Section: Gastroenterology

Original Research Article

# COMPARATIVE STUDY OF BEDSIDE INDEX OF SEVERITY IN ACUTE PANCREATITIS AND ACUTE PHYSIOLOGY AND HEALTH IN ACUTE (APACHE-II) SCORE IN ACUTE PANCREATITIS

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## ABSTRACT

**Background:** Identification of acute pancreatitis (AP) has a new prognostic scoring system, BISAP, which has been proposed as an accurate method for early detection of mortality, and APACH-II, which predicts the severity of pancreatic necrosis mortality and organ failure. **Materials and Methods:** 50 adult patients with AP have been studied. We evaluated APACHE II and BISAP scores in addition to laboratory and radiological findings to predict the severity of AP. **Result:** Clinical and laboratory findings in severe acute pancreatitis were observed, both scores were evaluated, and significant results were noted. The APACHE-II score > 8 group had 17 patients, and 7 were found to have SAP. The APACHE-II <8 group had 33 patients, and 4 had SAP. BISAP score ≥ 2 had 21 patients, and 9 had SAP. BISAP ≤ 2 score had 29 patients, and 2 had SAP. Moreover, significant sensitivity, specificity, PPV, and NPV were observed in BISAP and APACHE-II. **Conclusion:** APACHE-II emerged as the most reliable scoring system, followed by BISAP, to predict the SAP and mortality of the patients.

## INTRODUCTION

Acute pancreatitis (AP) is defined as an inflammatory process of the pancreases with possible peripancratic tissue and multi-organ involvement inducing multi-organ dysfunction syndrome (MODS) with an increased mortality rate.[1] Multi-organ dysfunction syndrome, the extent of pancreatic necrosis, infection, and sepsis are the major determinants of mortality in AP.[2] Pancreatic necrosis is considered a potent risk for infection, which represents the primary cause of late mortality. Occurrence of acute respiratory failure, cardiovascular failure (CVF), and renal failure (RF) can predict the fatal outcome in severe acute pancreatitis (SAP).[3] A wide range of (20% - 60%) mortality has been reported in SAP globally. Acute pancreatitis (AP) occurs when pancreatic enzymes are prematurely activated inside the pancreas, leading to auto-digestion of the gland and local inflammation. These enzymes can also reach the bloodstream, stimulating the production of inflammatory cytokines and tumor necrosis factor-α (TNF-α). From leukocytes Release of these organs triggers an inflammatory cascade, which leads to SAP.[4] Hence an attempt is made to compare BISAP and APACHE-II scores in pancreatitis patients.

## MATERIALS AND METHODS

50 adult patients having acute pancreatitis admitted to the surgery and medicine departments at Narayana Medical College, Nellore-524002, Andhra Pradesh, were studied.

**Inclusive Criteria**

Patients with symptoms of acute pancreatitis, laboratory and/or radiological evidence of acute pancreatitis, and patients who gave their consent in writing were selected.

**Exclusion Criteria**

Patients less than 15 years of age, cases of chronic pancreatitis, hereditary pancreatitis, traumatic pancreatitis, and immunocompromised patients were excluded from the study.

**Method:** Patients with acute pancreatitis were admitted and resuscitated with nasogastric decompression, IV fluids, analgesics, and electrolyte imbalance correction. Laboratory and radiological investigations were carried out according to the pro proforma. APACHE-II scores ranging from 0 to 71 and BISAP scores ranging from 0 to 5 were calculated from the worst parameters in the first 24 hours. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated for each score.


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The duration of the study was May 2023 to March 2025.

**Statistical Analysis:** Clinical and laboratory parameters in acute pancreatitis patients were collected, and scores of both APACHE-II and BISAP were compared with z test. Various clinical parameters of pancreatitis were classified with percentages. The statistical analysis was carried out in SPSS software. The ratio of male and females was 2:1.

## RESULTS

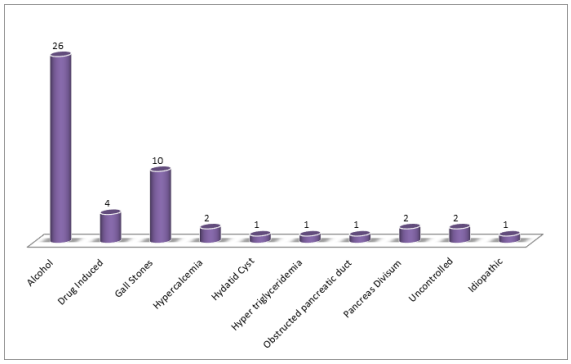


**Figure 1: Clinical manifestation of acute pancreatitis**

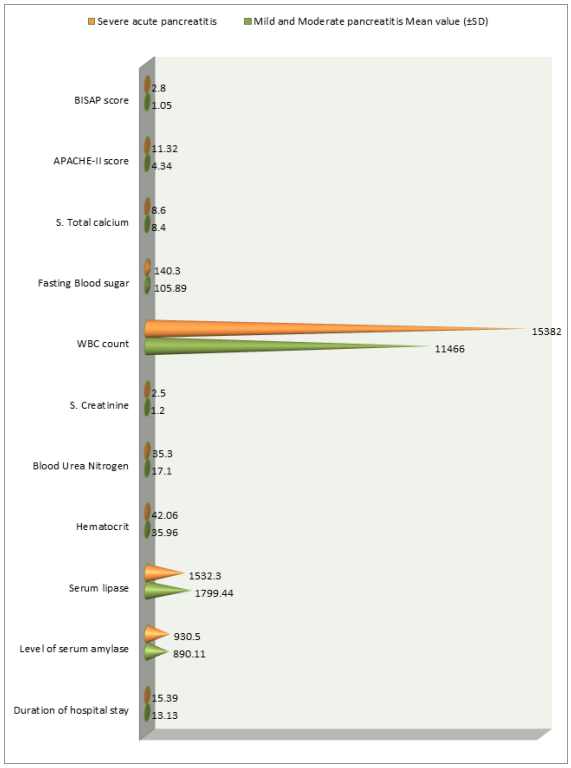


**Figure 2: Comparative study of laboratory parameters in Mild to moderate and severe acute pancreatitis**

[Table 1] Clinical Manifestation of acute pancreatitis: 26 (52%) Alcoholic, 4 (8%) Drug induced, 10 (20%) had Gall stones, 2 (4%) had Hypercalcaemia, 1 (2%) had Hypertriglyceridemia and 1 (2%) hydatid cyst, 1 (2%) hypertriglyceride, 1 (2%) Obstructed pancreatic duct, 2 (4%) had Pancreas divisum, 2 (4%) had uncontrolled diabetes, 1 (2%) Idiopathic.

[Table 2] Comparative study of laboratory parameters in mild to moderate versus severe acute pancreatitis: Duration of hospital, level of serum amylase, S. lipase, Hematocrit, Blood urea Nitrogen, serum creatinine, WBC count, Fasting Blood sugar, APACHE-II, BIASP score had significant p value ($p<0.001$) (Except Total S. ca.cium parameter which study had insignificant p value $p>0.564$)

[Table 3] Study of acute pancreatitis as per the score: 17 (34%) patients had ≥8 and 7 (14%) had severe pancreatitis. 33 (66%) had ≤8 score and 4 (8%) had severe pancreatitis. BISAP score 21 (42%) had ≥2 and 9 (18%) severe pancreatitis, 29 (58%) had ≤ BISAP score 2 (4%) had severe pancreatitis

[Table 4] Sensitivity, specificity, positive predictive value, physiology and chronic health evaluation APACHE-II and BISAP

Sensitivity in Apache-II had 63 and 74.02 specificity pp value 41.34 and Negative value 86.18

Sensitivity in BISP as 83, specificity was 68.68 pp value 42.24 and negative value was 94.02.

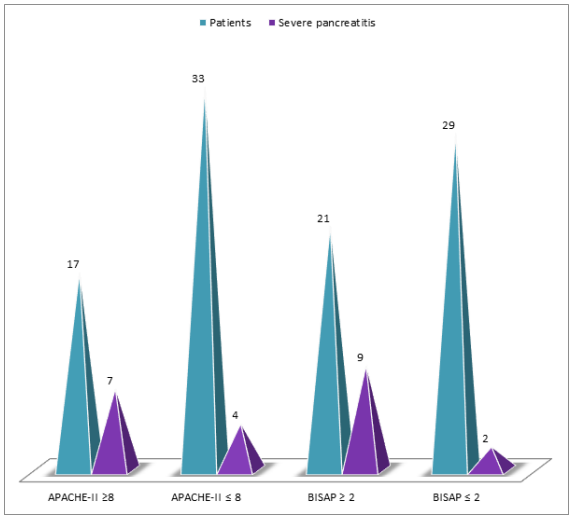


**Figure 3: Severity of acute pancreatitis as per the scores**

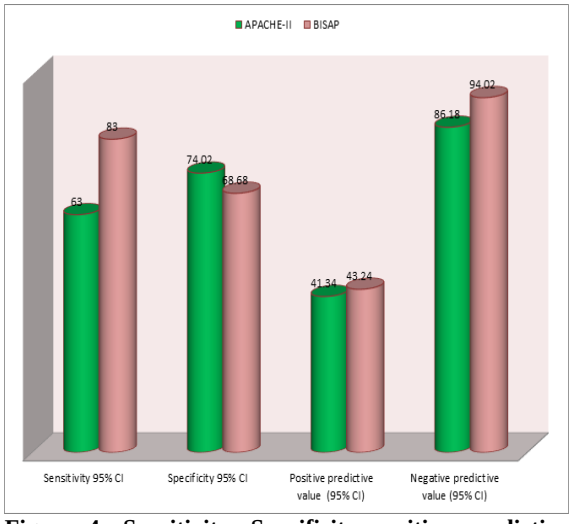


**Figure 4: Sensitivity, Specificity positive predictive value, physiology and chronic health evaluation II (APACHE-II) and Bedside Index, Index of severity in acute pancreatitis (BISAP).**


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**Table 1: Clinical manifestation of acute pancreatitis**

| Sl. No | Aetiology of Pancreatitis | No. of Patients (50) | Percentage % |
|---|---|---|---|
| 1 | Alcohol | 26 | 52 |
| 2 | Drug Induced | 4 | 8 |
| 3 | Gall Stones | 10 | 20 |
| 4 | Hypercalcemia | 2 | 4 |
| 5 | Hydatid Cyst | 1 | 2 |
| 6 | Hyper triglyceridemia | 1 | 2 |
| 7 | Obstructed pancreatic duct | 1 | 2 |
| 8 | Pancreas Divisum | 2 | 4 |
| 9 | Uncontrolled | 2 | 4 |
| 10 | Idiopathic | 1 | 1 |

**Table 2: Comparative study of laboratory parameters in Mild to moderate and severe acute pancreatitis.**

| Parameters | Mild and Moderate pancreatitis Mean value (±SD) | Severe acute pancreatitis | t test value | p value |
|---|---|---|---|---|
| Duration of hospital stay | 13.13 (± 2.28) | 15.39 (± 3.38) | 2.77 | P<0.001 |
| Level of serum amylase | 890.11 (±50.2) | 930.50 (± 68.8) | 2.37 | P<0.001 |
| Serum lipase | 1799.44 (± 136.2) | 1532.30 (±118.3) | 7.40 | P<0.001 |
| Hematocrit | 35.96 (± 6.18) | 42.06 (± 8.20) | 2.97 | p<0.001 |
| Blood Urea Nitrogen | 17.10 (± 3.30) | 35.30 (± 4.06) | 17.3 | P<0.001 |
| S. Creatinine | 1.20 (± 0.78) | 2.50 (± 1.02) | 5.00 | P<0.001 |
| WBC count | 11466 (± 518.2) | 15382 (± 528.6) | 41.0 | P<0.001 |
| Fasting Blood sugar | 105.89 (± 58.30) | 140.30 (± 50.36) | 2.23 | P<0.001 |
| S. Total calcium | 8.4 (± 1.03) | 8.60 (± 1.38) | 0.58 | p> 0.564 (insignificant) |
| APACHE-II score | 4.34 (± 2.28) | 11.32 (± 5.05) | 6.29 | P<0.001 |
| BISAP score | 1.05 (± 0.5) | 2.8 (± 1.20) | 3.95 | p<0.001 |

**Table 3: Severity of acute pancreatitis as per the scores**

| Score | Patients | Severe pancreatitis |
|---|---|---|
| APACHE-II ≥8 | 17 (34%) | 7 (14%) |
| ≤ 8 | 33 (66%) | 4 (8%) |
| BISAP ≥ 2 | 21 (42%) | 9 (18%) |
| ≤ 2 | 29 (58%) | 2 (4%) |

**Table 4: Sensitivity, Specificity positive predictive value, physiology and chronic health evaluation II (APACHE-II) and Bedside Index, Index of severity in acute pancreatitis (BISAP)**

| Scores | Sensitivity 95% CI | Specificity 95% CI | Positive predictive value (95% CI) | Negative predictive value (95% CI) |
|---|---|---|---|---|
| APACHE-II | 63.00 | 74.02 | 41.34 | 86.18 |
| | 35.06-82.85 | 61.52-85.38 | 30.02-56.42 | 79.20-92.56 |
| BISAP | 83 | 68.68 | 43.24 | 94.02 |
| | 58.32-96.17 | 58.12-82.24 | 35.42-55.30 | 83.22-97.18 |

## DISCUSSION

Present comparative study of BISAP and APACHE-II scores in acute pancreatitis. The clinical manifestations include 10 (20%) G.B. stone, 2 (4%) had hypercemia, 1 (2%) hydatid cyst, 1 (2%) hypertriglyceridemia, 2 (4%) obstructed pancreatic duct, 2 (4%) pancreas divisum, 2 (4%) uncontrolled diabetes, and 1 (2%) idiopathic [Table 1]. Comparative study of laboratory parameters in mild to moderate versus severe acute pancreatitis had a significant p-value ($p < 0.001$) except for total serum calcium [Table 2]. The severity of acute pancreatitis as per the score was 17 (34%) had ≥8 score and 7 (14%) had severe pancreatitis, and 33 (66%) had ≤8 score and 4 (8%) had severe pancreatitis. In the BISAP score study, 21 (42%) had >2 and 9 (18%) had severe pancreatitis, 29 (58%) had ≤1, and 2 (4%) had a severe score [Table 3]. In the study of sensitivity, specificity, positive predictive value, APACHE-II, and BISAP. In APACHE-II, the score is 63.00 specificity and 74.02 specificity. 41.34 pp value 86.18 negative predictive values. In BISAP, 83 sensitivity, 68.68 specificity, 43.29 PP value, and 94.02 negative predictive value [Table 4] These findings are more or less in agreement with previous studies.[5-7]

The pathophysiology of acute pancreatitis is generally considered in three phases. In the first phase there is activation of trypsin; once trypsin is activated, it activates a variety of injurious pancreatic digestive enzymes. In the second phase, there is intrapancreatic inflammation through a variety of mechanisms and pathways. In the third phase, there is extra pancreatic inflammation, including acute respiratory distress syndrome (ARDS).

The APACHE-II score was calculated from 12 admission physiologic variables comprising the Acute Physiology Score (APS), the patient's age, and chronic health status. The APS is determined from the most deranged (worst) physiologic value, e.g., the lowest BP or highest respiratory rate during the initial 24 hours of admission. The 24-hour period ensures that all pertinent physiologic values are available, and clinical judgment ensures that each value is legitimate. Because severity of ofdisease


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significantly reduces the probability of survival during acute illness, APACHE-II is a reliable and useful means of classifying ICU patients. Increased Acute Physiological Scores (APS) are associated with increased risk of subsequent hospital death.[8] APACHE-II has also proved useful in evaluating outcomes from intensive care and in comparing the success of different treatment protocols.[9]

Severe acute pancreatitis (SAP) implies the presence of organ failure, local complications, or pancreatic necrosis. The sensitivity and specificity of these scores predict the SAP range to be between 55% and 90%, depending on the cutoff number and timing of scanning.[10]

The factors that determine the severity are not clearly understood but appear to involve a balance between pro-inflammatory and anti-inflammatory factors.

## CONCLUSION

Present comparative study of BISAP and APACHE-II scores: APACHE-II scores yielded better results in predicting the severity, organ failure, and outcome. BISAP scores also hold significant value in predicting them. Hence it is concluded that the simple scoring systems may have reached their maximal utility and novel models are needed to further improve predictive accuracy because the exact pathological mechanism of acute pancreatitis is still unclear.

**Limitation of study:** Owing to remote location of research centre, small number of patients lack of latest techniques we have limited finding and results.

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