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# CT Severity Index Score and Serum Procalcitonin Level: A Prospective Study for Early Assessment of Severity and Prognosis in Acute Pancreatitis

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**Abstract:** ***Background**: Acute pancreatitis (AP) ranges from a mild, self - limiting condition to severe acute pancreatitis (SAP) with complications like organ failure and pancreatic necrosis, necessitating early risk stratification for better clinical management. This study evaluates the prognostic value of the Modified Computed Tomography Severity Index (CTSI) score and serum procalcitonin levels in predicting AP severity, organ failure, and clinical outcomes such as ICU admission, length of hospital stay, and mortality. **Methodology**: The study is a prospective observational study conducted at Hi - Tech Medical College & Hospital, Bhubaneswar from March 2023 to January 2025, involving all patients diagnosed with acute pancreatitis in the Department of General Surgery. Patients meeting the inclusion criteria were enrolled using purposive sampling, and their demographic, clinical, and laboratory data were recorded. Diagnosis was based on clinical presentation, elevated serum enzyme markers, and imaging findings, with further evaluation of CTSI score and serum procalcitonin levels for prognostic assessment. **Result & Conclusion**: 80 Patients were included in my study with 48 males and 32 females, of which most of the patients were of the 4th decade followed by 6th and 7th decade.21 % of the study population who developed Acute Pancreatitis consumed alcohol, 48% of the study population developed components of SIRS on admission and at 48 hours after admission, 68% of the study population had elevated Serum Procalcitonin level & 10 Patients out of the study group of 80 died during the period of hospitalisation. Serum procalcitonin (PCT) levels at admission do not reliably predict progression to severe acute pancreatitis but may help identify disease severity and guide antibiotic therapy duration.*

**Keywords:** Acute Pancreatitis, Serum Procalcitonin (PCT), CTSI Score, Pancreatic Necrosis, Acute oedematous pancreatitis, Acute necrotising pancreatitis, BISAP scoring, RANSON scoring, BALTHAZAR scoring, APACHE II

## 1. Introduction

Severe acute pancreatitis is a critical condition marked by organ failure, local complications, and pancreatic necrosis, often associated with the disruption of pancreatic blood supply. Over the years several prognostic markers have been developed to stratify the severity of acute pancreatitis. Multifactorial scoring systems which combine clinical and biochemical criteria have been in use for decades. These include Ranson's criteria, Glasgow score, MOSS score, BISAP score and APACHE II score. The sensitivity and specificity of these scoring systems for predicting severe acute pancreatitis ranges between 55% and 90% depending on the cut - off values and the timing of scoring.

In terms of imaging, Contrast - Enhanced CT (CECT) is the preferred modality for staging acute pancreatitis and detecting complications. CECT has demonstrated high accuracy in identifying pancreatic parenchymal necrosis with a diagnostic sensitivity of 87% and an overall detection rate of 90%. Serum procalcitonin (PCT) has emerged as another valuable biochemical marker for assessing the prognosis of pancreatitis. A meta - analysis reported a sensitivity of 89% and a specificity of 82% for procalcitonin in this context, though significant heterogeneity exists between individual studies.

The present study aims to evaluate and compare the prognostic markers i. e. serum procalcitonin level & CTSI in cases of acute pancreatitis. The study also aims to analyse the relationship between these markers and clinical outcomes including the length of hospital stay, the requirement for ICU admission and mortality in patients with acute pancreatitis.

## 2. Materials and Methods

a) **Study Area**: Hi - Tech Medical College & Hospital, Bhubaneswar
b) **Study Duration:** March 2023 to January 2025
c) **Study Population**: All suspected cases of acute pancreatitis evaluated, diagnosed and managed at the Department of General Surgery, Hi - Tech Medical College and Hospital, BBSR were included in this study.
d) **Study Setting**: This study was conducted in the Department of Surgery, Hi - Tech Medical College and Hospital, BBSR in collaboration with the Departments of Radiodiagnosis and Pathology. All patients attending the General Surgery OPD who meet the inclusion criteria will be screened for acute pancreatitis.
e) **Sample Size**: All Patients admitted to the department of General Surgery of Hi - Tech Medical College and Hospital, BBSR with acute pancreatitis satisfying the inclusion and exclusion criteria
f) **Sample:** All patients who met the inclusion criteria and were accessible during the study period were enrolled.
g) **Sampling Technique:** Purposive sampling was used to select participants based on specific inclusion and exclusion criteria.
h) **Inclusion Criteria:** 1. Patients presenting with a history and clinical findings suggestive of acute pancreatitis, confirmed by imaging evidence of a bulky oedematous pancreas on ultrasound or CT abdomen and elevated serum enzyme markers.2. Patients who have given consent to participate in the study.
i) **Exclusion Criteria:** 1. Patients with chronic pancreatitis.2. Age below 18 years.
j) Eligible patients were selected based on the inclusion and exclusion criteria and were briefed about the study's

nature. Detailed patient's information including name, age, sex and medical history were recorded.

k) Patients were screened for acute pancreatitis based on suggestive history and duration of symptoms. They were asked about similar complaints in the past and any treatment received.

l) Acute pancreatitis is defined by the presence of two or more of the following criteria:
- Characteristic abdominal pain.
- Serum amylase and/or lipase levels three times higher than the normal value.
- Ultrasonography of the abdomen within the first seven days of hospitalization showing changes consistent with acute pancreatitis.

**Parameters Studied:**
- White Blood Cell (WBC) count
- Blood Urea Nitrogen (BUN)
- Arterial Blood Gas (ABG) analysis
- Chest X - ray (PA view)
- Abdominal Ultrasonography (USG)
- Serum amylase levels
- Serum lipase levels
- Contrast - Enhanced CT (CECT) abdomen
- Procalcitonin levels (measured using an Automated Immune Analyzer with B. R. A. H. M. S. assay)

**Scoring System:**
Severity was assessed using Ranson's Score and the BISAP Score at admission and at 48 hours. Data was analysed using various statistical methods to determine the relationship between the markers and clinical outcomes.

## 3. Results & Analysis

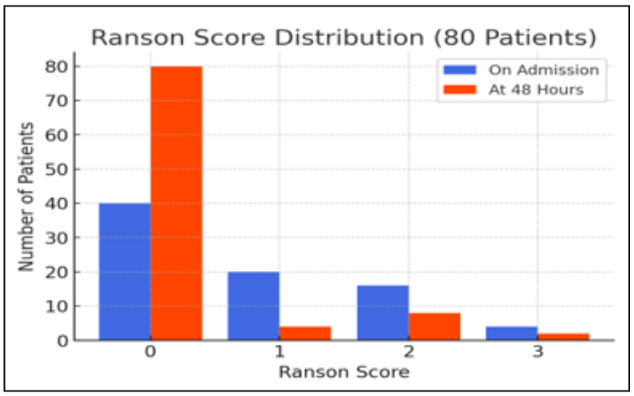
1) Sex distribution pattern & Male to Female ratio:

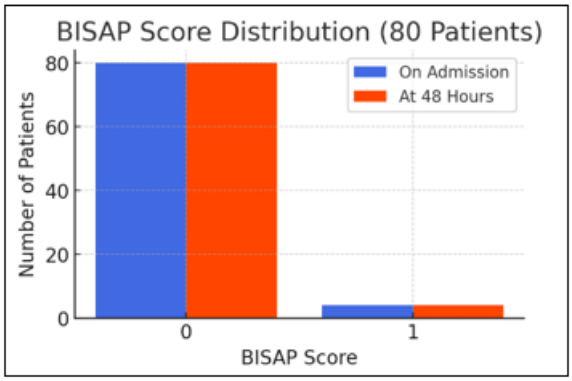
| SEX | Frequency | Percent |
|---|---|---|
| Female | 32 | 40.0 |
| Male | 48 | 60.0 |
| Total | 80 | 100.0 |

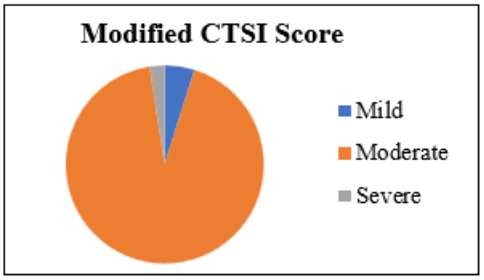
2) Most of the patients who reported and were found to have Acute pancreatitis were of the 4th decade followed by 6th and 7th decade

| AGE | Frequency | Percent |
|---|---|---|
| 18 - 20 | 4 | 5.0 |
| 21 - 30 | 2 | 2.5 |
| 31 - 40 | 22 | 27.5 |
| 41 - 50 | 8 | 10.0 |
| 51 - 60 | 18 | 22.5 |
| 61 - 70 | 18 | 22.5 |
| 71 - 80 | 8 | 10.0 |
| Total | 80 | 100.0 |

3) 21 % of the study population who developed Acute Pancreatitis consumed alcohol.
4) 48% of the study population developed components of SIRS on admission and at 48 hours after admission.
5) Ranson's and BISAP score on admission and at 48 hours were -
6) 68% of the study population had Elevated Serum Procalcitonin level.
7) Modified CTSI Score in the study group population




1) **10** Patients out of the study group of 80 died during the period of hospitalisation.
2) Serum Lipase levels at admission and at 48 hours corresponded to the duration of stay in the ICU with p value of **0.049** and **0.015** respectively. Also patients with significantly elevated Serum Amylase at admission and at 48 hours corresponded with the elevated levels of Serum Procalcitonin.
3) Serum Procalcitonin showed a positive correlation with respect to BISAP Score on admission. However, BISAP score to prognosticate duration of ICU stay, Acute ward stay and total duration of stay was found to be insignificant.
4) Severity of Acute pancreatitis assessed by Ranson's score showed positive correlation with Serum Procalcitonin levels with significant p value.
5) Patients with elevated Serum Procalcitonin levels showed a positive correlation with the mean stay in the ICU with significant p value. Serum Procalcitonin showed a positive correlation with stay in acute ward and total duration of hospital stay but due to small sample size p value was not significant.
6) Patients with significantly elevated Serum Amylase and lipase levels at admission and at 48 hours were also detected to have elevated Serum Procalcitonin level with a significant p value.

7) As per the results of this study Modified CTSI score and Serum Procalcitonin were not a good marker for prognosticating the death, however all the patients who died had an elevated Modified CTSI score and Serum Procalcitonin levels, but due to small study size results shows to be non - significant
8) For prognosticating severity and chances of death in a patient with Acute pancreatitis, Modified CTSI Score and Serum procalcitonin showed sensitivity of 100% and specificity of 8.57% and 40% respectively. Serum Procalcitonin had a diagnostic accuracy of 47.5% and PPV of 19.23%.

## 4. Discussion

The diagnosis and treatment of **acute pancreatitis** focuses on determining the severity, with **contrast - enhanced CT** being the gold standard to differentiate between **mild** and **severe** cases especially in identifying **acute oedematous or necrotizing pancreatitis**. Scoring systems like **Ranson's** and **APACHE II** are commonly used, though they have limitations such as long waiting times and complexity. **Procalcitonin (PCT)** is a promising biomarker that increases in response to severe inflammation, sepsis and organ failure. Studies suggest it can predict **severity** and **complications** in acute pancreatitis. It has been shown to correlate with **infected necrosis** and **organ failure**, but the sensitivity and specificity vary across studies. In our study, **serum PCT** levels showed **100% sensitivity** and **40% specificity** with a **diagnostic accuracy of 47.5%** for predicting severity, correlating with longer ICU and hospital stays. However, due to the **small sample size** results were not statistically significant. We found that **PCT** might be more accurate than the **Modified CTSI** in predicting outcomes, though larger studies are needed to validate these findings. Other studies, including a **meta - analysis** by Shafiq et al., suggest that **PCT** is not a strong marker for acute pancreatitis severity, with some studies reporting **low specificity**.

## 5. Conclusion

In patients with acute pancreatitis, serum procalcitonin (PCT) levels at admission do not reliably predict progression to severe acute pancreatitis. However, PCT may serve as a useful marker for early identification of disease severity and can help guide the duration of antibiotic therapy. To fully assess the clinical utility of PCT in acute pancreatitis, large prospective studies are needed.

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