ORIGINAL RESEARCH

Assessing Clinical Prognostic Indicators in Acute Pancreatitis Using the APACHE II Score

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ABSTRACT

Background: Acinar components may be damaged or destroyed as a result of pancreatitis, an inflammation of the glandular parenchyma. The present study was conducted to assess the prognosis in patients with acute pancreatitis by using the APACHE II scoring system.

Materials & Methods: 52 patients with a clinical diagnosis of acute pancreatitis of both genders were given scores based on the APACHE II Severity of the Disease Classification System. The patient outcomes' end points were divided into two categories: uncomplicated or complicated.

Results: Out of 52 patients, 30 were males and 22 were females. Uncomplicated outcome was seen in 34 patients. In this, APACHE II score was 0-5 in 12, 6-10 in 15, 11-15 in 4 and >15 in 3 patients. In complicated outcome, pseudocyst was seen in 7, necrosis/ abscess in 8, major organ failure in 3 patients. The difference was significant (P< 0.05). On admission, sensitivity, specificity, PPV and NPV in patients with APACHE II≥9at admission was 74%, 63%, 58% and 77%. In APACHE II≥10 was 54%, 2%, 67% and 79% and in patients with APACHE II≥12 was 50%, 85%, 74% and 73% respectively. The difference was significant (P< 0.05).

Conclusion: The fate of patients with acute pancreatitis is accurately predicted by the APACHE II scores that are determined at the time of admission. Because it considers all of the significant risk factors that affect the patient outcome, this scoring method is better than others, such as Ranson's criteria.

Keywords: Acute pancreatitis, Pseudocyst, APACHE II, Prognosis

INTRODUCTION

Acinar components may be damaged or destroyed as a result of pancreatitis, an inflammation of the glandular parenchyma. The clinical course of acute pancreatitis, a frequent and possibly fatal acute inflammatory disease, varies greatly.[1] From modest edema to severe pancreatic necrosis, acute pancreatitis encompasses a wide variety of conditions. It can manifest as anything from a simple, self-limiting stomach ache to a serious infection that can quickly result in sepsis, multiple organ failure, and death.[2] Patients need constant laboratory and radiographic testing, as well as acute care and hemodynamic monitoring. The severity and prognosis of acute pancreatitis have been predicted using a number of different methods. These include of imaging methods, biochemical indicators, multifactor scoring, and clinical evaluation.[3] Numerous biochemical factors have been investigated in acute pancreatitis and have been shown to be reliable indicators of the severity of the condition, in addition to a number of multifactorial grading systems. As of yet, no one marker has been identified as the best way to predict the severity of acute pancreatitis.[4] To anticipate the attack's severity and overall prognosis, numerous prognostic markers have been found and grading systems have been developed.[5] The Simplified Acute Physiology Score (SAPS), the Acute Physiology And Chronic-Health Evaluation score (APACHE II), the Medical Research Council Sepsis score (MRCS), Ranson's criteria, and LMI's Glasgrow system are a few of the scoring schemes in use.[6] Each of these scoring systems has its own limitations including the low sensitivity and specificity, complexity of the scoring system as well as inability to obtain a final score until 48 hours after admission.[7]

AIM & OBJECTIVES

Aim

To evaluate the clinical prognostic value of the APACHE II (Acute Physiology and Chronic Health Evaluation II) scoring system in predicting outcomes in patients with acute pancreatitis.

Objectives

1. To assess the severity of acute pancreatitis in hospitalized patients using the APACHE II scoring system at the time of admission.
2. To correlate APACHE II scores with clinical outcomes, categorized as uncomplicated or complicated (pseudocyst, necrosis/abscess, or major organ failure).
3. To determine the diagnostic accuracy (sensitivity, specificity, positive predictive value, and negative predictive value) of different APACHE II cut-off scores in predicting complications.
4. To identify the optimal APACHE II score threshold for early detection of severe disease and guide clinical decision-making.

MATERIALS & METHODS

Study Design
This was a prospective observational study conducted to assess clinical prognostic indicators in patients diagnosed with acute pancreatitis using the APACHE II severity scoring system.

Study Population
A total of 52 patients clinically diagnosed with acute pancreatitis were included in the study. The patients were of both genders and provided written informed consent to participate.

Study Place
The study was conducted in the Department of General Surgery, Mata Gujri Memorial Medical College & Lions Seva Kendra Hospital (MGMMC), Kishanganj, Bihar, India. All patients were admitted to the inpatient department for observation and treatment.

Study Period
The study was conducted over a period of 18 months, from June 2009 to November 2010.

Ethical Considerations
Written informed consent was obtained from all participants.
The study protocol adhered to the principles outlined in the Declaration of Helsinki.
Approval from the Institutional Ethics Committee (IEC) was obtained prior to initiation of the study.

Inclusion Criteria
- Patients were eligible for inclusion if they met the following criteria:
- Clinical diagnosis of acute pancreatitis confirmed by:
  o Serum amylase levels exceeding 1000 IU/L, or
  o Imaging evidence of pancreatitis on abdominal ultrasonography or contrast-enhanced computed tomography (CECT).

Exclusion Criteria
- Patients with chronic pancreatitis
- Patients with pancreatic malignancies
- Pregnant women
- Patients unwilling to provide consent
- Incomplete medical records

Study Procedure
- Upon admission, all patients diagnosed with acute pancreatitis were evaluated clinically and biochemically.
- Demographic data including name, age, gender, and clinical presentation were recorded.
- The APACHE II scoring system, as proposed by Knaus et al., was applied to each patient to assess disease severity.
- Patients were monitored for clinical progression and categorized based on outcome endpoints as either:
  o Uncomplicated
  o Complicated

Investigations
- **Biochemical Test:** Serum amylase levels (≥1000 IU/L used as a diagnostic threshold)
- **Imaging:**
  o **Abdominal ultrasonography**
  o **Contrast-enhanced computed tomography (CECT)** for detection of:
    ▪ Pancreatic necrosis
    ▪ Pseudocyst or abscess

Outcome Measures

The primary outcome was the classification of **patient outcomes** as:

- **Uncomplicated**
- **Complicated**, defined as:
  - **Local complications:**
    - Necrosis (identified by CT or surgery)
    - Pseudocyst or abscess (detected via ultrasound or CT)
  - **Systemic complications:**
    - Major organ failure, such as acute respiratory insufficiency (e.g., reduced PO_2)

Statistical Analysis

- Data was analyzed using **SPSS version 15.0** (SPSS Inc., Chicago, IL, USA).
- **Qualitative variables** (e.g., gender, outcome type) were analyzed using: **Chi-square test**
- **Quantitative variables** (e.g., APACHE II scores) were analyzed using:
  - **Student's t-test** for normally distributed data
  - **Mann-Whitney U test** for non-parametric data
- A **p-value < 0.05** was considered statistically significant.

RESULTS

Table 1: Gender wise distribution of patients

Total- 52		
Gender	Male	Female
Number	30	22

Table I shows that out of 52 patients, 30 were males and 22 were females.

Table 2: Outcome of patients

Outcome APACHE II score	Uncomplicated outcome	Complicated			Total
		Pseudocyst	Necrosis/ Abscess	Major organ failure	
0-5	12	0	0	0	12
6-10	15	0	3	0	18
11-15	4	2	3	1	10
>15	3	5	2	2	12
Total	34	7	8	3	52

Table 2 presents the distribution of clinical outcomes in patients with acute pancreatitis based on their APACHE II scores at admission, categorized into two broad groups: uncomplicated and complicated outcomes. Complicated outcomes were further sub-classified into pseudocyst formation, pancreatic necrosis/abscess, and major organ failure.

Among the 12 patients with an APACHE II score of 0–5, all had uncomplicated outcomes, with no complications reported. This indicates that patients with low scores typically had a mild disease course.

In the 6–10 score range, 15 patients had uncomplicated outcomes, while 3 patients developed necrosis or abscesses. No cases of pseudocyst or major organ failure were seen in this group, suggesting a moderate risk of complications with increasing score.

In patients with scores ranging from 11–15, only 4 had uncomplicated outcomes, while 6 patients developed complications—2 developed pseudocysts, 3 developed necrosis or abscess, and 1 developed major organ failure. This trend shows a rise in the incidence and severity of complications with higher APACHE II scores.

For patients with APACHE II scores greater than 15, the majority experienced complications. Only 3 had uncomplicated outcomes, while the remaining 9 patients developed one or more complications— 5 had pseudocysts, 2 had necrosis/abscess, and 2 developed major organ failure. This group had the highest burden of complications, indicating that APACHE II >15 is strongly associated with severe disease.

In total, 34 out of 52 patients (65.4%) had uncomplicated outcomes, while 18 patients (34.6%) experienced complications, including 7 with pseudocysts, 8 with necrosis or abscess, and 3 with major organ failure. The distribution across score categories demonstrates a clear correlation between increasing APACHE II scores and the likelihood of developing complications, which was found to be statistically significant ($P < 0.05$). This underscores the utility of APACHE II scoring in predicting the severity and potential complications in acute pancreatitis.
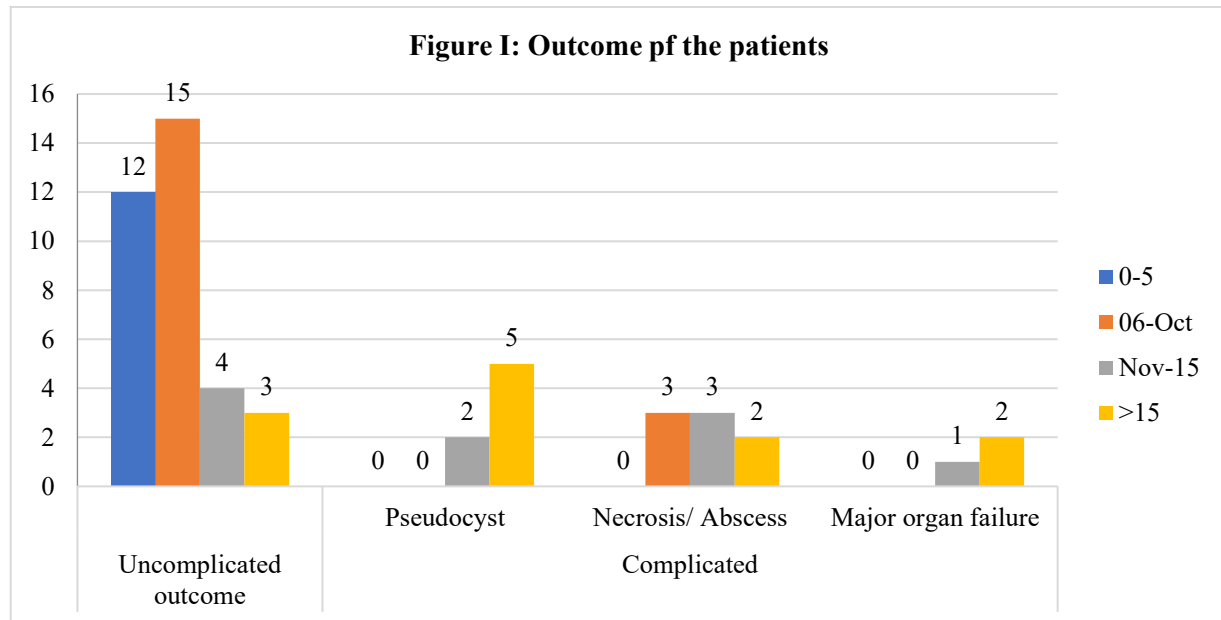

Figure I: Outcome pf the patients

Table 3: Diagnostic value

On admission	Sensitivity	Specificity	PPV	NPV	P value
APACHE II≥9	74%	63%	58%	77%	0.05
APACHE II≥10	54%	72%	67%	79%	0.04
APACHE II≥12	50%	85%	74%	73%	0.02

Table 3 illustrates the diagnostic performance of the APACHE II score at different threshold levels (≥9, ≥10, and ≥12) for predicting complications in patients with acute pancreatitis at the time of admission.

When the cut-off value was set at APACHE II ≥9, the sensitivity was 74%, indicating that this threshold could correctly identify 74% of patients who eventually developed complications. The specificity at this level was 63%, meaning it correctly identified 63% of those who did not develop complications. The positive predictive value (PPV) was 58%, showing that 58% of patients with a score ≥9 actually had complications, while the negative predictive value (NPV) was 77%, indicating that 77% of those with a score <9 had an uncomplicated outcome. The p-value of 0.05 suggests that these results are statistically significant.

At a higher threshold of APACHE II ≥10, sensitivity dropped to 54%, reflecting a lower ability to detect all complicated cases, but specificity increased to 72%, improving the accuracy in identifying uncomplicated cases. The PPV improved to 67%, and the NPV increased to 79%, suggesting a better predictive value for excluding complications. The p-value was 0.04, indicating statistical significance.

With a further increase in the threshold to APACHE II ≥12, sensitivity further decreased to 50%, but specificity rose markedly to 85%, making it a strong indicator for ruling in uncomplicated cases. The PPV was highest at 74%, suggesting that patients with APACHE II scores ≥12 had a high likelihood of developing complications. The NPV remained satisfactory at 73%, and the p-value was 0.02, showing the strongest statistical significance among all three thresholds.

DISCUSSION

Early disease severity grading is crucial for patients with acute pancreatitis in order to plan for prompt interventional procedures, such as ERCP in biliary pancreatitis, and to provide the best supportive

care possible in intensive units, high dependency units, or wards, particularly with limited health care resources.[8] Approximately 50% of fatalities, primarily from multi-organ failure syndrome, happen within a week following the incident.[9] Severe instances are difficult to detect before two to three days after the onset of symptoms, by which time the network of pathophysiological pathways causing multi-organ failure syndrome has been created.[10] A single test, a high negative predictive value, universal availability, reproducibility, and affordability would characterize the perfect prognostic system.[11]The present study was conducted to assess the prognosis in patients with acute pancreatitis by using the APACHE II scoring system.

We found that out of 52 patients, 30 were males and 22 were females. Larvin et al.[12] performed evaluation and monitoring of acute pancreatitis in 290 attacks. Attacks were graded mild (231) if uncomplicated, or severe (59) when major organ failure or a pancreatic collection occurred. Only APACHE-II scores were available at the time of admission; they correctly predicted outcome in 77% of attacks and identified 63% of severe attacks, compared with 44% achieved by clinical assessment. After 48 hours, APACHE-II was most accurate, and correctly predicted outcome in 88% of attacks, compared with 69% for Ranson and 84% for Imrie scores. APACHE-II predicted 73% of pancreatic collections at 48 h, compared with 65% for Ranson and 58% for Imrie scores. In acute pancreatitis, APACHE-II may facilitate rapid selection of patients for intensive therapy or clinical trials, improve comparison between groups of patients, and indicate that a pancreatic collection is probable.

We found that uncomplicated outcome was seen in 34 patients. In this, APACHE II score was 0-5 in 12, 6-10 in 15, 11-15 in 4 and >15 in 3 patients. In complicated outcome, pseudocyst was seen in 7, necrosis/ abscess in 8, major organ failure in 3 patients. De Sanctis et al.[13] investigated the correlation between established contrast-enhanced computed tomography (CECT) criteria of disease severity in acute pancreatitis and the APACHE (Acute Physiology and Chronic Health Evaluation) II score and assessed the utility of each as prognostic indicators in acute pancreatitis. No statistically significant correlation existed between the APACHE II score and CECT grade, the degree of necrosis, or the CECT severity index. Only the CECT grade and severity index correlated significantly with the occurrence of local complications (P = 0.0035 and 0.0048, respectively). The APACHE II score was superior to the CECT grade as a predictor of the need for ICU admission (P = 0.022 vs P = 0.035), and no other CECT criteria was a significant predictor of ICU admission.

We found that on admission, sensitivity, specificity, PPV and NPV in patients with APACHE II≥9at admission was 74%, 63%, 58% and 77%. In APACHE II≥10 was 54%, 2%, 67% and 79% and in patients with APACHE II≥12 was 50%, 85%, 74% and 73% respectively. Paredes – Cotore et al.[14] observed that out of 113 patients, biliary etiology was found in 93 cases, (average age: 63 years) and 66% females. The diagnostic accuracy of Ranson, Imrie, Osborne and apache II scores were analyzed. There were complications in 12%, and mortality was 8%. Among all the systems analyzed the Ranson criteria achieved the highest sensitivity (79%), although sensitivity was improved with Apache II at admission to the hospital (86%). We have obtained the best specificity with the Apache II (89%) and with the Osborne criteria (88%). The modification of Ranson's criteria for biliary etiology didn't improve the sensitivity (56%) to detect severe cases of acute pancreatitis.

LIMITATIONS OF THE STUDY

- Single-centre study with a relatively small sample size (n=52), which may limit the generalizability of the findings.
- Short follow-up period; long-term outcomes such as recurrence or chronic pancreatitis were not assessed.
- Only APACHE II score was evaluated; other established severity indices like Ranson's criteria, BISAP, or CT Severity Index were not compared.
- Some subjectivity in imaging interpretation (e.g., ultrasound or CT findings) may have affected complication classification.
- Potential observer bias in score calculation and outcome categorization could not be fully eliminated.

CONCLUSION

Author found that the fate of patients with acute pancreatitis is accurately predicted by the APACHE II scores that are determined at the time of admission. Because it considers all of the significant risk

factors that affect the patient outcome, this scoring method is better than others, such as Ranson's criteria. The APACHE II score is a reliable prognostic tool for acute pancreatitis, with higher scores strongly associated with increased risk of complications. A score ≥12 offers the best specificity and predictive value for identifying severe cases. Early APACHE II assessment can aid in risk stratification and guide clinical decision-making.

ACKNOWLEDGEMENT

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