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Outcome Analysis of APACHE-II Scoring System in Predicting 30 Days Mortality in Acute Pancreatitis in Tertiary Care Hospital

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ABSTRACT

Objective: To evaluate outcome analysis of Apache-II scoring system in predicting 30 days mortality in acute pancreatitis in tertiary care hospital.

Study Design: Prospective longitudinal study.

Place and Duration of Study: Combined Military Hospital Rawalpindi, Pakistan from August 2023 and December 2023.

Methodology: One hundred patients with acute pancreatitis were examined retrospectively. Individuals who met the Ranson criteria or were hospitalized for>2 months were chosen. Mortality, organ failure, and pancreatic necrosis were the primary outcome measures. On the other hand, the occurrence of organ failure was analyzed with a score of Apache II at admission to the hospital.

Results: The 48-hour score was significantly correlated with organ failure (p=0.001), pancreatic necrosis (p<0.01), and mortality (p<0.01). In contrast, organ failure was the only factor with which the score at admission had a significant relationship (p=.007). A fatal outcome had a considerable connection (p=.03) with declining scores over 48 hours. The overall score of Apache II was substantially higher in non-survivors (p<.001) and was highly correlated with organ failure (p<.001) and pancreatic necrosis (p=.001). In contrast to 74% based on the admission score, 92% of patients had their outcomes correctly predicted by the 48-hour and combined scores.

Conclusion: The 48-hour score has a better prognostic value than the admission score in predicting which individuals with severe acute pancreatitis will have a poor prognosis. A declining APACHE II score 48 hours after admission identifies individuals who are at risk for negative results.

Keywords: APACHE score, Acute mortality, Necrosis, Organ failure, Pancreatitis, Prognosis

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INTRODUCTION

In acute pancreatitis (AP), the prevalence of organ failure and death ranges from 29% to 77% and 29% to 70%, accordingly.[1] For this reason, determining the best course of action for these individuals' treatment depends critically on the mortality prediction. It is commonly said that acute pancreatitis is the worst disease related to the organs of the abdomen, and this recognition dates back thousands of years. Thankfully, acute pancreatitis is a moderate, self-limited condition that responds to conservative therapies in 85% of individuals.[2,3] This is because inflammation causes the illness. Approximately 15% of these individuals will experience potentially deadly issues from necrosis that cannot be treated with straightforward medication support.[4]

Severe acute pancreatitis often has a highly variable and unpredictable clinical certainty.[5] To distinguish between individuals who have mild acute pancreatitis and those who are at high risk for acquiring pancreatitis, several indicators scoring systems have been conducted.[4] Research investigations have extensively used the APACHE II (acute physiology and chronic health evaluation) and Ranson criteria. Several investigators believe that the APACHE II score is better than the Ranson criteria since it can be calculated when hospitalized, and many intensive care units (ICUs) routinely measure it for individual assessment.[6]

A large number of episodes of acute pancreatitis are moderate, have a self-limiting obviously, and require no treatment other than supportive care and parenteral fluid for some time. This is an excellent reason for prompt evaluation of the severity of the condition. Treatment advances for acute severe pancreatitis have mostly been made in the past few decades. Various anti-inflammatory regimens and cytokine agents are two of the newly developed methods.[7] APACHE II, Ranson's, and the bedside index of severity in acute pancreatitis (BISAP) are among the various evaluation methods commonly

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used6 to measure severity and anticipate death in acute severe pancreatitis. Numerous studies have emphasized its significance when assessing the severity of AP; however, a clear contrast of its variations and relationship with the current severity scores in estimating death after AP is lacking.[7,8]

The majority of individuals in these investigations had mild pancreatitis. Earlier researches on prognostic scoring systems concentrated on separating individuals with severe and mild pancreatitis.[9,10] As far as we know, prognostic systems have not been studied for their potential to identify individuals in a preselected group of individuals suffering from severe pancreatitis who will not have a good outcome. This is a significant paradigm shift since, over the last ten years, results from severe pancreatitis have enhanced, necessitating a better definition of the subgroup of individuals who suffer inadequately from severe pancreatitis. This research assesses the effectiveness of the Apache-II scoring system's outcome analysis in forecasting the 30-day mortality rate for acute pancreatitis in tertiary care hospitals.

METHODOLOGY

The study was conducted at Combined Military Hospital Rawalpindi, Pakistan from August to December 2023. The WHO sample size calculator was used to determine the sample size, accounting for a 5.5% reported incidence of acute pancreatitis.[9]

Inclusion Criteria: Patients of either gender with age>18 who had been admitted to the ICU for longer than two days with APACHE II scores at least at admission and for 48 hours afterward, were included.

Exclusion Criteria: Individuals who experienced mild episodes of acute pancreatitis were excluded based on an arbitrary cutoff of seven hospital days. Furthermore, after their acute pancreatitis resolved, patients who were still in the hospital for a planned cholecystectomy were not excluded.

Eighteen (36%) and thirty-two (64%) of the fifty patients in the study met two or more Ranson criteria.[9] According to whether they lived or died in the intensive care unit, the patients were divided into survivors and non-survivors. Age, gender, and coexisting conditions were the demographic variables retrieved and contrasted. The modified Atlanta classification10 was used to categorize the patient's pancreatitis into two groups: necrotizing and acute interstitial edematous. The existence or lack of necrosis on a 48-hour-old contrast-enhanced CT scan of being admitted to the ICU was also noted to verify the medical condition.

A dynamic computed tomographic (CT) scan of the abdomen enhanced with contrast was utilized to identify any non-enhancing pancreatic tissue related to at least 30% of the pancreas, which was considered significant pancreatic necrosis.[11]

The definition of primary acute pancreatitis from Atlanta was applied. According to this categorization, severe acute pancreatitis is defined as having three or more Ranson criteria: an APACHE II score of at least seven days of hospital stay, more than thirty percent pancreatic necrosis, the emergence of a cyst, and organ failure. The Atlanta symposium's standards further defined pancreatic abscess and organ failure. The following data were recorded and evaluated using a retrospective review of the medical records: the prognosis of the patient, the reason for acute pancreatitis, duration of hospitalization, Ranson criteria, evidence of pancreatic necrosis or pancreatic abscess by contrast-enhanced abdominal CT scan, surgeries, advancement of organ failure, and the APACHE II score 48 hours after being hospitalized.

Data was analyzed using the Statistical Package for Social Sciences (SPSS) 22.00. Qualitative analysis was represented by percentage and frequency. The median was calculated for non-normal data and APACHE score. The chi-square test and Mann-Whitney U-test were applied, and the p-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 50 patients were included in this study and were divided into two groups: Survivors and Non Survivors. There was no statistical significance found concerning gender (p-value=0.251), Diagnosis (p-value=0.387), Duration days of stay at mechanical ventilation (p-value=0.387), and infection (p-value=0.630). A comparison of the demographic and clinical parameters of both groups is shown in Table-I. Table-II showed that there was no statistically significant difference between the groups' APACHE score at admission (p-value=0.773) and APACHE score at 48 Hours (p-value=0.290).

DISCUSSION

According to our research, scores of apache and organ failure from the time of admission to 48 hours later were positively correlated with mortality in cases of acute severe pancreatitis.

Table-I: Comparison of Demographic and Clinical Parameters of Study Groups (n=50)

Parameters		Survivors (n=30)	Non survivors (n=20)	*p*-value
Gender	Male Female	19(63.3%) 11(36.7%)	9(45.0%) 11(55.0%)	0.251
Diagnosis	NP IE	17(56.7%) 13(43.3%)	8(40.0%) 12(60.0%)	0.387
Duration days of stay at mechanical ventilation		9.0(12.0-5.0)	9.0(13.5–6.0)	0.387
Infection		10(33.3%)	6(30.0%)	0.630

IE= interstitial edematous, NP= necrotizing pancreatitis

Table-II: Comparison of APACHE Score Among Study Groups (n=50)

Parameters	Survivors (n=30) Median (IQR)	Non-survivors (n=30) Median (IQR)	*p*-value
APACHE score at admission	25.00 (32.30 – 18.75)	25.00 (36.00– 20.00)	0.773
APACHE score at 48 Hours	29.00 (34.00 – 19.75)	33.00 (34.00 – 20.00)	0.290

In a previous research, where a prospective investigation of 190 individuals revealed no deaths, the score was used to distinguish between complex and non-complex pancreatitis from fatal pancreatitis when the individual's peak score was less than ten within the initial three days.[12] Multiple research investigations have since compared and validated the applicability of diverse AP contexts. More accurate comparisons between scores—CT, Japanese severity, harmless AP, sequential organ failure assessment, and outcome analysis of pancreatitis, followed the development of imaging strategies.[13-15] According to our research, the change in the score from being admitted is a reliable indicator of AP mortality.

In a previous study, only 58(19%) of 290 acute pancreatitis attacks were categorized as severe. The researchers discovered that patients with severe acute pancreatitis could be accurately identified at admission based on their APACHE II score. However, our research revealed that the admission score was not predictive of death, organ failure, or pancreatic necrosis, which lessens the significance of measuring it at hospital admission.[16]

Our results appear to be in line with our knowledge of AP as an evolutionary disease process in which individuals are likely to be identified at high risk of difficulties or death despite suitable resuscitation measures when their physiologic evaluation ratings worsen. Over 200 individuals with acute pancreatitis are treated in our hospital each year, ranked according to the outcomes of their clinical examinations. Based on our observations, prognostic scoring systems appear ineffective in differentiating the stage of pancreatitis at the time of hospital admission.

Over the last twenty years, there has been a notable improvement in treating severe acute pancreatitis, and the overall mortality rate for individuals with severe pancreatitis has dropped to less than 14%.[17,18] Individuals who experience a fulminant course (3 out of 4 mortality) and those who need more than one debridement, which is linked to ICU stay, hospital stay, and an increased rate of death, comprise a small subgroup that accounts for the majority of the deaths.[19]

To our understanding, in a predefined population of individuals with severe pancreatitis, the prognostic scoring systems' function in determining the subgroup with a poor prognosis has not yet been established.[20,21] To achieve this, we looked at the correlation between a group of individuals with severe pancreatitis and their score and negative results in the current study. 84% of the individuals in the current research met the criteria for severe pancreatitis according to the Atlanta classification of severe acute pancreatitis, which we used in this investigation. Our patients were sick overall; of them, 44% were admitted to the ICU, and 55% showed signs of organ failure.

The 48-hour score evaluations and the total of the admission and 48-hour scores correctly predicted the occurrence of substantial pancreatic necrosis, organ failure, and fatalities. Additionally, compared to survivors, individuals who passed away from acute pancreatitis experienced a marked decline in their score in the first 48 hours following admission. Seven out of nine patients who died later had declining APACHE II scores 48 hours after admission. Our findings imply that the score may help determine an individual's risk category for severe pancreatitis. Additionally, declining scores within the first 48 hours of admission could be a warning indication of impending deaths from severe acute pancreatitis.

Nevertheless, our study does have a few drawbacks. First, only persistent organ failure is considered in our research; the precise timing of organ failure is not accessible. Second, the observations may

vary depending on how long there is a lag between the score documentation. Third, it is unlikely that the recurrent pancreatitis individuals with drainage processes done before admission would show comparable changes. Lastly, every flaw in a retrospective design has the potential to directly or indirectly affect our results.

To enhance care for individuals with severe acute pancreatitis, additional studies focusing on CT standards may be able to determine the subgroup of sick individuals who have a poor prognosis.[22,23] This could lead to the possibility of targeted therapy.[24]

CONCLUSION

In conclusion, in a chosen population of individuals suffering from severe pancreatitis, this research has shown that the score 48 hours after being admitted had a higher predictive value than the admission score to determine the likelihood of pancreatic necrosis, organ destruction, and mortality. Moreover, individuals suffering from severe acute pancreatitis showed a significant correlation between mortality and a declining score. Individuals with severe acute pancreatitis may be classified into a subgroup that has a worse prognosis based on the APACHE II score, which is determined repeatedly.

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Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

MAL & WAK: Conception, study design, drafting the manuscript, approval of the final version to be published.

IA & AH: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

AT & MBSN: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Halonen KI, Pettilä V, Leppäniemi AK, Kemppainen EA, Puolakkainen PA, Haapiainen RK, et al. Multiple organ dysfunction associated with severe acute pancreatitis. Crit Care Med 2002; 30(6): 1274-1279. https://doi.org/10.1097/00003246-200206000-00019
2. Dobszai D, Mátrai P, Gyöngyi Z, Csupor D, Bajor J, Erőss B, et al. Body-mass index correlates with severity and mortality in acute pancreatitis: a meta-analysis. World J Gastroenterol 2019; 25(6): 729. https://doi.org/10.3748/wjg.v25.i6.729
3. Garg PK, Singh VP. Organ failure due to systemic injury in acute pancreatitis. Gastroenterol 2019; 156(7): 2008-2123. https://doi.org/10.1053/j.gastro.2018.12.04
4. Goodchild G, Chouhan M, Johnson GJ. Practical guide to the management of acute pancreatitis. Front Gastroenterol 2019; 10(3): 292-299. https://doi.org/10.1136/flgastro-2018-101102
5. Li S, Zhang Y, Li M, Xie C, Wu H. Serum albumin, a good indicator of persistent organ failure in acute pancreatitis. BMC Gastroenterol 2017; 17: 1-6. https://doi.org/10.1186/s12876-017-0615-8
6. 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. https://doi.org/10.1177/0004563213480712
7. Garret C, Péron M, Reignier J, Le Thuaut A, Lascarrou JB, Douane F, et al. Risk factors and outcomes of infected pancreatic necrosis: Retrospective cohort of 148 patients admitted to the ICU for acute pancreatitis. Unit Eur Gastroenterol J 2018; 6(6): 910-918. https://doi.org/10.1177/2050640618764049
8. Kuo DC, Rider AC, Estrada P, Kim D, Pillow MT. Acute pancreatitis: what's the score?. J Emerg Med 2015; 48(6): 762-770. https://doi.org/10.1016/j.jemermed.2015.02.018
9. 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. the American Coll Gastroenterol 2010; 105(2): 435-441. https://doi.org/10.1038/ajg.2009.622
10. Schuetz P, Christ-Crain M, Muller B. Procalcitonin and other biomarkers to improve assessment and antibiotic stewardship in infections--hope for hype?. Swiss Med Weekly 2009; 139(23): 318. https://doi.org/10.4414/smw.2009.12584
11. Siregar GA, Siregar GP. Management of severe acute pancreatitis. Open access Macedon J Med Sci 2019; 7(19): 3319. https://doi.org/10.3889/oamjms.2019.720
12. Vijay Ganapathy S, Karthikeyan VS, Sreenivas J, Mallya A, Keshavamurthy R. Validation of APACHE II scoring system at 24 hours after admission as a prognostic tool in urosepsis: A prospective observational study. Invest Clin Urol 2017; 58(6): 453-459. https://doi.org/10.4111/icu.2017.58.6.453
13. Donnino MW, Salciccioli JD, Dejam A, Giberson T, Giberson B, Cristia C, et al. APACHE II scoring to predict outcome in post-cardiac arrest. Resuscitation 2013; 84(5): 651-656. https://doi.org/10.1016/j.resuscitation.2012.10.024
14. Schepers NJ, Bakker OJ, Besselink MG, Ali UA, Bollen TL, Gooszen HG, et al. Impact of characteristics of organ failure and infected necrosis on mortality in necrotising pancreatitis. Gut 2019; 68(6): 1044-1051. https://doi.org/10.1136/gutjnl-2017-314657
15. 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. American Coll Gastroenterol 2010; 105(2): 435-441. https://doi.org/10.1038/ajg.2009.622
16. 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 2018; 6(2): 127-131. https://doi.org/10.1093/gastro/gox029
17. Jeong S. Scoring systems for the patients of intensive care unit. Acute Crit Care 2018; 33(2): 102. https://doi.org/10.4266/acc.2018.00185

18. Saleh A, Ahmed M, Sultan I, Abdel-Lateif A. Comparison of the mortality prediction of different ICU scoring systems (APACHE II and III, SAPS II, and SOFA) in a single-center ICU subpopulation with acute respiratory distress syndrome. Egypt J Chest Dis Tuberculosis. 2015; 64(4): 843-848. https://doi.org/10.1016/j.ejcdt.2015.05.012
19. Lee H, Lim CW, Hong HP, Ju JW, Jeon YT, Hwang JW, et al. Efficacy of the APACHE II score at ICU discharge in predicting post-ICU mortality and ICU readmission in critically ill surgical patients. Anaesth Intens Care 2015; 43(2): 175-186. https://doi.org/10.1177/0310057X1504300206
20. Edipoglu IS, Dogruel B, Dizi S, Tosun M, Çakar N. The association between the APACHE-II scores and age groups for predicting mortality in an intensive care unit: a retrospective study. Roman J Anaesth Intens Care 2019; 26(1): 53-58. https://doi.org/10.2478/rjaic-2019-0008
21. Garcea G, Gouda M, Hebbes C, Ong SL, Neal CP, Dennison AR, et al. Predictors of severity and survival in acute pancreatitis: validation of the efficacy of early warning scores. Pancreas 2008; 37(3): e54-61. https://doi.org/10.1097/MPA.0b013e3181771451
22. Waller A, Long B, Koyfman A, Gottlieb M. Acute pancreatitis: updates for emergency clinicians. J Emerg Med 2018; 55(6): 769-779. https://doi.org/10.1016/j.jemermed.2018.08.009
23. Venkataraman R, Gopichandran V, Ranganathan L, Rajagopal S, Abraham BK, Ramakrishnan N, et al. Mortality prediction using acute physiology and chronic health evaluation II and acute physiology and chronic health evaluation IV scoring systems: Is there a difference?. Indian J Crit Care Med 2018; 22(5): 332. https://doi.org/10.4103/ijccm.IJCCM_422_17
24. Metri A, Bush N, Singh VK. Predicting the severity of acute pancreatitis: Current approaches and future directions. Surg Open Sci 2024; 19: 109-117. https://doi.org/10.1016/j.sopen.2024.03.012