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SEVERITY OF ACUTE PANCREATITIS: CORRELATING BISAP SCORE, POCUS, AND CT FINDINGS IN A TERTIARY EMERGENCY SETTING

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Abstract

Acute pancreatitis (AP) presents with a wide spectrum of severity. Stratification must be done accurately and early in order to maximize management and enhance results. The objective of this investigation was to assess the correlation between the Bedside Index for Severity in Acute Pancreatitis (BISAP) score, point-of-care ultrasound (POCUS), and contrast-enhanced CT (CECT) findings in assessing the extent of AP and envisaging short-term clinical outcomes. A research of prospective research study was carried out on 100 patients presenting with AP over one year. BISAP scores were considered within 24 hours of admission. POCUS was performed on all patients, and CECT was performed when indicated. Associations among BISAP scores, ultrasound findings, CT severity index (CTSI), and six-week outcomes were analyzed using appropriate statistical tests. The majority (64%) of patients were aged between 30–60 years; 67% were female. Gallstones were the most common etiology (64%), followed by idiopathic causes (28%). BISAP score was 0–2 in 84% and 3–5 in 16%. All seven deaths occurred in the BISAP ≥3 group ($p < 0.001$). POCUS revealed pleural effusion in 30% and peripancreatic fluid in 45% of patients. Pleural effusion showed a significant implication with higher BISAP scores ($p = 0.012$), and the presence of both pleural effusion and fluid collections was also significantly related to severity ($p = 0.039$). CT was performed in 50% of patients; 46% had necrotizing pancreatitis. However, no statistically significant correlation was observed between BISAP and CTSI ($p = 0.137$). BISAP score calculated within 24 hours, when used in conjunction with early POCUS, offers a practical and reliable method for early risk stratification in AP. In resource-limited settings, this combined approach offers a fast, cost-effective, and evidence-based alternative to CT-based assessments.

Keywords: Acute pancreatitis, BISAP score, POCUS, CT findings, CTSI, prognostic scoring

1. Introduction

Acute pancreatitis (AP) is a sudden pancreatic tissue inflammation that presents with a broad clinical spectrum, ranging from minor ailments that go away on their own to serious illnesses characterized by local complications, non-specific systemic immune response, and systemic organ failure cascade.[1] Its incidence is globally rising, but most occurrences are minor and go away with supportive care;

approximately 15–20% progress to moderate or severe forms, which may result in prolonged hospitalization, invasive interventions, or death.[2] Mortality in severe AP can reach up to 30%, especially when there is ongoing organ failure, pancreatic injury, or contaminated collections.[3]

The underlying causes of AP vary geographically. Globally, alcohol consumption and gallstones are leading etiologies.[4] In specific regions, including the Kashmir Valley, where alcohol consumption is relatively low due to cultural and religious factors, biliary pathology, including gallstones and biliary ascariasis, emerges as the predominant cause, especially among women. The management of AP hinges on early diagnosis, prompt risk stratification, and appropriate supportive interventions.[5] Given that the clinical trajectory of AP can evolve rapidly, the ability to forecast disease severity early in the clinical course is crucial to avert complications and minimize the death rate.

The Ranson criteria, the "Computed Tomography Severity Index (CTSI), and the Acute Physiology and Chronic Health Evaluation II (APACHE II)" score are some of the prognostic measures that have been created to assess the severity or extent of AP.[6] Many of these scoring systems require 48–72 hours for complete evaluation or are computationally intensive, limiting their applicability in acute emergency settings. "The Bedside Index for Severity in Acute Pancreatitis (BISAP)", on the other hand, provides a straightforward and trustworthy scoring method that may be computed using five readily available clinical and laboratory indicators within the first 24 hours of admission.[7]

Parallel to the expansion of clinical scoring systems, imaging modalities play a vital role in diagnosing and classifying the severity of AP. Ultrasound (USG), particularly point-of-care ultrasound (POCUS), is a readily available, non-invasive modality that can detect features such as gallstones, bile duct dilation, peripancreatic fluid collection (AFC), and pleural effusion.[8] However, its diagnostic utility can be impacted by intestinal gas and the patient's body habits.

Contrast-enhanced computed tomography (CECT), while regarded as the benchmark for assessing necrosis and other complications, may not be immediately feasible in all settings due to cost, contrast contraindications, or limited access, especially in rural or resource-constrained facilities.[9]

"A clinically applicable framework for classifying AP into mild, moderately severe, and severe forms with an emphasis on the presence or absence of local and systemic complications is provided by the 2012 Revised Atlanta Classification (RAC)".[10] Tools, such as "BISAP", when aligned with imaging findings, allow emergency physicians to make timely decisions, stratify patients by risk, and triage appropriately.

Despite the availability of scoring tools and imaging modalities, there remains a significant gap in the early assessment of the extent of AP in emergency settings, particularly in regions with limited access to advanced radiological equipment.[11] The challenge lies in promptly identifying those Individuals that are susceptible to serious illness so that appropriate care escalation can be initiated. While the BISAP score offers an efficient method for severity assessment, its correlation with radiological findings such as those obtained via POCUS and CT is not fully elucidated in certain regional populations.[12] The prognostic value of combining bedside scoring with ultrasound findings has not been extensively validated in real-world emergency medicine settings in Kashmir or similar contexts.

This study is a single-center, prospective, observational investigation conducted over 12 months at the "Emergency Department of Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Srinagar". The scope encompasses adult patients presenting with clinical features of acute pancreatitis who met established diagnostic criteria and were followed for a short-term outcome evaluation over six weeks. The research evaluates the correlation between BISAP score and imaging findings from POCUS and CT scans, with particular focus on parameters such as pancreatic size, echogenicity, peripancreatic fluid, pleural effusion, and morphological CT features.

The study is subject to several limitations. First, CT imaging could only be performed in 50% of patients due to clinical and logistical constraints, which may limit the power of some comparative analyses. Second, the study excludes patients with significant comorbidities and chronic organ dysfunction, which may influence generalizability. Third, while the study captures short-term outcomes, it does not evaluate long-term morbidity or pancreatic function beyond six weeks.

The research addresses a vital clinical question: Can simple bedside tools, when used synergistically with available imaging modalities, serve as reliable predictors of extent and outcomes in AP? The

significance lies in the potential for emergency physicians to rapidly stratify patients without relying on complex or delayed scoring systems or advanced imaging. In resource-limited healthcare environments, especially in peripheral or rural hospitals, the BISAP score and POCUS findings could offer a practical alternative to CT-based assessment.

The study provides region-specific insights, particularly highlighting the unique etiological profile of AP in Kashmir, where gallstone-related and parasitic causes predominate. By validating the use of BISAP and POCUS in this demographic, the study offers evidence-based support for implementing simplified triage protocols and optimizing resource allocation.

The study aims to check the correlation between the BISAP score and POCUS findings in patients with AP, and to compare these with CT findings when available. The study also aims to assess the short-term clinical outcomes (including mortality, readmission, resolution, and need for intervention) with the initial BISAP score and imaging characteristics.

Specifically, the objectives include:

1. To determine the relationship between BISAP scores and POCUS findings, including pancreatic size, echogenicity, peripancreatic fluid, and pleural effusion
2. To compare POCUS findings with contrast-enhanced CT scan findings where available
3. To evaluate the short-term outcomes at six weeks and assess how well BISAP and imaging findings predict these outcomes

2. Literature Review

AP is an inflammatory condition of the pancreas that may be limited to the gland or extend to involve surrounding tissues and distant organ systems.[13] The disease presents with highly variable clinical severity, necessitating accurate and timely prognostication to guide effective management. Over the decades, the understanding and classification of AP have undergone significant evolution, transitioning from descriptive clinical observations to structured criteria supported by imaging and biochemical parameters.[14]

The initial terminology surrounding the pancreas and its pathologies dates back to classical antiquity, with Eristratos (310–250 BC) and later Rufus of Ephesus around 100 AD contributing early descriptions.[15] In modern clinical practice, however, the management of AP is guided by standardized diagnostic and severity classification systems. The clinical grading of acute pancreatitis is determined by evaluating the extent of local tissue damage and the duration of organ dysfunction, allowing it to be categorized as mild, moderately severe, or severe.[16]

Among the prognostic tools developed for initial risk stratification in AP, the BISAP score stands out for its simplicity and bedside applicability.[17] BISAP comprises five clinical and laboratory parameters that can be assessed within one day of hospital admission: blood urea nitrogen >25 mg/dL, age >60 years, presence of systemic inflammatory response syndrome, impaired mental status (Glasgow Coma Scale <15), and detection of pleural effusion. Each parameter contributes one point, yielding a total score between 0 and 5. A BISAP score ≥3 is related to an amplified risk of severe disease, organ failure, and death. [18]

Subsequent validations of the BISAP score across diverse populations have confirmed its clinical utility. Wu et al. showed an area under the receiver operating characteristic curve of 0.82 for death prediction in a large-scale cohort study.[19] Park et al. reported comparable predictive value between "BISAP" and the more complex "APACHE II score", with BISAP demonstrating superior ease of use.[20] Through a comprehensive review and meta-analysis, Gao et al. further demonstrated that BISAP is a useful screening tool for identifying high-risk patients with early onset of the disease because it maintains high specificity despite having a lower sensitivity than the "APACHE II or Ranson criteria". [21]

In the regional context of the Kashmir Valley, epidemiological characteristics of AP differ significantly from global patterns. Alcohol, while a major etiological factor in many regions, contributes minimally in this population due to cultural constraints. Gallstone disease, often associated with female gender, emerges as the leading cause, followed by idiopathic and parasitic causes such as biliary ascariasis.[22] A retrospective study conducted at SKIMS over two years revealed that

approximately 27% of patients presented with severe AP. Additional risk factors, including elevated hematocrit, high C-reactive protein levels, hyperglycemia, and elevated body mass index, were found to be associated with adverse outcomes.

Radio imaging plays a major role in the diagnostic and prognostic assessment of AP. Ultrasound (USG), particularly when performed as POCUS, is often the first-line method because it's easily accessible and can identify gallstones, bile duct dilatation, and peripancreatic fluid collections.[23] Despite limitations in obese patients or those with excessive bowel gas, "POCUS" offers valuable bedside insights into disease extent.

Computed tomography, particularly contrast-enhanced, remains the gold standard for detecting pancreatic necrosis and assessing disease severity. The Modified CT Severity Index, which incorporates findings of pancreatic inflammation, necrosis, and extrapancreatic complications, has been shown to correlate well with hospital stay duration and the likelihood of organ failure.[24] Nevertheless, logistical and financial limitations may restrict the routine early use of CT in many emergency departments, especially in resource-limited settings.

The cumulative evidence supports a synergistic approach to early risk stratification in AP, combining clinical scoring systems like "BISAP" with accessible imaging tools such as POCUS.[25] This integrated strategy is especially pertinent in emergency and peripheral settings where CT might not be accessible right away. This approach speeds up the process of identifying susceptible patients, guides the escalation of treatment, and may reduce the rates of morbidity and death associated with severe AP.

3. Materials and Methods

The Investigation employed a structured, evidence-based approach to check the correlation between BISAP scores, bedside ultrasound findings, and CT imaging in patients with AP. By adopting a prospective observational design, aimed at objectively capturing clinical and radiological parameters within the early phase of presentation. The methodology was rigorously defined to ensure reproducibility and relevance in real-world emergency settings, particularly in resource-constrained environments.

3.1 Study Design

This prospective, observational study was conducted in the Department of Emergency Medicine at Sher-i-Kashmir Institute of Medical Sciences, Soura, Srinagar, over one year from August 2022 to July 2023. The study aimed to assess the clinical severity of AP using the BISAP score and to correlate this score with point-of-care ultrasound findings and contrast-enhanced computed tomography findings when available.

3.2 Study Population and Sample Size

Adult patients with clinical signs of acute pancreatitis who arrived at the emergency room were screened for eligibility one after the other. "A sample size of 100 patients" was determined based on the statistical formula:

$$N = \frac{Z^2 pq}{d^2} = \frac{3.84 \times 0.5 \times 0.5}{0.01} = 97$$

Where,

- N = sample size
- p = 0.5
- q = 0.5
- Z = Z score from 95% confidence interval =1.96^2
- D = marginal error of 10%

The final sample size was reduced to 100 patients to account for possible exclusions or dropouts.

3.3 Eligibility Criteria

The study included patients if they:

- Were aged 18 years or above
- Had clinical symptoms consistent with AP (epigastric pain radiating to the back)
- Met at least two of the following diagnostic criteria:
  - Characteristic abdominal pain
  - Serum amylase or lipase ≥3 times the upper limit of normal
  - Radiological evidence suggestive of pancreatitis

Patients were excluded if they had:

- Pre-existing chronic organ dysfunction (renal, hepatic, cardiac)
- Active malignancy
- Neurological disorders or were chronically bedridden
- Declined or were unable to provide informed consent

3.4 Data Collection and Clinical Assessment

Upon enrollment, demographic data (age, sex), medical history, presenting symptoms, vital signs, and comorbidities were recorded. The BISAP score was calculated within the first 24 hours of admission. The five components of the BISAP score included:

- Blood urea nitrogen (BUN) >25 mg/dL
- Age >60 years
- Non-specific systemic immune response
- Altered mental status (Glasgow Coma Scale <15)
- Presence of pleural effusion

Laboratory investigations were conducted on admission and included complete blood count, serum amylase and lipase, BUN, liver function tests, blood glucose, and serum electrolytes. These investigations were used both for diagnostic confirmation and severity scoring.

3.5 Ultrasound Examination

All patients underwent a POCUS examination using an ESAOTE MyLab™ Gamma portable ultrasound machine. The pancreas was assessed for:

- Size and echotexture (bulky, heterogeneous)
- Presence of peripancreatic or intraperitoneal fluid collections (acute fluid collection, AFC)
- Associated findings such as pleural effusion

The ultrasound examinations were performed and interpreted by trained emergency physicians experienced in abdominal sonography. Gallbladder and biliary tree assessments were also conducted to identify etiological factors.

3.6 CT Imaging and Interpretation

Patients had abdominal CECT procedures with clinical deterioration, diagnostic uncertainty, or when complications were suspected. Intravenous contrast agents (ULTRAVIST/Iohexol) were administered unless contraindicated. CT images were evaluated by a senior radiologist blinded to the BISAP scores. The extent of pancreatitis was classified using the Modified CTSI, which integrates morphological findings, degree of necrosis, and extrapancreatic complications. CT diagnoses included interstitial edematous pancreatitis or necrotizing pancreatitis, with CTSI scores categorized as mild (0–3), moderate (4–6), or severe (7–10).

3.7 Follow-Up and Outcome Measures

Patients were followed for six weeks post-enrollment. Follow-up data were obtained through outpatient visits or telephone interviews. The following outcomes were documented:

- Complete clinical resolution

- Need for readmission or surgical/interventional procedures
- Persistence or development of local/systemic complications
- Organ dysfunction or failure
- Mortality

Outcome assessments were conducted by the treating physician and verified through hospital records.

3.8 Statistical Analysis

"Data analysis was conducted using SPSS software, version 22. Descriptive statistics were applied with categorical variables summarized as counts and percentages, and continuous variables expressed as mean values with standard deviations. To explore associations between BISAP scores and imaging findings from ultrasound or CT, the Chi-square test or Fisher's exact test was applied for categorical data, while independent t-tests were used for continuous variables. A p-value below 0.05 was considered to indicate statistical significance".

3.9 Ethical Considerations

The Declaration of Helsinki's guiding principles were adhered to throughout the study's execution. Before the investigation started, ethical approval was received from SKIMS's Institutional Ethics Committee. Following a thorough description of the goals, methods, risks, and advantages of the study, each individual gave written informed consent in the language of their choice.

4. Results

The following section presents the key findings derived from the comprehensive analysis of clinical, biochemical, and radiological data collected during the study period. Results are structured to sequentially highlight baseline demographic features, the distribution of BISAP scores, ultrasound and CT correlations, and six-week patient outcomes. Emphasis is placed on identifying significant associations that reflect the prognostic value of early bedside assessments in acute pancreatitis.

4.1 Baseline Characteristics of the Study Population

A total of 100 patients diagnosed with AP were included in the final analysis. The mean age was 46.55 ± 16.11 years, with a majority of patients (64%) in the 30–60-year age group. A female predominance (67%) was observed. Abdominal pain was reported universally, followed by nausea (74%) and vomiting (72%). Gallstones emerged as the predominant etiology (64%), while idiopathic and alcohol-related or other causes accounted for 28% and 8%, respectively, as mentioned in Table 1.

Table 1. Demographic and Clinical Characteristics of the Study Population

Parameter	Value
Mean Age (years)	46.55 ± 16.11
Gender Distribution	Male: 33%, Female: 67%
Abdominal Pain	100%
Nausea	74%
Vomiting	72%
Etiology – Gallstones	64%
Etiology – Idiopathic	28%
Etiology – Alcoholic/Other	8%

4.2 BISAP Score Distribution and Mortality Analysis

Within 24 hours of admission, BISAP scores were assigned. The majority (84%) had scores between 0–2, while 16% had scores between 3–5. Importantly, all seven deaths occurred in the higher BISAP group (3–5), indicating a statistically significant correlation between BISAP ≥3 and mortality ($p < 0.001$). No deaths occurred in patients with a BISAP score ≤2, as mentioned in Table 2 & visualized in Figure 1.

Table 2. BISAP Score Distribution and Associated Mortality

BISAP Score Range	Number of Patients (n)	Observed Mortality
0–2	84	0%
3–5	16	7 deaths (100% of total mortality)

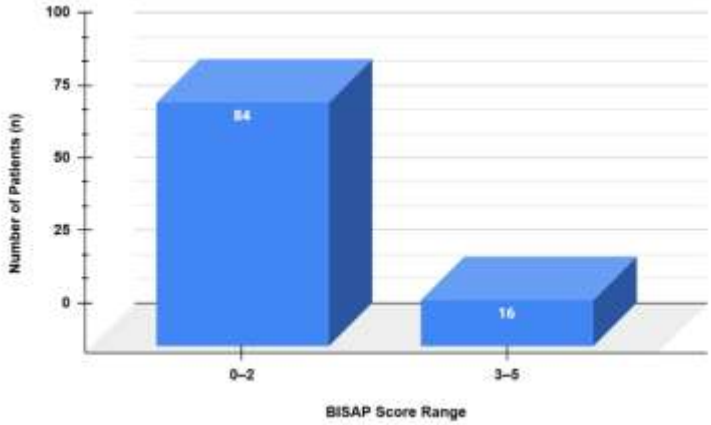

Figure 1. Distribution of Patients According to BISAP Score Ranges

Figure 1 illustrates the distribution of patients (N = 100) according to their BISAP scores calculated within the first 24 hours of admission.

4.3 POCUS Findings and Their Correlation with BISAP Score

All 100 patients underwent POCUS within 24 hours of presentation. The pancreas appeared bulky in 88% of cases and heterogeneous in 95%. Acute fluid collections (AFC) were detected in 28%, and pleural effusion in 30%. Pleural effusion was significantly associated with higher BISAP scores ($p = 0.012$), and the presence of both AFC and pleural effusion demonstrated a statistically significant correlation with increased severity ($p = 0.039$), as mentioned in Table 3 & visualized in Figure 2.

Table 3. Summary of POCUS Findings and Their Statistical Significance

Finding	Frequency (%)	Statistical Significance (p-value)
Bulky Pancreas	88	Not significant
Heterogeneous Echogenicity	95	Not significant
Acute Fluid Collection (AFC)	28	Not significant
Pleural Effusion	30	0.012 (Significant)

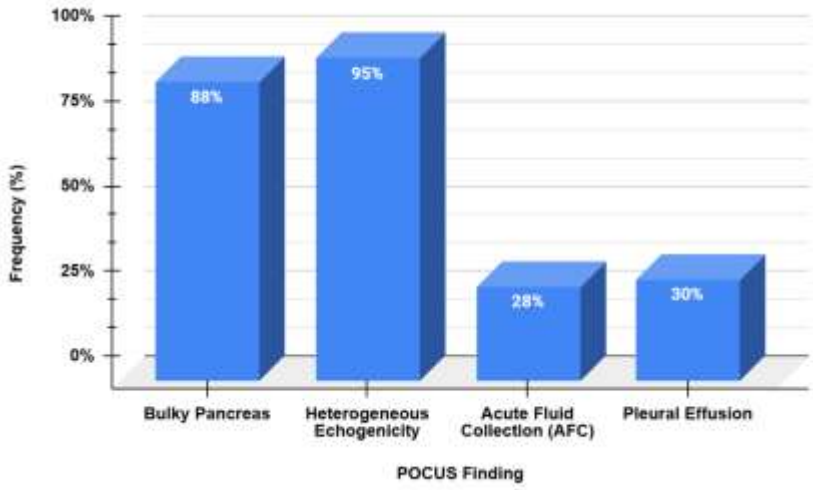

Figure 2. Frequency of Key Point-of-Care Ultrasound (POCUS) Findings in Acute Pancreatitis

Figure 2 presents the frequency (in percentage) of ultrasound findings observed on bedside POCUS among the study population. The most common findings included heterogeneous echogenicity of the pancreas (95%) and a bulky pancreas (88%). Notably, pleural effusion was present in 30% and acute fluid collections (AFC) in 28% of patients. Pleural effusion was significantly associated with higher BISAP scores ($p = 0.012$), highlighting its prognostic value in identifying severe AP early on.

4.4 CT Imaging and Severity Classification (n = 50)

CT (CECT) of the abdomen was performed in 50% of the patients (n = 50), based on clinical indications such as worsening symptoms or diagnostic uncertainty. Among these, 54% were found to have interstitial edematous pancreatitis, while 46% had necrotizing pancreatitis. When classified according to the Modified CT Severity Index, 60% of the patients had scores indicating moderate severity (CTSI 4–6), and the remaining 40% were categorized as severe (CTSI 7–10). Despite the observation that necrotizing pancreatitis was associated with higher CTSI scores, there was no statistically significant correlation between BISAP scores and CT-based severity grading ($p = 0.137$), as detailed in Table 4 and illustrated in Figure 3.

Table 4. CT Findings and Modified CTSI Classification (n = 50)

CT Category	Percentage (%)
Interstitial Edematous Pancreatitis	54
Necrotizing Pancreatitis	46
CTSI 4–6 (Moderate Severity)	60
CTSI 7–10 (Severe)	40

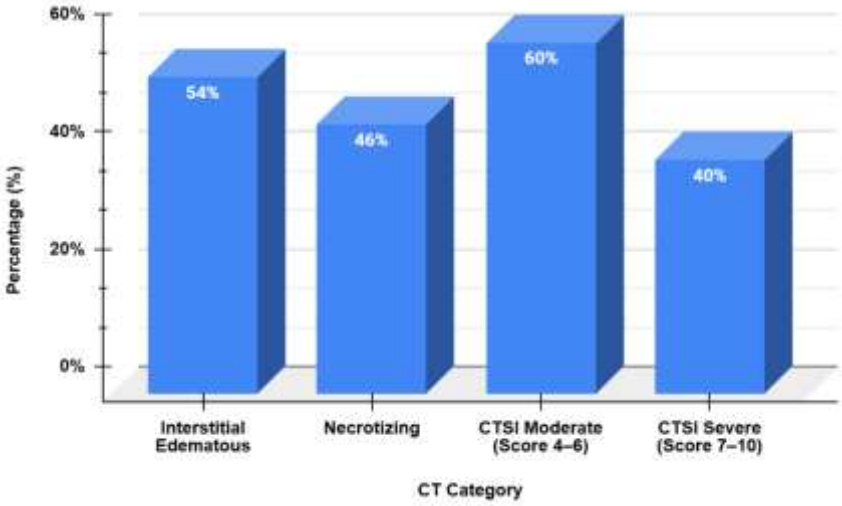

Figure 3. Contrast-Enhanced CT Findings and Severity Stratification Based on CTSI

Figure 3 summarizes the findings from contrast-enhanced CT scans performed in 50 patients. Of these, 54% showed interstitial edematous pancreatitis, while 46% had necrotizing pancreatitis. CTSI scoring revealed that 60% had moderate (score 4–6) and 40% had severe (score 7–10) pancreatitis. Although CT provided clear anatomical detail and classification, there was no statistically significant association between CT severity and BISAP scores in this study ($p = 0.137$).

4.5 Clinical Outcomes at Six-Week Follow-Up

Patients were followed up for six weeks to assess short-term outcomes. Complete clinical resolution was observed in 79% of cases. Mortality occurred in 7% (n = 7), all within the BISAP ≥3 group. 11% of patients required interventional procedures, and notably, none developed persistent organ dysfunction during the follow-up period, as mentioned in Table 5 & visualised in Figure 4.

Table 5. Clinical Outcomes at Six-Week Follow-Up

Outcome	Percentage (%)
Complete Resolution	79
Mortality	7
Required Intervention	11
Persistent Organ Dysfunction	0

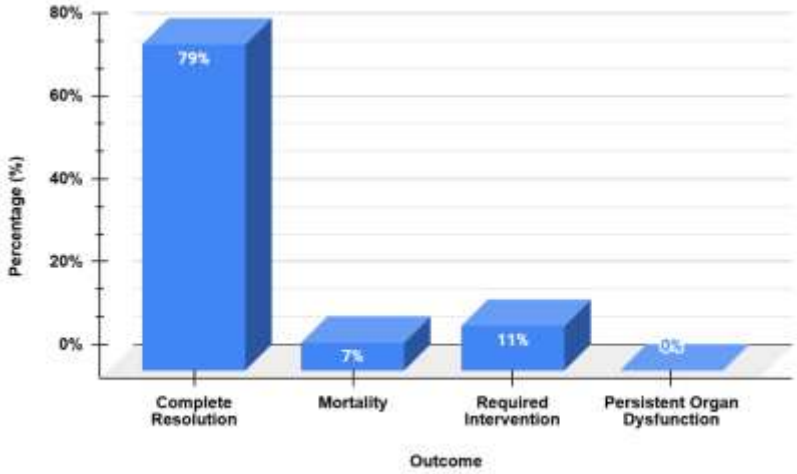

Figure 4. Six-Week Outcomes Among Patients with Acute Pancreatitis

Figure 4 shows patient outcomes at the six-week follow-up. A large majority (79%) achieved complete clinical resolution. Mortality was observed in 7% of patients, all from the higher BISAP category. 11% of patients required interventional procedures. No cases of persistent organ dysfunction were reported. These results underscore the prognostic reliability of early clinical scoring and imaging for risk stratification and outcome prediction.

5. Discussion

The present study highlights the prognostic strength of the "BISAP" score and its meaningful integration with POCUS and contrast-enhanced "CT (CECT)" in assessing the severity of acute pancreatitis. The BISAP score, when calculated within the first 24 hours of presentation, effectively stratified patients into low- and high-risk categories. Patients with scores between 0 and 2 showed complete recovery and no mortality, while all recorded deaths occurred in those with a BISAP score ≥3. This finding reinforces the utility of BISAP as a reliable early severity index and supports its wider adoption in frontline emergency settings. [26]

Interpretation of the data reveals that POCUS added significant diagnostic and prognostic value when used alongside clinical scoring. Notably, pleural effusion and acute fluid collection (AFC) on ultrasound were associated with more severe disease. Among these, pleural effusion demonstrated a statistically significant association with BISAP score elevation ($p = 0.012$), and the concurrent presence of both AFC and pleural effusion was predictive of worse clinical outcomes ($p = 0.039$). In contrast, although contrast-enhanced CT provided detailed anatomical insights and classified nearly half the patients as having necrotizing pancreatitis, no statistically significant correlation was observed between BISAP score and CT severity index (CTSI) ($p = 0.137$). This discrepancy may reflect the fact that only half of the patients underwent CT imaging, primarily those with more severe symptoms, potentially introducing selection bias and limiting correlation strength.[27-28]

The results of this study are well-aligned with previous literature that affirms BISAP as a practical and efficient severity scoring tool in acute pancreatitis. Wu et al. established BISAP's prognostic validity in a large multicenter study, indicating an area under the curve of 0.82 for predicting in-hospital mortality. Subsequent investigations by Papachristou et al. and Singh et al. also confirmed its comparable accuracy to APACHE II but with improved ease of use.[29-30] The present work emphasizes

BISAP's value as a bedside tool suitable for early triage decisions. The lack of significant correlation between BISAP and CTSI in the current cohort echoes findings reported by Gao and colleagues, who noted that early CT imaging may not always correlate with clinical trajectory and should not be used in isolation for prognostic purposes.[21]

Ultrasound findings, particularly pleural effusion, have been historically underutilized in severity prediction. Studies highlighted the relevance of extrapancreatic findings in predicting severe disease and organ dysfunction.[31] This study lends additional support to this hypothesis by demonstrating that ultrasound findings, though limited in pancreatic visualization due to bowel gas and operator dependence, can offer vital clinical clues when combined with scoring systems. While the bulky and heterogeneous pancreas on ultrasound was frequently observed, only pleural effusion reached statistical significance, reinforcing its potential as an early indicator of systemic inflammatory response and impending severity.

From a clinical standpoint, these results carry several important implications. The BISAP score offers a rapid, low-resource method to identify patients who require closer monitoring and possible intensive care. Its integration with POCUS enhances diagnostic precision, particularly in settings where access to advanced imaging may be delayed or limited. Since POCUS is repeatable, portable, and non-invasive, its adoption as a complementary assessment modality can facilitate the timely detection of complications such as peripancreatic collections, pleural effusions, or signs of necrosis.[32-33] Together, BISAP and ultrasound offer a layered and synergistic approach that can optimize decision-making in resource-constrained environments or overcrowded emergency departments.

This study has a number of drawbacks that should be noted despite its positives. The results' external validity may be limited by the small sample size and the fact that it came from a single tertiary care facility. Only 50% of patients underwent CT imaging, limiting the ability to make strong inferences regarding BISAP–CTSI correlations. CRP levels, APACHE II scores, and Ranson's criteria were not consistently available and, therefore, excluded from comparative analysis.[34] Although efforts were made to standardize POCUS interpretation, some degree of inter-operator variability cannot be eliminated, and findings may vary based on the skill and experience of the sonographer.

These limitations present opportunities for future research. Larger, multicentric studies would help validate these findings across varied populations and healthcare settings. Future investigations may explore sequential BISAP scoring combined with serial ultrasound monitoring to track dynamic changes and predict deterioration more precisely.[35] The integration of emerging biomarkers such as IL-6 or procalcitonin could refine the accuracy of risk stratification tools. Standardization of POCUS training protocols and certification for emergency physicians should also be considered to reduce operator dependency and maximize diagnostic reliability.

The findings of this study support the use of the BISAP score as a practical, accurate tool for early risk assessment in acute pancreatitis.[36] Its combination with POCUS significantly enhances its clinical utility by identifying key imaging markers of severity. Together, these tools offer a robust, bedside-compatible approach that aligns with current priorities in emergency medicine: timely triage, efficient resource allocation, and proactive management of high-risk patients. The study's results not only reinforce established clinical practices but also pave the way for future innovations in acute pancreatitis management.

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