson score after 48 hours was significantly associated with both complications and mortality ($p = 0.001$ and $p = 0.000$, respectively), with the mortality rate remaining consistent at 8.4%.

Conclusion: The Ranson scoring system is a reliable and accurate tool for predicting the progression of acute and severe acute pancreatitis. While the criteria are straightforward and easy to recall, completing the assessment requires 48 hours, limiting its immediate applicability at the time of admission.

Keywords: Ranson Score, Acute pancreatitis, Morbidity, Mortality, Severity of disease

Introduction

.

Acute pancreatitis is a serious condition with diverse clinical manifestations, and its incidence is steadily increasing[1]. Along with this rising occurrence, mortality rates associated with severe

acute pancreatitis have also been reported to range from 2% to 10%. The condition is classified into three categories based on its severity. Mild acute pancreatitis is characterized by the absence of local or systemic complications or organ failure[2]. Moderate-severe acute pancreatitis involves local complications within the first 48 hours but does not result in organ failure. Severe acute pancreatitis is defined by persistent organ failure lasting more than 48 hours, often involving the failure of one or more organs. This classification aids in understanding the progression and management of the disease[3,4].

Approximately 25% of acute pancreatitis cases progress to severe acute pancreatitis, a more life-threatening condition[5]. This severe form typically develops in two phases. The first phase is marked by necrosis and pancreatic inflammation, which leads to the second phase characterized by systemic inflammatory response syndrome (SIRS). This systemic response can progress to multi-organ dysfunction syndrome (MODS), typically occurring within the first week of illness[6]. During this critical initial period, approximately 50% of deaths are attributed to MODS, with 40–60% of these fatalities occurring in hospitals and affecting individuals across all age groups. By the second week, most patients exhibit complications such as pancreatic necrosis or fluid accumulation; however, infection is generally absent during the early phase of the disease[7].

In the United States, the incidence of acute pancreatitis ranges from 50 to 80 cases per 100,000 people, whereas in the subcontinent, its prevalence is approximately 2.29%[8]. The development of multi-organ failure, commonly involving the kidneys, lungs, and liver, is primarily driven by the release of pro-inflammatory cytokines. Advancing age has been consistently associated with higher mortality rates during the acute phase of pancreatitis[9]. Over time, numerous diagnostic criteria and scoring systems have been devised to evaluate the severity of pancreatitis. An ideal diagnostic scoring system should be non-invasive, simple to use, widely accessible, qualitative, accurate, and cost-effective.

Among the diagnostic scoring systems, the Ranson score was originally developed to evaluate the severity of alcohol-induced acute pancreatitis[10]. However, with gallstones being identified as another common cause of pancreatitis, the scoring system was revised, incorporating a cutoff value of 3. The Ranson score is highly effective in predicting outcomes at the extremes, with a score of less than 3 indicating a high likelihood of survival and a score greater than 6 suggesting a significantly increased risk of mortality. However, its accuracy diminishes for intermediate values. This study aims to assess the effectiveness of the Ranson scoring system in diagnosing and predicting the severity of acute pancreatitis.

Methodology

This cross-sectional study was conducted in the Department of General Surgery at Nishtar Hospital, Multan, from August 2022 to August 2023. The study commenced after obtaining approval from the hospital's ethical review committee, and informed consent was secured from all participants. A non-probability consecutive sampling technique was utilized.

A total of 106 patients presenting to the emergency department with acute pancreatitis were enrolled. Patients with comorbid conditions, such as cardiovascular, neurological, renal, or respiratory diseases, were excluded. Comprehensive patient histories and clinical examinations

were conducted, supplemented by laboratory tests, including complete blood count, ALT, LDH, serum calcium, leukocyte count, hematocrit, blood sugar, and arterial blood gases. Selected patients underwent chest X-rays in the anteroposterior view.

The Ranson criteria were applied to assign scores, categorizing patients into mild or severe acute pancreatitis. Organ failure lasting more than 48 hours was documented. Patients received treatment in the intensive care unit (ICU) or high-dependency unit (HDU) following international management protocols.

Data entry and analysis were performed using SPSS version 23. Quantitative variables, such as age, were presented as mean ± standard deviation, while qualitative variables, including early blood transfusion reactions, were summarized as frequency percentages. Associations between variables were analyzed using the Student's t-test and chi-square test, with a p-value ≤ 0.05 considered statistically significant.

Results:

A total of 106 patients participated in this study, comprising both genders. Among them, 47 patients (44.3%) were male, and 59 patients (55.7%) were female. The age distribution was as follows: 6 patients (5.7%) were aged 10–20 years, 24 patients (22.6%) were aged 21–30 years, 20 patients (18.9%) were aged 31–40 years, 22 patients (20.8%) were aged 41–50 years, 12 patients (11.3%) were aged 51–60 years, 16 patients (15.1%) were aged 61–70 years, 5 patients (4.7%) were aged 71–80 years, and only 1 patient (0.9%) was aged 81–90 years (see Table I).

The correlation between complications and the Ranson score at admission (R.S.A.) was analyzed. No significant association was found between R.S.A. and complications (p=0.159). However, the mortality rate associated with R.S.A. was 8.4%, and a significant association was observed between R.S.A. and mortality (p=0.000). The relationship between R.S.A., complications, and mortality was further examined, revealing consistent mortality rates of 8.4% from admission. Moreover, significant associations were identified between R.S.A. and both mortality (p=0.000) and complications (p=0.001).

Table. I

Demographic characteristics

Variables	n , %
Gender	
Male	n=47 (44.3%)
Female	n=59 (55.7%)
Total	n=100 (100%)
Age distribution	
10-20 years	n=6 (5.7%)
21-30 years	n=24 (22.6%)
31-40 years	n=20 (18.9%)
41-50 years	n=22 (20.8%)

51-60 years	n=12 (11.3%)
61-70 years	n=16 (15.1%)
71-80 year	n=5 (4.7%)
81-90 years	n=1 (0.9%)
Total	n=100 (100%)

Table. II

Association of RSA and complications

	R.S.A at the time of admission							
Complications	**0**	**1**	**2**	**3**	**4**	**5**	**Total**	**P-value**
No complication	18	**25**	**19**	**8**	**3**	0	73	0.159
PSEUDOCYST	2	2	3	0	0	0	7	
Shock	1	2	0	0	0	0	3	
ASCITIES	1	2	1	1	0	1	6	
PLEURAL EFFUSION	0	0	0	1	0	0	1	
ARF	0	0	0	1	0	0	1	
P. NECROSIS	0	0	2	2	0	0	4	
Multiple	1	4	3	3	0	0	11	
Total	23	35	28	16	3	1	106	

Table. III

Association between mortality and RSA

	R.S.A at the time of admission							
Mortality	**0**	**1**	**2**	**3**	**4**	**5**	**Total**	**P-value**
Yes	0	3	2	3	1	0	9	0.000
No	23	32	26	13	2	1	97	
Total	23	35	28	16	3	1	106	

Table. IV

Association of RSA and complications

	R.S.A at 48 hours	

Complications	0	1	2	3	4	5	Total	P-value
No complication	40	21	8	4	0	0	73	0.001
PSEUDOCYST	4	2	1	0	0	0	7	
Shock	1	1	1	0	0	0	3	
ASCITIES	2	4	0	0	0	0	6	
PLEURAL EFFUSION	0	1	0	0	0	0	1	
ARF	0	0	1	0	0	0	1	
P. NECROSIS	1	2	0	1	0	0	4	
Multiple	1	3	1	1	3	2	11	
Total	49	34	12	6	3	2	106	

Table IV shows a significant association (p = 0.001) between lower Ranson scores at 48 hours and fewer complications. Most patients without complications had an RSA score of 0, while higher RSA scores were associated with an increased incidence of complications, such as pseudocyst, shock, ascites, and pancreatic necrosis. These findings suggest that a higher RSA score is linked to a greater risk of developing complications.

Table. V

Association between mortality and RSA

	R.S.A at 48 hours							
Mortality	**0**	**1**	**2**	**3**	**4**	**5**	**Total**	**P-value**
Yes	0	3	1	1	2	2	9	0.000
No	49	31	11	5	1	0	97	
Total	49	34	12	6	3	2	106	

Table V shows a strong association between Ranson scores at 48 hours and mortality (p = 0.000). Among the non-survivors, most had higher RSA scores, with 9 deaths occurring across scores ranging from 1 to 5. In contrast, the majority of survivors had lower RSA scores, particularly a score of 0. These findings indicate that higher RSA scores are strongly associated with an increased risk of mortality.

Discussion

A study by Ali AA et al. (2004)[11] reported a higher prevalence of acute pancreatitis among females compared to males, noting that the disease affects all age groups without a gender predominance. Similarly, a study by Hussain SS et al. (2009)[12] found that 76% of patients were female, with 6% of patients dying within 76 hours of admission. These findings align with the results of our study, enabling a comparative analysis with previous research.

In a 2017 study by Al-Qahtani HH et al.[13], it was reported that the Ranson criteria demonstrated high accuracy, with 98% sensitivity, 77% specificity, and 96% diagnostic accuracy. However, its reliability and accuracy are best assessed after 48 hours. The study concluded that the Ranson criteria can provide more accurate and reliable predictions, but this requires a full 48 hours for comprehensive evaluation. These findings are consistent with the results of our study. In their research, 1.7% of patients were diagnosed with severe pancreatitis, while 2 patients were classified as having mild pancreatitis.

A study conducted by Shabbir S et al.[14] reported that most patients who developed pancreatitis followed by necrosis ultimately died, with all deceased patients having Ranson scores greater than 3. This finding is consistent with the results of our study. Another similar study by Bai Y et al.[15] reported a death rate of 12.05% in the Chinese population. Both of these studies align closely with our findings.

Previous studies have concluded that evaluating patients for severe pancreatitis in its early phase is essential for making better diagnoses and treatment decisions. In a study conducted by Damani SAAR et al.[16], it was found that 18% of patients had severe pancreatitis. Similarly, a study by Mofidi R et al.[17] reported a 31% frequency of severe pancreatitis at the time of admission. The findings of these two studies are comparable to the results of our study.

Papachristou et al.[18] conducted a study to compare the Ranson criteria with the APACHE II scoring system and reported sensitivity, specificity, and accuracy of the Ranson scoring as 84.2%, 89.8%, and 94%, respectively, for predicting severe acute pancreatitis. This supports the findings of our study. Similarly, a study by Chand P et al.[19] estimated that 36.6% of acute pancreatitis cases were assessed using the Ranson score, with severe pancreatitis diagnosed in 63.3% of cases. Another relevant study by Cho JH et al.[20] in 2015 reported that 87% of patients were diagnosed with mild pancreatitis, while 13% were diagnosed with severe pancreatitis.

Conclusion:

The results of our study indicate that the Ranson criteria are both accurate and reliable in predicting acute and severe acute pancreatitis, as well as its progression. While the components of the Ranson criteria are easy to remember, the complete assessment process requires 48 hours to finalize.

References

1. Mehta N, Chauhan A. Ranson's Scoring System and Modified CT Severity Index in the Evaluation of Acute Pancreatitis: A Prospective Hospital Based Study. IABCR. 2017 [cited 16Oct.2018];3(4):41-3.
2. Zhao JG, Liao Q, Zhao YP. Mortality indicators and risk factors for intra-abdominal hypertension in severe acute pancreatitis Int Surg 2014;99 (3):252-57.

3. Leung TK, Lee CM, Shen LK. Balthazar CT severity index is superior to Ranson's criteria and APACHE-II scoring system in predicting acute pancreatitis outcome World J Gastroenterol 2005;11(38): 6049-52.
4. Qiu L, Sun RQ, Jia RR. Comparison of Existing Clinical Scoring Systems in Predicting Severity and Prognoses of Hyperlipidemic Acute Pancreatitis in Chinese Patients: A Retrospective Study. Amornyotin. S, ed. *Medicine*. 2015;94(23):e957.
5. Tee Y-S, Fang H-Y, Kuo I-M, Lin Y-S, Huang S-F, Yu M-C. Serial evaluation of the SOFA score is reliable for predicting mortality in acute severe pancreatitis. François. V, ed. *Medicine*. 2018;97(7):e9654.
6. Srinivasan G, Venkatakrishnan L, Sambandam S. Current concepts in the management of acute pancreatitis. J Family Med Prim Care 2016;5:752–8.
7. Eachempati SR, Hydo LJ, Barie PS. Severity scoring for prognostication in patients with severe acute pancreatitis: comparative analysis of the Ranson score and the APACHE III score. Arch Surg 2002;137:730–6.
8. Russell PS, Mittal A, Brown L. Admission, management and outcomes of acute pancreatitis in intensive care. ANZ J Surg 2017;87:E266–70.
9. De Bernardinis M, Violi V, Roncoroni L. Discriminant power and information content of Ranson's prognostic signs in acute pancreatitis: a meta-analytic study. Crit Care Med 1999;27:2272–83.
10. Ha EJ, Kim S, Jin HS. Early changes in SOFA score as a prognostic factor in pediatric oncology patients requiring mechanical ventilatory support. J Pediatr Hematol Oncol 2010;32:e308–13.
11. Ali AA, Niazi BA, Naqvi N, Gondal KM, Islam HR,Chaudhry AM. Management of acute pancreatitis: an experience at Mayo Hospital, Lahore. Ann King Edward Med Univ. 2004;10:197-9.
12. Hussian SS, Ansari A, Ali S. Early prediction of severity and outcome of acute severe pancreatitis. Pak J Med Sci. 2009;25:619- 23.
13. Al-Qahtani HH, Alam MK, Waheed M. Comparison of Harmless Acute Pancreatitis Score with Ranson's Score in Predicting the Severity of Acute Pancreatitis. JCPSP 2017;27(2):75-79.
14. Shabir S, Jamal S, Khaliq T, Khan ZM. Comparison of BISAP with Ranson's score in determing the severity of acute pancreatitis. J Coll Physicians Surg Pakistan. 2015; 25:328-31.
15. Bai Y, Liu Y, Jia L, Jiang H, Ji M, Lv N, et al. Severe acute pancreatitis in China: Etiology and mortality on 1976 patients. Pancreas. 2007;35:232-7.
16. Damani SAAR, Islam Z, Rasheed K, Hashami A, Shah SSH. Predicting Severity of pancreatitis and mortality- comparison of BISAP and Ranson scoring systems. J Surg Pakistan. 2016;21(1):9-12.
17. Mofidi R, Patil PV, Suttie SA, Parks RW. Risk assessment in acute pancreatitis. Br J Surg. 2009;96:137-50.
18. Papachristou GI, Muddana V, Yadav D, Connell M. Comparison of BISAP, Ranson's, APACHE-II, and CTSI scores in predicting organ failure, complications, and mortality in acute pancreatitis. Am J Gastroenterol. 2010;105:435- 41.
19. Prem Chnad, Vivek Pahuja, Goldendeep Singh, Paramjit Singh, Vinod Kumar. Assesment of the severity of acute pancreatitis by Ranson's criteria and modified CT severity index. International Journal of Contemporary Medical Research 2017;4(6):1280-1282.

20. Cho JH, Tae Nyeun Kim, Hyun Hee Chung, Kook Hyun Kim.(Comparison of scoring systems in predicting the severity of acute pancreatitis).World J Gastroenterol. 2015;21:2387–94.