

# Comparative Study of Ransons Criteria and Modified Computed Tomography Severity Index (Mctsi) in Predicting Complication and Mortality in Acute Pancreatitis

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## Abstract

**Introduction:** Acute pancreatitis (AP) is a sudden inflammation of the pancreas that can range from mild to severe. While mild cases resolve with supportive care, severe acute pancreatitis (SAP) is associated with high morbidity, complications such as systemic inflammatory response syndrome (SIRS), multiorgan failure, and mortality. Early diagnosis and severity assessment are critical in guiding treatment to improve patient outcomes. Ranson's score and the Modified Computed Tomography Severity Index (CTSI) are commonly used to assess severity and predict complications in AP.

**Aim & Objective:** The aim of the study was to compare the effectiveness of Ranson's score and the Modified CTSI in predicting mortality and complications in acute pancreatitis. The objectives included evaluating the efficiency of these scoring systems and examining the demographic profile of patients.

**Methodology:** This observational study was conducted over 18 months at Santosh Hospital, with a sample size of 70 patients diagnosed with acute pancreatitis. Data were analyzed using SPSS software. Categorical variables were expressed as numbers and percentages, while quantitative data were presented as mean  $\pm$  SD. Statistical comparisons were made using the student's t-test and chi-square test, with a p-value of  $<0.05$  considered statistically significant.

**Results:** The study revealed a male predominance (68.6%), with the highest age group being 31–45 years (35.7%). The mean Ranson's score was  $4.2 \pm 1.1$ , and the mean Modified CTSI score was  $6.8 \pm 1.5$ . Complications were common, with necrosis (25.7%) and pseudocysts (21.4%) being most prevalent. Mortality was significantly associated with necrosis and multi-organ failure. Severe cases had higher readmission rates, with 8.6% of severe cases requiring readmission.

**Conclusion:** The study found that both Ranson's score and Modified CTSI are effective tools for assessing the severity of acute pancreatitis. The Modified CTSI score may provide a more detailed assessment. Severe cases showed higher rates of complications and readmissions, emphasizing the importance of early identification and targeted interventions in improving outcomes for high-risk patients.

**Keywords:** Acute Pancreatitis, Ranson's Score, Modified CTSI, Severity Assessment, Complications.

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## Introduction

Acute pancreatitis refers to the rapid onset of inflammation of pancreas, with varying severity. Mild cases typically resolving with supportive care, while severe pancreatitis is more dangerous, leading to multiple complications, and potentially death. Early

diagnosis and severity assessment are crucial for guiding treatment and improving outcomes. Mild cases usually respond to conservative management (hydration, pain control, dietary changes), but SAP requires intensive care, aggressive fluid resuscitation, and, in some cases, surgery or other interventions [1].

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SAP is life-threatening and associated with high morbidity and mortality due to complications. Early recognition helps focus on preventive measures and targeted treatments, reducing complications.

Multiple scoring system are used to identify severe cases to predict complications and mortality. These systems incorporate various parameters. Their main goal is to stratify risk, guide clinical decisions, and predict outcomes. Two key scoring systems are:

**Ranson's score:** A clinical system that assesses the acute pancreatitis severity on basis of multiple criteria. Points are assigned to each criterion, and the cumulative score helps classify the severity of pancreatitis, guiding treatment and prognosis.

#### Modified Computed Tomography Severity Index (MCTSI):

A radiological system using CT imaging to assess pancreatic inflammation, necrosis, and extra-pancreatic complications [2].

Ranson's score, established in 1974, relies on biochemical changes observed within the first 48 hours of hospitalization [3]. The Modified CTSI, on the other hand, focuses on structural and anatomical changes detected through CT imaging. Combining both systems offers a comprehensive assessment of acute pancreatitis, enhancing diagnosis, prognosis, and treatment strategies [4].

## Aims & Objectives

### AIMS

- To compare the effectiveness of Ransons score and the Modified CTSI in predicting mortality and complication of AP.

### Objectives

- To compare efficiency of Ranson's scoring and MCTSI scoring to predict complication and mortalities of AP.
- To assess the demographic profile of patient diagnosed with Pancreatitis.

## Material & Method

### Study Design

Observational study

Study Duration: 18month (Total study period)	Review of literature and proforma design	Data collection	Data analysis	Thesis writing and submission
18 months	2 months	10 months	3 months	3 months

### Study Population

Patients admitted in a Tertiary Care Hospital with acute Pancreatitis

**Sample Size:** 70

### Inclusion Criteria:

- Patients diagnosed as a case of acute pancreatitis and admitted in Tertiary care Hospital.

- Gender- both males and females

### Exclusion Criteria:

- Patient refusal to participate
- All patients below the age of 18 years visiting general surgery OPD and IPD.
- Chronic pancreatitis

## Result

**Table 1: Distribution of Patients Based on Socio-demographic Characteristics**

Parameter	Frequency (n)	Percentage (%)	p-value
<b>Gender</b>			
Male	48	68.6	0.042
Female	22	31.4	
<b>Age Group (year)</b>			
18–30	20	28.6	0.003
31–45	25	35.7	
46–60	15	21.4	
>60	10	14.3	
<b>Socioeconomic Status (Kuppuswamy Scale)</b>			
Upper Class	6	8.6	0.021
UMC	20	28.6	
LMC	25	35.7	
ULC	19	27.1	
<b>Education Level</b>			
Illiterate	10	14.3	0.035
Primary	18	25.7	
Secondary	30	42.9	
Graduate and above	12	17.1	

Table-1 illustrates that 68.6% were males and 31.4% females with p - value 0.042. Regarding age groups distribution, 28.6% were 18–30 year, 35.7% were 31–45 year, 21.4% between 46–60 year, and 14.3% are over 60 years, with a p-value of 0.003. In terms of socioeconomic status, 8.6% belonged to the upper class, 28.6% to the upper middle class, 35.7% to the lower middle class, and 27.1% to the upper lower class, with a p-value of 0.021.

**Table 2: Comparison between Ransons and MCTSI scoring in AP**

Score	Mean $\pm$ SD	Range	p-value
Ranson's Score	4.2 $\pm$ 1.1	2–7	0.016
Modified CTSI Score	6.8 $\pm$ 1.5	3–10	

Table-2 illustrates that out of the total study participants, the mean Ranson's score was 4.2  $\pm$  1.1, with a range of 2 to 7, and a p-value of 0.016. The mean Modified CTSI score was 6.8  $\pm$  1.5, with a range of 3 to 10.

**Table 3: Complications and Their Frequency in Patients with Pancreatitis**

Complications	Frequency (n)	Percentage (%)	p-value
Pseudocyst	15	21.4	0.032
Necrosis	18	25.7	
ARDS	8	11.4	
Multi-Organ Failure	5	7.1	

Table-3 illustrates that out of the total study participants, 21.4% experienced pseudocyst, 25.7% had necrosis, 11.4% developed ARDS, and 7.1% experienced multi-organ failure. The p-value for pseudocyst is 0.032, indicating statistical significance for this complication in the study group.

**Table 4: Mortality and Percentage Distribution of Complications in Patients**

Complications	Mortality (n)	Percentage (%)	p-value
Pseudocyst	2	2.9	0.039
Necrosis	4	5.7	
Multi-Organ Failure	4	5.7	

Table-4 illustrates that out of the total study participants, 2 (2.9%) experienced mortality due to pseudocyst, 4 (5.7%) due to necrosis, and 4 (5.7%) due to multi-organ failure. The p-value for pseudocyst mortality is 0.039, indicating statistical significance.

**Table 5: Severity of Condition and Associated Readmission Rates**

Severity	Readmissions (n)	Percentage (%)	p-value
Mild	1	1.4	0.045
Moderate	4	5.7	
Severe	6	8.6	

Table-5 illustrates that out of the total study participants, 1.4% were readmitted with mild severity, 5.7% with moderate severity, and 8.6% with severe severity. The p-value for mild severity is 0.045, indicating statistical significance.

## Discussion

A prospective observational study was undertaken at a tertiary care hospital in Ghaziabad, over 18 months with ethical approval. The aim was to compare between the Ransons and MCTSI scoring system in assessing the outcomes and morbidity in Acute Pancreatitis. The primary objective was to assess the predictive value of both system in determining severity and prognosis. Demographic characteristics for patients were also evaluated. Data collection occurred over 10 months, with 2 months for literature review and proforma design, and 3 months for analysis, thesis writing, and submission. Consents were taken from all the patients.

In our study, 68.6% of patient were males, with females comprising 31.4% ( $p = 0.042$ ), indicating a higher prevalence in males. The most involved age group between 31-45 year (35.7%), then 18-30 year (28.6%). Age significantly influenced prevalence,

with younger to middle-aged adults more affected ( $p = 0.003$ ). Most patients were from lower socioeconomic backgrounds, with 35.7% lower middle class, 28.6% upper middle 27.1% upper lower class and 8.6% from the upper class ( $p = 0.021$ ), suggesting socioeconomic status impacts Acute Pancreatitis. Education levels showed that 14.3% were illiterate, and 25.7% had primary education ( $p = 0.035$ ). Mathai MJ et al. examined demographic parameters, including gender and age, in a study of 150 participants [5]. Of these, 103 (68.66%) were male and 47 (31.33%) were female, indicating a male-dominated population. The majority of participants were aged 41-50 years (33.33%, 50 individuals), followed by 51-60 years (21.33%, 32 participants). The 31-40 years group comprised 16% (24 participants), while the 21-30 years group had the fewest (8 participants, 12%). Participants aged 61-70 years represented 19.33% (29 individuals), and those above 71 years made up 4.66% (7 participants). These findings suggest a predominance of the 41-50 age group and a male-biased distribution.

Mean Ransons score ( $4.2 \pm 1.1$ , range 2–7) and Modified CTSI Score ( $6.8 \pm 1.5$ , range 3–10) in acute pancreatitis patients were compared. The significant p-value of 0.016 indicates a notable difference between the scores. The Modified CTSI Score appears to be more sensitive, suggesting it may provide a better assessment of pancreatitis severity. This supports its potential utility for guiding clinical decision-making more effectively compared to the Ranson's Score. Harshit Kumar A et al. analyzed the clinical characteristics of patient using both scoring systems [6]. They found that 44% of patients had a Ranson's score  $\geq 3$ , indicating higher severity, while 36% had a score  $< 3$ , suggesting lower severity. For the Modified CTSI, 44% of patients scored between 4–6, indicating moderate severity, 28% scored 0–2 (mild cases), and 28% scored 8–10 (severe cases). These findings support the Modified CTSI's effectiveness in predicting patient outcomes.

In our study, the frequency and mortality rates of complications were carefully analyzed, revealing important trends. The most common complication observed was necrosis, which occurred in 25.7% of patients, followed by pseudocyst formation, reported in 21.4% of cases. Acute Respiratory Distress Syndrome (ARDS) was present in 11.4% of patients, while multi-organ failure was less frequent, occurring in 7.1% of patients. Major associations between occurrence of pseudocyst ( $p=0.032$ ) & necrosis ( $p=0.039$ ) with mortality, indicating that these complications are linked to an increased risk of death. The mortality rates for these complications were 2.9% for pseudocysts and 5.7% for both necrosis and multi-organ failure. The data suggests that pseudocyst formation, despite being a common complication, has a relatively low mortality rate, whereas necrosis and multi-organ failure contribute to higher mortality. These findings emphasise the severity of necrosis and multi-organ failure in clinical outcomes. The p-values further suggest a statistically significant relationship between these complications and patient mortality, highlighting the critical need for early detection and manage these conditions to improve survival outcomes. Overall, the study underlines the importance of monitoring and addressing these complications in the clinical setting. We did not find any relevant studies which relates to Complications and Their Frequency in Patients with Pancreatitis and Mortality and Percentage Distribution of Complications in Patients.

In our study, we observed that the readmission rates increased with the severity of the condition. Among those with mild severity, 1.4% were readmitted, while 5.7% of patients with moderate severity and 8.6% of those with severe conditions required readmission. The p-value of 0.045 suggests that the difference in readmission rates between the severity groups is statistically significant. This indicates that more severe cases are associated with higher rates of readmission, which could be due to the increased complexity of managing severe conditions. These findings highlight the usefulness of close monitoring and focus for severe cases to prevent readmissions. Ahmed A et al. classified patients based on severity using a scoring system [7]. From the total patients, 41.4% (29) had mild severity, 27.1% (19) had moderate severity, and 31.4% (22) had severe severity. This distribution shows that a significant portion experienced mild or moderate symptoms, while nearly a third of the population had severe manifestations of the condition.

## Conclusion

- The majority of the study participants were male (68.6%) and in the 31–45 years age group (35.7%).
- A significant proportion of participants were from the lower-middle and upper-middle socioeconomic classes (35.7% and 28.6%, respectively).
- The education level of participants varied, with the highest percentage (42.9%) having secondary education.
- The mean Ranson's score was  $4.2 \pm 1.1$ , indicating a moderate level of severity in the acute pancreatitis cases, while the mean Modified CTSI score was  $6.8 \pm 1.5$ , also suggesting moderate severity.
- Complications were common, with necrosis (25.7%) and pseudocysts (21.4%) being the most prevalent. Mortality was significantly associated with necrosis and multi-organ failure.
- Severe cases had the highest readmission rates, with 8.6% of severe cases being readmitted, highlighting the impact of severity on readmission.

## Declarations

All methods were carried out in accordance with relevant guidelines and regulations. The study protocol was reviewed and approved by the Institutional Ethics Committee of Santosh Deemed to be University (Approval No: SU/R/2023/2489[40]). Written informed consent was obtained from all participants (or from a parent/legal guardian in the case of minors) prior to inclusion in the study.

## Ethical Approval



**SANTOSH**  
Deemed to be University  
(Established u/s 3 of the UGC Act, 1956)

F. No. SU/R/2023/2489[40]

Dated: 26.09.2023

Subject: Grant of Ethical Clearance for Thesis Protocol Topic "COMPARATIVE STUDY OF RANSON'S CRITERIA AND MODIFIED COMPUTED TOMOGRAPHY SEVERITY INDEX (MCTSI) IN PREDICTING COMPLICATIONS AND MORTALITY IN ACUTE PANCREATITIS", submitted by Dr. RAVI SHANKAR, MD/MS student of Batch 2022-2023, Department of GENERAL SURGERY.

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With reference to his/her request for grant of Ethical Clearance for the Thesis Protocol entitled "COMPARATIVE STUDY OF RANSON'S CRITERIA AND MODIFIED COMPUTED TOMOGRAPHY SEVERITY INDEX (MCTSI) IN PREDICTING COMPLICATIONS AND MORTALITY IN ACUTE PANCREATITIS", Dr. RAVI SHANKAR is informed that the Thesis Protocol submitted by him/her was considered by the Screening Committee of the Santosh Medical College & Hospital in its meetings held on 17.07.2023 to 28.07.2023. The recommendations of the Screening Committee were considered in detail by the Institutional Ethics Committee in its meeting held on 23.09.2023 and the same was approved by the Ethics Committee.

He /She is informed accordingly for further necessary action.

(Dr. NARESH SHARMA)  
REGISTRAR

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### Copy to:

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