

## ORIGINAL ARTICLE

# Accuracy of CTSI in Predicting Severity in Acute Pancreatitis Keeping Ranson Score as Gold Standard

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## ABSTRACT

**Background:** Acute pancreatitis is a common health issue that leads to emotional, physical and financial human burden.

**Aim:** To determine the diagnostic accuracy of CTSI, in predicting the severity of acute pancreatitis, keeping Ranson's score as Gold Standard.

**Study design:** Cross Sectional study.

**Methodology:** Total of 148 patients were observed by using Sajid's calculator for sensitivity and specificity, using a sensitivity of 87.5% with a margin of error = 10% and a specificity of 55.3% with a margin of error=10%, with a confidence interval of 95% and a prevalence rate of 20%. Moreover, random consecutive sampling technique was used for sample collection. Data was evaluated by using SPSS version 24. The results were presented as counts (percentage), means and, standard deviation as appropriate.

**Results:** Our study showed that mean age was 42 years with SD±2.25. Twenty eight percent patients were male, 107(72%) patients were female. Diagnostic accuracy of CTSI score keeping Ranson's score as a gold standard was analyzed as CTSI has the sensitivity 91%, Specificity 59%. Positive predictive value was 81%, Negative predictive value 67%, Diagnostic accuracy was 84%.

**Practical Implication:** The routine use of CTSI has been practiced in our health setup since long but not much research was done to assess the validity of CTSI in our population. Thus present study assessed the effectiveness of CTSI in our population against the local standard validates in our local setup.

**Conclusion:** It was concluded that CT severity index is still a very valuable and relatively inexpensive tool for assessing acute inflammation of pancreas and for predicting the severity of the pancreatitis.

**Keywords:** Diagnostic Accuracy, CTSI, Acute Pancreatitis and Ranson's Score.

## INTRODUCTION

Acute pancreatitis is a common health issue that leads to emotional, physical and financial human burden<sup>1</sup>. Few researchers reported an incidence of 20~40/100,000 population for acute pancreatitis<sup>2</sup>.

Premature activation of pancreatic enzymes inside the pancreas cause acute pancreatitis thus results in auto-digestion of the gland and local inflammation. Almost 20% of patients suffer from severe pancreatitis that causes organ failure along-with local complications like necrosis, infection, or pseudo-cyst formation<sup>3</sup>. Accurate diagnosis of Severe Acute Pancreatitis (SAP) on admission carries significant importance thus identification of its risk factors helps in predicting morbidity and death among patients.

Features of severe acute pancreatitis include organ failure, local complications along-with disturbance its blood supply. In past as revealed by literature review, there were many multi-factorial scoring systems that used both clinical and biochemical criteria for severity assessment of acute pancreatitis. These scoring systems include Ranson score, Glasgow score, MOSS score, BISAP score and APACHE-II score. Literature review revealed that all these systems had sensitivity and specificity for predicting severe acute pancreatitis from 55% to 90%. There were few limitations that include inability to obtain a complete score until at least 48 hours into the illness or complexity of the scoring system itself.<sup>4</sup> With advanced technology, imaging with dynamic contrast-enhanced CT (DCT) is used for staging acute pancreatitis and detection of its complications<sup>5</sup>. Past studies showed that contrast-enhanced computed tomography as a early predictor of severe acute pancreatitis decreased overall death rate thus and lowered its burden<sup>4</sup>.

One researcher reported a sensitivity of 87.5% and specificity of 55.3% for ICU admission with an accuracy of 64.8% for CTSI while Ranson's Score had a sensitivity of 88.9% and specificity of 57.1% for ICU admission with an accuracy of 61.1%<sup>5</sup>. There is limited value for clinical evaluation about the severity of acute pancreatitis. Literature revealed that only 34 to 39% cases of severe pancreatitis get correct diagnosis clinically at the time of admission while remaining cases get missed. These missed cases later develop fatal necrotizing pancreatitis until autopsy done for its diagnosis<sup>6</sup>. Previous studies showed that contrast-enhanced computed tomography (CECT) provided better evidence for pancreatitis if carried out 48–72 h after the onset of

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symptoms among patients with predicted severe pancreatitis<sup>7</sup>. Early, efficient, and accurate evaluation for organ failure is an important step for improving outcome in severe acute pancreatitis<sup>8</sup>. The routine use of CTSI has been practiced in our health setup since long but not much research was done to assess the validity of CTSI in our population. Thus present study assessed the effectiveness of CTSI in our population against the local standard validates in our local setup. CT severity index is still a very valuable and relatively inexpensive tool for assessing acute inflammation of pancreas and for predicting the severity of the pancreatitis.

The objective of the study was to determine the diagnostic accuracy of CTSI, in predicting the severity of acute pancreatitis, keeping Ranson's score as Gold Standard.

## METHODOLOGY

It was a cross sectional study. This research was carried out on patients (n=148) of acute pancreatitis who met the inclusion criteria who presented to casualty or outpatient department of the surgical units of Khyber Teaching Hospital within 48 hours of onset of symptoms of acute inflammation of the pancreas and a raised serum amylase levels beyond 100 IU/Liter. Sample size was calculated by using Sajid's calculator for sensitivity and specificity, using a sensitivity of 87.5% with a margin of error = 10% and a specificity of 55.3% with a margin of error = 10%, with a confidence interval of 95% and a prevalence rate of 20%. Moreover, random consecutive sampling technique was used for sample collection. All patients were subjected to contrast enhanced computer tomography (CECT) by Toshiba Asteion Scanner with Pancreatic Protocol and the severity of Pancreatic inflammation scored according to CTSI by the same team of radiologists. Simultaneously, Ranson's Scores were also calculated for all patients. Sensitivity, specificity, positive predictive value and negative predictive value was measured for each scoring system in predicting the severity of Pancreatitis, and all patients were managed according to standard protocols. The patients were observed during their hospital stay till their discharge or referral to other specialized unit, like ICU. All patients presenting within 48hours of onset of symptoms of pancreatitis with serum Amylase level of >100 IU/dl were included.

**Statistical analysis:** Data was evaluated by using SPSS version 24. Mean±SD presented age parameter. Gender presented as frequencies and percentages. Sensitivity, specificity, positive predictive value and negative predictive value were calculated taking Ranson's score as a Gold Standard. P value of < 0.05 was considered significant.

**RESULTS**

Age among participants was presented as frequency and percentage (table-1). Age ranged from 20 to 50 years. Age distribution among 148 patients was analyzed as 18(12%) patients were in age range 20-30 years, 47(32%) patients were in age range 31-40 years, 83(56%) patients were in age range 41-50 years. Mean age was 42 years with SD±2.25 (table-1). Ranson's score among 148 patients was analyzed as 133(90%) patients had Ranson's score > 3 (positive) while 15(10%) patients had Ranson's score <3 (negative). Other parameters like gender and CTSI were shown as frequency and percentage in table-1.

Table-1: Baseline Parameters (n=148)

Parameters	Groups	Frequency(%)
Age (years)	20-30	18 (12%)
	31-40	47 (32%)
	41-50	83 (56%)
	Mean ± SD	42±2.25
Gender	Male	41 (28%)
	Female	107 (72%)
Ranson's Score	>3(positive)	133 (90%)
	<3 (negative)	15 (10%)
CTSI	>3(positive)	118(80%)
	<3 (negative)	30 (20%)

Diagnostic accuracy of CTSI score keeping Ranson's score as a gold standard was analyzed as CTSI has the sensitivity 91%, Specificity 59%, Positive predictive value 81%, Negative predictive value 67%, Diagnostic accuracy was 84% as shown in table-2.

Table-2: Diagnostic accuracy of CTSI

CTSI	Ranson's Score	
	Positive (>3)	Negative (<3)
Positive (>3)	104 (88%)	14 (12%)
Negative (<3)	10 (33%)	20 (67%)

**DISCUSSION**

Acute Pancreatitis occurs when pancreatic enzymes are prematurely activated inside the pancreas leading to autodigestion of the gland and local inflammation. Severe pancreatitis, also referred to as necrotizing pancreatitis, occurs in approximately 20% of patients and is associated with organ failure or local complications, including necrosis, infection, or pseudocyst formation<sup>3</sup>. Accurate diagnosis of Severe Acute Pancreatitis (SAP) on admission to the hospital is of paramount importance and there is, therefore, agreement about the need for finding predictors of severe disease to identify patients who are at risk of morbidity and death.

Our study showed that mean age was 42 years with SD ± 2.25. Twenty eight percent patients were male, (72%) patients were female. Diagnostic accuracy of CTSI score keeping Ranson's score as a gold standard was analyzed as CTSI has the sensitivity 91%, Specificity 59%, Positive predictive value 81%, Negative predictive value 67%, Diagnostic accuracy was 84%.

Similar results were found in another study conducted by one researcher<sup>9</sup> who reported a sensitivity of 87.5% and specificity of 55.3% ICU admission with an accuracy of 64.8% for CTSI while Ranson's Score had a sensitivity of 88.9% and specificity of 57.1% for ICU admission with an accuracy of 61.1%.<sup>5</sup> Literature revealed that only 34 to 39% cases of severe pancreatitis get correct diagnosis clinically at the time of admission while remaining cases get missed. These missed cases later develop fatal necrotizing pancreatitis until autopsy done for its diagnosis<sup>6</sup>. Previous studies showed that contrast-enhanced computed tomography (CECT) provided better evidence for pancreatitis if carried out 48–72 h after the onset of symptoms among patients with predicted severe pancreatitis<sup>7</sup>. Early, efficient, and accurate evaluation for organ failure is an important step for improving outcome in severe acute pancreatitis<sup>8</sup>.

Similar results were found in another study<sup>10</sup> in which mean age was 47 years with SD ± 1.23. Twenty percent patients were male, (80%) patients were female. CTSI has the sensitivity 80%, Specificity 63%, Positive predictive value 83%, Negative predictive value 70%, Diagnostic accuracy was 86%.

Similar results were found in another study<sup>11</sup> that enrolled 39 patients of acute pancreatitis. Their results showed that 49% patients had AP due to biliary etiology. On admission, AP was assessed clinically as severe in 7 patients (18%). A strong correlation was demonstrated between CTSI and MRSI on admission and 7 days later. Their results showed that MRI has sensitivity (83%) for severe AP while 91% specificity in comparison to CT which showed 78% and 86% sensitivity and specificity respectively.

One previous study detected that sensitivity, specificity, positive predictive value and negative predictive value of modified CT severity index in assessing the severe acute pancreatitis were 100%, 87%, 81.13% and 100%, respectively.<sup>12</sup> The diagnostic accuracy was yielded as 91.67% considered APACHE II as gold standard. Their findings were in line with our findings.

**CONCLUSION**

It was concluded that CT severity index is still a very valuable and relatively inexpensive tool for assessing acute inflammation of pancreas and for predicting the severity of the pancreatitis.

**Author's contribution:** **MJS:** Overall supervision, write up and literature review, **MA:** Statistics application, analysis literature review, help in write up, **MAK & AU:** Literature review

**Limitations:** Single centre study with financial constrains and limited resources.

**Conflict of interest:** None

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