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Utility of Revised Atlanta Classification using CT & BISAP Clinical Scoring System in Determining Severity of Acute Pancreatitis & Prediction of Clinical Outcome

Renjith Balakrshnan[1*], Vinay M.D. Prabhu[1], Praneeti Shetty[1] & Neeraj S.[1]

[1]Department of Radiodiagnosis, M. S. Ramaiah Medical College (MSRMC), Bangalore, Karnataka. India

HIGHLIGHTS

- BISAP predicts disease severity
- Revised Atlanta accurately classifies
- Combined prediction improves
- Higher BISAP prolongs hospitalization
- Organ failure is strongly associated

Key Words:
Acute Pancreatitis
Revised Atlanta Classification
BISAP Score
Severity Assessment

ABSTRACT

Introduction: Acute pancreatitis ranges from mild disease to life-threatening complications. This study evaluates the Revised Atlanta CT classification and BISAP score, individually and combined, for predicting disease severity and clinical outcomes. **Aim & Objective:** To determine the value of the Revised Atlanta classification and the BISAP scoring system in predicting the severity and clinical outcome of acute pancreatitis, and to assess whether their combination improves predictive ability. **Materials & Methods:** A prospective observational study was conducted from May 2024 to November 2025 at Ramaiah Medical College hospitals, including 49 patients with first-episode acute pancreatitis who underwent CECT abdomen. Patients were classified according to the Revised Atlanta criteria and the BISAP scoring system. Clinical outcomes, including organ failure, infection, intervention requirement, duration of hospital stay, and mortality, were recorded and analyzed. **Results:** The cohort predominantly comprised males (79.6%) in the 40-60 years age group. Interstitial edematous pancreatitis (IEP) was the most common CT finding (57.1%). According to the Revised Atlanta classification, 59.2% had mild, 36.7% moderately severe, and 4.1% severe acute pancreatitis. A BISAP score ≥3 was seen in 6.1% patients. Significant associations were observed between severity grade and BISAP score ($p<0.001$), duration of stay ($p<0.001$), organ failure ($p<0.001$), and infection ($p<0.001$). Patients with BISAP ≥3 had significantly longer hospital stay (10.7 vs 7.0 days, $p=0.042$). Mortality rate was 0%. **Conclusion:** Both the Revised Atlanta CT classification and the BISAP scoring system effectively predict severity and clinical outcomes in acute pancreatitis. Their combination provides a comprehensive assessment, with BISAP identifying patients at risk for prolonged stay and organ failure, while the Revised Atlanta classification accurately grades morphological severity.

*** Corresponding Author:** Renjith Balakrshnan, e-mail: renjith.28@gmail.com
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INTRODUCTION

Acute pancreatitis is an acute inflammatory disorder of the pancreas with a highly variable clinical course, ranging from mild, self-limiting disease to severe, life-threatening illness associated with multi-organ dysfunction. The condition results from premature activation of pancreatic enzymes within acinar cells, leading to autodigestion, inflammation, edema, and necrosis, which may trigger systemic inflammatory response syndrome. Clinically, patients may present with epigastric pain radiating to the back, nausea, and vomiting, while severe cases can progress to complications such as sepsis, acute respiratory distress syndrome, renal failure, and coagulopathy. Despite advances in diagnostic and therapeutic approaches, acute pancreatitis continues to pose significant challenges in early diagnosis and management due to its unpredictable progression [1-3].

The etiology of acute pancreatitis is diverse, with alcohol abuse and biliary tract diseases such as gallstones being the most common causes. Alcohol induces direct cellular toxicity and oxidative stress, whereas biliary pancreatitis results from transient obstruction of the pancreatic duct, leading to enzyme activation and inflammation. Other causes include metabolic disorders like hyperlipidemia and hypercalcemia, infections, trauma, post-procedural complications such as ERCP, genetic mutations, drugs, and congenital anomalies.

However, a proportion of cases remain idiopathic. Although overall mortality is relatively low, it increases substantially in severe cases, particularly in the presence of necrosis and persistent organ failure, highlighting the importance of early severity assessment [4,5].

Early prediction of disease severity is essential for guiding management and improving outcomes in acute pancreatitis. Various clinical scoring systems and classification methods have been developed for this purpose, among which the Bedside Index for Severity in Acute Pancreatitis (BISAP) score and the Revised Atlanta Classification are widely used. The BISAP score is a simple and reliable tool based on five parameters assessed within 24 hours of admission, enabling early risk stratification. Higher BISAP scores are associated with increased risk of complications, organ failure, and mortality, and its simplicity makes it particularly useful in routine clinical practice and resource-limited settings [6–8].

The Revised Atlanta Classification provides a standardized framework for categorizing acute pancreatitis into mild, moderately severe, and severe forms based on clinical features, organ failure, and local or systemic complications. Imaging, particularly contrast-enhanced computed tomography, plays a crucial role in this classification by identifying pancreatic inflammation, necrosis, and associated complications. The CT Severity Index further enhances assessment by quantifying

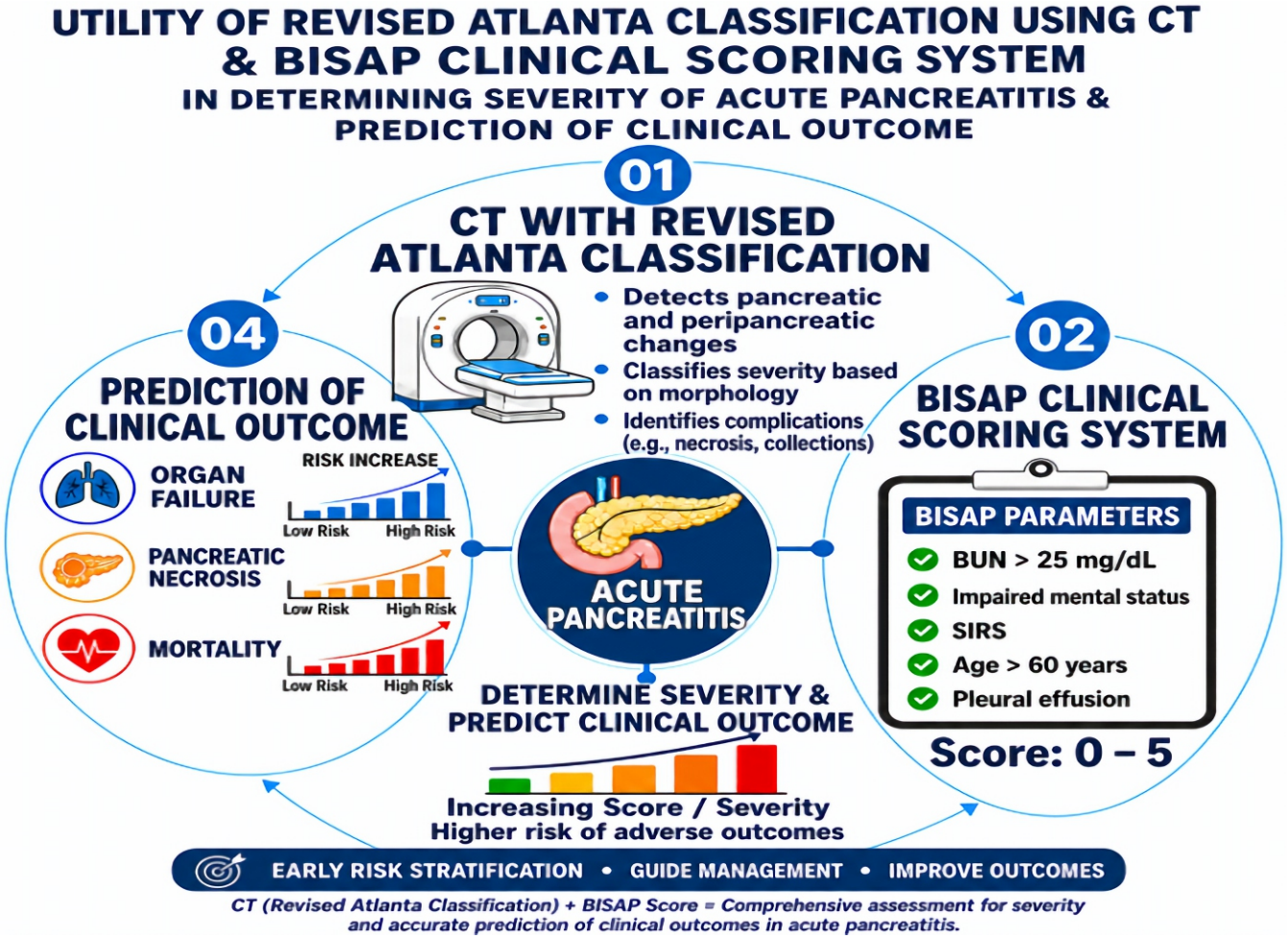

Figure 1: Utility of the Revised Atlanta CT classification and BISAP score for severity assessment and clinical outcome prediction in acute pancreatitis.

morphological changes and the extent of necrosis, thereby complementing clinical scoring systems and aiding in prognostication and therapeutic planning [9,10].

Effective management of acute pancreatitis primarily involves supportive care, including fluid resuscitation, pain control, nutritional support, and monitoring for complications. Early identification of high-risk patients using BISAP and imaging-based classifications allows timely intensive care, early interventions, and prevention of complications. Combining clinical and radiological assessment improves prognostic accuracy, facilitates better decision-making, and contributes to improved patient outcomes, making these tools essential in the comprehensive evaluation and management of acute pancreatitis [11,12]. Revised Atlanta CT classification and BISAP score in acute pancreatitis **(Figure 1)**.

This study aims to determine the value of the revised Atlanta classification in predicting the severity and clinical outcomes of patients with acute pancreatitis, to evaluate the effectiveness of the BISAP clinical scoring system in predicting the severity and clinical outcomes of these patients, and to assess whether the combination of the revised Atlanta classification and the BISAP clinical scoring system provides a better predictive ability for determining severity and clinical outcomes in acute pancreatitis.

MATERIAL & METHODS

This prospective observational study was conducted at the Department of Radiodiagnosis, Ramaiah Medical College, Bengaluru from May 2024 to November 2025. Ethical approval has been obtained from the Ethical Approval Committee of Ramaiah Medical College, Bengaluru.

Study Population

The study population consisted of patients aged above 18 years presenting for the first time with acute pancreatitis diagnosed based on clinical findings and laboratory investigations, and who underwent contrast enhanced computed tomography of the abdomen. Patients with chronic pancreatitis, pancreatitis secondary to trauma, or imaging findings suggestive of recurrent pancreatitis were excluded from the study to ensure a homogeneous cohort and minimize confounding clinical conditions during analysis of outcomes

Data Analysis

Data analysis involved summarising the classification of acute pancreatitis using descriptive statistics, expressed in terms of percentages to present the distribution of severity categories. Agreement between the revised Atlanta classification severity grades and the BISAP scoring system was assessed using kappa statistics. This approach enabled evaluation of the level of concordance between the two classification methods and helped determine their reliability and consistency in categorising the severity of acute pancreatitis cases accurately.

RESULT

The study population of 49 patients showed that the majority were aged 40–60 years (42.9%), followed by 20–40 years (38.8%), with very few below 20 years (2.0%), indicating a predominance of middle-aged individuals. Males constituted a significant majority (79.6%), reflecting strong gender predominance. Based on Revised Atlanta CT classification, interstitial edematous pancreatitis was most common (57.1%), while necrotizing forms were less frequent. Most patients had no organ failure (89.8%), and when present, it was transient. The majority had mild disease (59.2%), with very few severe cases. Elevated BUN was rare, and all patients had normal mental status. SIRS was absent in 34 (69.4%) subjects and present in 15 (30.6%) out of a total of 49 individuals. Overall, most subjects did not exhibit SIRS, with less than one-third showing its presence **(Table 1)**. Pleural effusion was present in 30 (61.2%) subjects and absent in 19 (38.8%) out of a total of 49 individuals. Overall, more than half of the subjects exhibited pleural effusion, indicating it was a common finding **(Table 2)**.

The distribution of BISAP scores among the 49 patients showed that a score of 1 was the most common (51.0%), followed by scores of 2 (26.5%) and 0 (16.3%), while only a small proportion had a score of 3 (6.1%). When categorized, most patients (93.9%) had a BISAP score less than 3, indicating low risk, whereas only 6.1% had scores ≥3, suggesting higher risk. Overall, the findings indicate that most patients presented with low BISAP scores, reflecting a lower likelihood of severe disease and complications. Persistent organ failure was absent in most patients (89.8%), with only a small proportion (10.2%) experiencing it, indicating that prolonged organ dysfunction was relatively uncommon in the study population **(Table 3)**. In contrast, infection was present in a notable proportion of patients, occurring in 36.7%, while 63.3% remained free of infection. These findings suggest that although most patients did not develop persistent organ failure, infectious complications were relatively more frequent and represent an important clinical concern during acute pancreatitis.

Intervention was not required in 31 (63.3%) subjects, while 18 (36.7%) required intervention out of 49 individuals. Overall, the majority did not need intervention, with about one-third requiring it **(Figure 2)**.

The duration of hospital stays among patients showed that nearly half (49.0%) were discharged within less than 5 days, while 38.8% stayed for 5–10 days and only a small proportion (12.2%) required hospitalization for 10–15 days, indicating generally shorter hospital stays for most patients. Regarding outcomes, all 49 patients survived, resulting in a 0% mortality rate. These findings suggest favorable clinical outcomes in the study population, likely reflecting the predominance of mild-to-moderately severe cases and effective management strategies.

There was a statistically significant association between severity grade and BISAP score ($p < 0.001$) among 49 subjects.

All 29 mild cases (63.0%) had BISAP <3, whereas 2 severe cases (66.7%) had BISAP ≥3. Overall, higher BISAP scores were strongly associated with increased disease severity **(Table 4)**. There was a highly significant association between severity grade and duration of hospital stay ($p < 0.001$) among 49 subjects. Most patients with stays <5 days had mild acute cases (22, 91.7%), while all patients staying 10–15 days had moderately severe cases (6, 100.0%). Overall, increased disease severity was associated with longer hospital stays **(Table 5)**.

The analysis demonstrated that patients with higher BISAP scores had significantly longer hospital stays, with those scoring ≥3 having a mean duration of 10.7 days compared to 7.0 days for those with scores <3 ($p = 0.042$), indicating increased disease severity and resource utilization. Additionally, a strong and statistically significant association was observed between BISAP score and organ failure ($p < 0.001$). All patients with BISAP ≥3 developed organ failure, whereas the majority with lower scores did not, highlighting the effectiveness of BISAP in predicting early organ dysfunction. There was a statistically significant association between severity grade and organ failure ($p < 0.001$) among 49 subjects. Organ failure was absent in all mild cases, while renal and respiratory failures were observed in moderately severe and severe cases. Overall, higher disease severity was strongly associated with increased occurrence of organ failure **(Table 6)**.

There was no statistically significant association between BISAP score and infection ($p = 0.9$) among 49 subjects. Infection rates were similar in both BISAP <3 and ≥3 groups. Overall, BISAP score did not show a meaningful relationship with the presence of infection **(Table 7)**. There was a highly significant association between severity grade and infection ($p < 0.001$) among 49 subjects. Most infections occurred in moderately severe cases (16, 88.9%), while the majority without infection were mild cases (28, 90.3%). Overall, higher disease severity was strongly associated with increased risk of infection **(Table 8)**.

Table 1: Presence of Systemic Inflammatory Response Syndrome (SIRS)

SIRS	Frequency	Percent (%)
Absent	34	69.4
Present	15	30.6
Total	**49**	**100.0**

Table 2: Presence of Pleural Effusion

Pleural effusion	Frequency	Percent (%)
Absent	19	38.8
Present	30	61.2
Total	**49**	**100.0**

Table 3: Presence of Persistent Organ Failure

Persistent organ failure	Frequency	Percent (%)
Absent	44	89.8
Present	5	10.2
Total	**49**	**100.0**

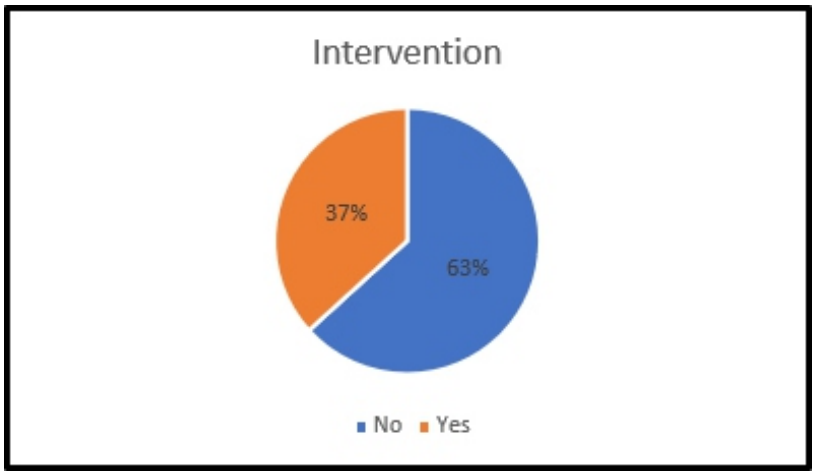

Figure 2: Intervention Requirement

Table 4: Association between Severity Grade and BISAP Score

Severity grade	BISAP <3 N (%)	BISAP ≥3 N (%)	Total N (%)	p-value
Mild acute	29 (63.0%)	0 (0.0%)	29 (59.2%)	<0.001*
Moderately severe	17 (37.0%)	1 (33.3%)	18 (36.7%)	
Severe acute	0 (0.0%)	2 (66.7%)	2 (4.1%)	
Total	**46 (100.0%)**	**3 (100.0%)**	**49 (100.0%)**	

Table 5: Association between Severity Grade and Duration of Stay

Severity grade	<5 days N (%)	5-10 days N (%)	10-15 days N (%)	Total N (%)	p-value
Mild acute	22 (91.7%)	7 (36.8%)	0 (0.0%)	29 (59.2%)	<0.001*
Moderately severe	2 (8.3%)	10 (52.6%)	6 (100.0%)	18 (36.7%)	
Severe acute	0 (0.0%)	2 (10.5%)	0 (0.0%)	2 (4.1%)	
Total	**24 (100.0%)**	**19 (100.0%)**	**6 (100.0%)**	**49 (100.0%)**	

Table 6: Association between Severity Grade and Organ Failure

Severity grade	Absent N (%)	Renal failure <48hrs N (%)	Respiratory failure <48hrs N (%)	Total N (%)	p-value
Mild acute	29 (65.9%)	0 (0.0%)	0 (0.0%)	29 (59.2%)	<0.001*
Moderately severe	15 (34.1%)	1 (50.0%)	2 (66.7%)	18 (36.7%)	
Severe acute	0 (0.0%)	1 (50.0%)	1 (33.3%)	2 (4.1%)	
Total	**44 (100.0%)**	**2 (100.0%)**	**3 (100.0%)**	**49 (100.0%)**	

Table 7: Association between BISAP Score and Infection

BISAP score	Infection Absent N (%)	Infection Present N (%)	Total N (%)	p-value
<3	29 (93.5%)	17 (94.4%)	46 (93.9%)	0.9
≥3	2 (6.5%)	1 (5.6%)	3 (6.1%)	
Total	**31 (100.0%)**	**18 (100.0%)**	**49 (100.0%)**	

Table 8: Association between Severity Grade and Infection

Severity grade	Infection Absent N (%)	Infection Present N (%)	Total N (%)	p-value
Mild acute	28 (90.3%)	1 (5.6%)	29 (59.2%)	<0.001*
Moderately severe	2 (6.5%)	16 (88.9%)	18 (36.7%)	
Severe acute	1 (3.2%)	1 (5.6%)	2 (4.1%)	
Total	**31 (100.0%)**	**18 (100.0%)**	**49 (100.0%)**	

DISCUSSION

Acute pancreatitis is an acute inflammatory disorder of the pancreas with a clinical spectrum ranging from mild, self-limiting disease to severe necrotizing pancreatitis associated with multi-organ failure and high mortality. It is a major cause of gastrointestinal-related hospitalizations globally and contributes significantly to healthcare burden. The disease results from premature activation of pancreatic enzymes within acinar cells, leading to autodigestion, inflammation, edema, and necrosis, which may progress to systemic inflammatory response syndrome and organ dysfunction. Given its unpredictable course, early assessment of severity is essential. Prognostic tools such as the BISAP score and the Revised Atlanta Classification are widely used, with BISAP offering early bedside risk assessment and the Revised Atlanta system providing imaging-based severity categorization [1–3].

Radiological evaluation using contrast-enhanced computed tomography, as per the Revised Atlanta Classification, showed that interstitial edematous pancreatitis was the most common pattern, indicating that the majority of cases were mild in nature. Necrotizing forms and associated complications such as peripancreatic collections and walled-off necrosis were less frequent. **Song YS, et. al; 2020,** highlighted the importance of CT imaging in detecting morphological changes, identifying complications, and predicting disease progression, thereby guiding clinical decision-making [14].

Most patients in the study did not develop organ failure, and when present, it was usually transient and resolved within 48 hours, suggesting a favorable prognosis. Persistent organ failure was uncommon but is known to be strongly associated with increased mortality and complications. Most cases were classified as mild, with fewer moderately severe and very few

severe cases. **Johnson CD & Abu-Hilal M. 2004,** and **Zhou H, et. al; 2019,** demonstrated that early identification of severity using clinical scores and laboratory markers is critical for predicting outcomes and guiding management [15,16]. Assessment of BISAP score components revealed that most patients had low scores, indicating a lower risk of severe disease. Elevated blood urea nitrogen levels and altered mental status were uncommon, while systemic inflammatory response syndrome was present in a subset of patients. Pleural effusion was observed in a considerable proportion, reflecting its role as an important marker of disease severity. Studies have shown that parameters such as SIRS and pleural effusion correlate with increased severity, complications, and adverse outcomes, reinforcing their prognostic significance [17,18].

The majority of patients had BISAP scores below 3, indicating low risk, while only a small proportion had higher scores associated with increased severity. A significant association was observed between higher BISAP scores and disease severity, organ failure, and longer hospital stay. Patients with higher scores were more likely to develop complications and required prolonged hospitalization. **Arif A, et. al; 2019** and **Hagjer S & Kumar N. 2018,** demonstrated that BISAP is a simple, reliable, and effective tool for early prediction of severity and clinical outcomes in acute pancreatitis [19,20].

Infection was absent in most patients, although a notable proportion developed infectious complications, particularly among those with higher disease severity. The presence of infection was strongly associated with worse outcomes and is recognized as a major contributor to mortality in acute pancreatitis. Most patients were managed conservatively, with only a minority requiring interventions, supporting the observation that mild cases predominate and can be effectively treated without invasive procedures. Hospital stay was generally short, especially in mild cases, while longer durations were associated with increased severity [21-23]. The study demonstrates that disease severity in acute pancreatitis is closely associated with BISAP scores and clinical outcomes such as organ failure, infection, and duration of hospitalization. Mild cases typically had favorable outcomes with minimal complications, whereas more severe forms were linked to increased morbidity. The absence of mortality in this cohort reflects early diagnosis, appropriate management, and predominance of mild disease. **Carroll JK, et. al; 2007,** highlighted the utility of the BISAP score and Revised Atlanta Classification as complementary tools for early risk stratification, guiding management, and improving patient outcomes in acute pancreatitis [24].

CONCLUSION

This prospective observational study evaluating the Revised Atlanta Classification using CT and the BISAP scoring system demonstrates their effectiveness in assessing severity and predicting outcomes in acute pancreatitis. The disease predominantly affected middle-aged males, with most cases being mild. The Revised Atlanta Classification correlated well with clinical outcomes, while BISAP provided reliable early risk stratification, particularly for organ failure and hospital stay. Their combined use offers complementary benefits for comprehensive assessment. Severity was strongly associated with complications, though mortality was absent, highlighting the systems' utility in guiding management and improving patient outcomes.

CLINICAL SIGNIFICANCE

The clinical significance of this study lies in its potential to bridge the gap between research findings and practical healthcare applications. It emphasizes the importance of translating scientific observations into meaningful improvements in patient care, diagnosis, and treatment outcomes. By highlighting real world relevance, the study contributes to evidence based medical practice and supports informed clinical decision making. Ultimately, the findings aim to enhance patient quality of life, optimize therapeutic strategies, and promote better disease management in clinical settings.

ABBREVIATIONS

AP: Acute Pancreatitis
BISAP: Bedside Index for Severity in Acute Pancreatitis
RAC: Revised Atlanta Classification
CECT: Contrast-Enhanced Computed Tomography
IEP: Interstitial Edematous Pancreatitis
NP: Necrotizing Pancreatitis
LOS: Length of Hospital Stay
OF: Organ Failure
ICU: Intensive Care Unit
SIRS: Systemic Inflammatory Response Syndrome

AUTHOR INFORMATION

Dr. Renjith Balakrshnan: Third Year Junior Resident
Dr. Vinay M.D. Prabhu: Professor & HOD
Dr. Praneeti Shetty: Associate Professor
Dr. Neeraj S.: Assistant Professor

AUTHOR CONTRIBUTIONS

All authors significantly contributed to the study conception and design, data acquisition, or data analysis and interpretation. They participated in drafting the manuscript or critically revising it for important intellectual content, consented to its submission to the current journal, provided final approval for the version to be published, and accepted responsibility for all aspects of the work. Additionally, all authors meet the authorship criteria outlined by the International Committee of Medical Journal Editors (ICMJE) guidelines.

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CONFLICT OF INTEREST

Authors declared that there is no conflict of interest.

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None

ETHICAL APPROVAL & CONSENT TO PARTICIPATE

All necessary consent & approval was obtained by authors.

CONSENT FOR PUBLICATION

All necessary consent for publication was obtained by authors.

DATA AVAILABILITY

All data generated and analyzed are included within this research article. The datasets utilized and/or analyzed in this study can be obtained from the corresponding author upon a reasonable request.

USE OF ARTIFICIAL INTELLIGENCE (AI) & LARGE LANGUAGE MODEL (LLM)

The authors confirm that no AI & LLM tools were used in the writing or editing of the manuscript, and no images were altered or manipulated using AI & LLM.

AUTHOR'S NOTE

This article serves as an important educational tool for the scientific community, offering insights that may inspire future research directions. However, they should not be relied upon independently when making treatment decisions or developing public health policies.

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