

## Comparison Between Glasgow Score and CTSI in Predicting the Severity of Acute Pancreatitis Based on Modified Atlanta Classification 2012

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### ABSTRACT

**Objective:** To compare the Glasgow scoring system and modified CTSI scoring system regarding its ability to predict the severe nature of acute pancreatitis according to the revised Atlanta classification in a tertiary care hospital in Pakistan.

**Study Design:** Comparative cross-sectional study.

**Place and Duration of Study:** General Surgery Department, Combined Military Hospital, Rawalpindi from July 2020 to Jul 2021.

**Methodology:** Forty patients ranging from 30 to 70 years of age with acute pancreatitis, some of them were admitted to our hospital and others were received in the Emergency Department. Glasgow and modified CTSI scores were calculated for all cases.

**Results:** Glasgow and CTSI scoring systems were compared according to the Atlanta Classification. The data in our study showed a mean Glasgow score of  $2.475 \pm 2.975$ , whereas the mean CTSI score was  $5.575 \pm 2.458$ . In predicting severe acute pancreatitis using the AUC graph, the CTSI scoring system had a higher accuracy (0.994) than Glasgow score (0.987). For mild and moderately severe acute pancreatitis, both Glasgow and CTSI showed significance ( $p < 0.01$ ).

**Conclusion:** CTSI scoring is more accurate in detecting the severity of acute pancreatitis. Glasgow was close behind, but it is not an accurate indicator.

**Keywords:** Pancreatitis, Atlanta classification, CTSI score, Glasgow score.

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### INTRODUCTION

Acute pancreatitis (AP) is inflammation of the pancreas. It involves multiple acute inflammatory responses, which results in systemic inflammatory response syndrome (SIRS) or multiple organ failure. There is no specific treatment for this disease which shows that the exact cause of its pathogenesis is still unknown.<sup>1</sup> In terms of severity, an attack of acute pancreatitis could be mild, primarily self-limited or severe, which has high morbidity and mortality. A study done from 1990-to 2017 has done a systemic analysis in 195 countries and revealed that the prevalence rate of acute pancreatitis has risen from 67.2% (1990) to 76.52% (2017).<sup>2</sup>

The most common causes of AP include; alcohol abuse, gall stones, trauma, post-ERCP, idiopathic, drugs induced, autoimmune and Scorpio sting and hyper-triglyceridaemia; alcohol and biliary tract related cases account for 35% and 40%, respectively.<sup>3</sup>

The revised Atlanta classification can distinguish between mild, moderate, and severe diseases based on

organ failure development and duration.<sup>4</sup>

With the mortality rate being up to 30% for severe AP, identifying the risk factors and therapeutic targets become even more vital in determining the prognosis of management.<sup>5</sup>

Balthazar developed the computerized topography severity index (CTSI) to assess the severity of acute pancreatitis radiologically, but it does not show the extrapancreatic complications like multi-organ failure.<sup>6</sup> Modified version of the CT scoring system was made to determine the clinical outcome accurately. It closely correlates with a patient's outcome parameters like hospital stay duration, surgery or intervention, infection, organ failure, and death.<sup>7</sup>

In this study, we compared Glasgow and CTSI scoring systems based on modified Atlanta Classification (2012). Modified Atlanta Classification divides acute pancreatitis into mild, moderately severe, and severe acute pancreatitis. It provides a simple classification to define morphological and clinical findings of acute pancreatitis. It distinguishes an early phase from a late phase and allows doctors to detect necrosis, pseudocyst, and fluid collection. Predicting the severity of AP in a patient is highly vital as it helps to

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stratify the severity of the disease and its management.<sup>8,9</sup> Many prognostic scoring methods have been devised to predict the severity and prognosis of acute pancreatitis from clinical, laboratory and radiological evaluations.<sup>10</sup>

This study aims to assess and compare the prediction of severity of acute pancreatitis by comparing two scoring systems, the Glasgow score and the CTSI score, according to the revised Atlanta classification (2012). Due to the pandemic (COVID-19), fewer patients came into the hospital. Due to the COVID-19 pandemic, travel restrictions caused a decreased influx of patients to CMH, Rawalpindi.

### METHODOLOGY

The cross-sectional comparative study was carried out at Combined Military Hospital (CMH) Rawalpindi from July 2020 to July 2021. Data for the research was gathered using a consecutive sampling technique. Clinical, biochemical and radio-graphical data were collected from 40 patients. Patients admitted and treated under the direct supervision of the authors were considered. Ethical clearance for the study was obtained from the Hospital Ethics Review Committee (No. 237/1/22). The sample size was calculated using the online WHO sample size calculator, taking a 95% confidence level, with a margin of error 7%, reported prevalence of 4.47%.<sup>11</sup>

**Inclusion Criteria:** Patients above the age of 30 years, diagnosed cases of acute pancreatitis and those with the affordability of CECT were included.

**Exclusion Criteria:** Patients diagnosed with chronic pancreatitis based on their prior hospital records or found to have characteristics of chronic pancreatitis on history or radiological studies during their admission to hospital such as pancreatic calcifications, dilated pancreatic duct, atrophy and pseudocysts were excluded from the study.

The diagnostic criteria of pancreatitis were based on the presence of two out of the three findings: (i) epigastric pain, (ii) serum amylase and lipase levels at least three times the upper limit of normal; and (iii) characteristic findings of acute pancreatitis on abdominal imaging (ultrasonography or computerized tomography).<sup>12</sup>

A detailed history and physical examination, laboratory investigations were sent at admission and 48 hours after admission-arterial blood gas analysis (ABGs), complete blood picture (Blood CP), kidney function tests (S. Urea), liver function tests (S. AST),

serum electrolytes (serum calcium), serum amylase, serum LDH and serum lipase. 72 hours after the onset of symptoms, all patients underwent.

Abdominal ultrasound and contrast enhance computer tomography scan. Patients were examined daily, and laboratory investigations were done according to Glasgow criteria.<sup>13</sup> Our patients were diagnosed and categorized into mild, moderately severe and severe acute pancreatitis using the Atlanta classification (2012), compared to Glasgow and CTSI scores.<sup>14</sup>

At the time of transfer/discharge/death/admission, patients were categorized as having mild, moderately severe and severe acute pancreatitis based on the modified Atlanta (2012) classification. Among the patients categorized as mild acute pancreatitis, those (majority) that had neither local nor systemic complications were discharged. However, patients with moderately severe acute pancreatitis that had developed organ failure or local complications were either discharged or sent to the ICU, depending on their complications. Lastly, patients diagnosed with severe acute pancreatitis had persistent organ failure seen in the ICU and poor prognosis.

Patients presenting to ER with suspected acute pancreatitis were resuscitated and stabilized. All patients were cannulated with two large-bore intravenous cannulas; necessary blood samples were taken and monitored for urine output. All patients were forbidden to eat/drink (NPO) for 24 hours. Informed written consent was obtained from all study participants prior to undergoing surgery, and all patients were made aware of their rights to withdraw from the study. Confidentiality was maintained at all levels of the study, and the researchers were unaware of any of the study participants.

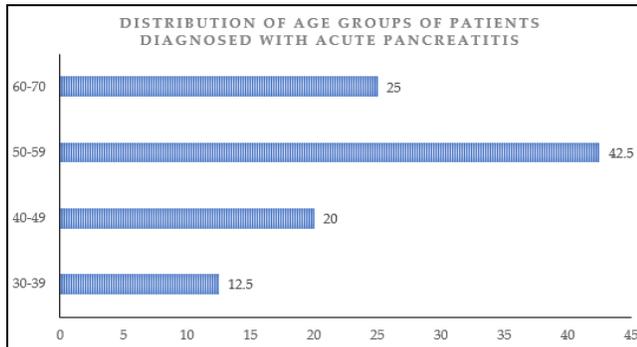
Statistical Package for Social Sciences (SPSS) version 28.0 was used for the data analysis and MS Excel 2013 software. Quantitative variables were summarized as mean  $\pm$  SD and qualitative variables were summarized as frequency and percentages.

### RESULTS

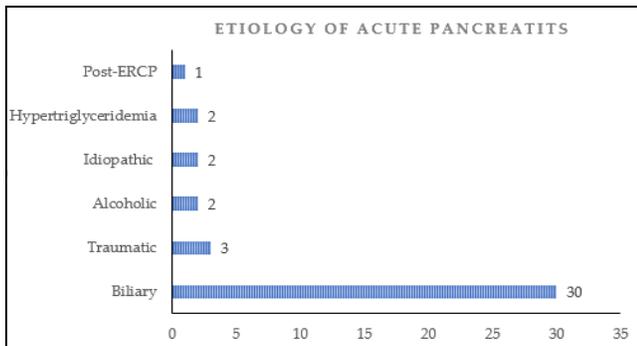
Among the patients, 25 were females and 15 were males respectively. The average age of the subjects was  $55.27 \pm 9.35$  years. Figure 1 showed the percentage of the patients in different age groups; most of the patients were above the age of 50 in the age group of 50-59 (42.5%). Figure-2 showed the most common cause of acute pancreatitis was biliary (75%), followed by (7.5%) trauma-related, (5%) alcoholic, idiopathic

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and hypertriglyceridemia. The least common cause was post-ERCP 2.5%.



**Figure-1.** Distribution of Age Groups of Patients Diagnosed with Acute Pancreatitis that were taken as subjects in this study.



**Figure-2:** Etiology of Pancreatitis.

The data in our study showed mean of  $2.475 \pm 2.957$  for the Glasgow score, whereas the mean for the CTSI score was  $5.575 \pm 2.458$ . Subjects were classified according to Atlanta classification as mild, 16 (40%)

recovery from acute pancreatitis in satisfactory condition. In this study mortality rate was 7.5% (3 patients). Two patients (5%) left against medical advice during the period of study (Table-I)

**Table-I:** Categorization of Patients according Glasgow and CTSI Scoring Systems.

Characteristic (n=40)	Characteristic (n=40)	CTSI score	Glasgow score
		Number of Patients (%)	Number of Patients (%)
Outcome	0-3	15 (37.5%)	28 (70%)
	4-7	13 (32.5%)	7 (17.5%)
	8-10	11 (27.5%)	5 (12.5%)

Table-II showed the number of patients separated according to the Glasgow scoring system, with the Glasgow score above or equal to 3. Glasgow score above or equal to three was used because it was considered severe acute pancreatitis.

According to CTSI scoring, a score above or equal to 7 indicated severe acute pancreatitis. Table-II showed the number of patients according to the CTSI score of 7 and determining aiding us in determining the sensitivity and specificity of CTSI scoring for Severe Acute Pancreatitis. Table-III showed different diagnostic parameters that determine how well the scoring system/lab test determines the diagnosis of a patient. For severe acute pancreatitis, both Glasgow and CTSI show a 100% sensitivity which means that every patient was diagnosed clinically as severe the scoring system correlates the same severity of the disease.

**Table-II:** Two by two contingency table for CTSI and Glasgow scoring systems according to Atlanta Classification.

		Diagnosis (Atlanta Classification)	
		Severe Acute Pancreatitis	Not Severe Acute Pancreatitis (Mild and Moderately Severe Acute Pancreatitis)
Diagnostic Test (Glasgow Scoring System)	Positive ( $\geq 3$ )	11 (27.5%)	2 (5%)
	Negative ( $< 3$ )	-	27 (67.5%)
Diagnostic Test (CTSI Scoring System)	Positive ( $\geq 7$ )	11 (27.5%)	1 (2.5%)
	Negative ( $< 7$ )	-	28 (70%)

**Table-III:** Diagnostic Parameters of Glasgow and CTSI scoring systems for Severe Acute Pancreatitis.

Diagnostic Parameters	Glasgow	CTSI
Sensitivity=True Positive	100% (71.51%-100%)	100% (71.51%-100%)
Specificity=True Negative	93.10% (72.23%-99.15%)	96.55% (82.24%-99.91%)
Positive Predictive Value	84.62 % (59.08%-95.44%)	91.67% (61.59%-98.69%)
Negative Predictive Value	100%	100%
Diagnostic Accuracy	95%	97.5% (86.84-99.94%)

patients, moderately severe, 13 (32.5%) patients and severe acute pancreatitis, 11 (27.5%) patients. Out of total patients (n=40), 22 (55%) were discharged after

With the addition of the CECT scans, there has been an improvement in the scoring systems in the hospitals in predicting the severity, organ failure and

the overall grading system of Acute Pancreatitis. CECT has shown an accuracy of 87% with a 100% sensitivity for detecting pancreatic necrosis. However, if a CT scan is done early on in the disease (during the time the necrosis is developing). Usually, necrosis becomes prominent 2-3 days after the onset of symptoms. In this study, both Glasgow and CTSI scores had high sensitivity percentage; of 100%. However, CTSI had a higher specificity, 96.55%, in comparison to the Glasgow score, which was 93.10%. The mean of GLASGOW was  $2.475 \pm 2.975$  and CTSI was  $5.575 \pm 2.458$  with a significant  $p$ -value  $<0.001$  shown in Table-IV.

**Table-IV: Comparison of significance between Glasgow and CTSI scoring system.**

Scoring System	SIGNIFICANCE	$p$ -value
Glasgow	$2.475 \pm 2.975$	$<0.001$
Ctsi	$5.575 \pm 2.458$	

## DISCUSSION

This study shows that CTSI scoring is superior to Glasgow because it has higher accuracy in detecting acute pancreatitis. Although Glasgow is also good at detecting the severity of this disease, for severe cases, it did not produce a significant value ( $p>0.05$ ).

Acute pancreatitis is one of the most common cases encountered in Emergency Departments and admissions in hospitals worldwide.<sup>15,16</sup> There has been an increase in incidence (0.37%/year) of acute pancreatitis compared to the last two decades, and it continues to rise yearly. A systemic review that selected 520 abstracts for their review report global incidence of acute pancreatitis from the 1960s to 2015 showed the majority of the cases detected were in Europe.<sup>17</sup> In 1995 there was a surge of pancreatitis cases in Oceania, North America and Asia, with South America cases emerging in 2005. The incidence of the cases increased exponentially with time in all regions. The most common aetiology remains biliary and alcohol-related. The increased detection of acute pancreatitis cases could be because of increased availability and better diagnostic tests (radiological and laboratory) available at hospitals. The use of MRCP (Magnetic Resonance Cholangiopancreatography) and CECT (contrast-enhanced computer tomography), and EUS (endo-scopic ultrasound) improved the detection of causes (Cholelithiasis) and complications of acute pancreatitis.<sup>18</sup>

The mean age of the studied sample was  $55.27 \pm 9.35$  years, and the female to male ratio was 1.66. Our study found that the most common etiological factor

was biliary-related (gallstones, 75%). In this study, the patients were diagnosed according to the modified Atlanta classification (2012), and 16 patients were of mild acute pancreatitis, 13 patients with moderately severe, and 11 were graded with severe acute pancreatitis. Out of the 40 patients, 13 needed ICU admission. During this study, mortality was recorded in 3 patients. All three were diagnosed as severe AP based on the Modified Atlanta classification. The cause of their deaths was a multi-organ failure due to SIRS and extra-pancreatic involvement. The data in our study showed a mean of  $2.475 \pm 2.957$  for the Glasgow score, whereas the mean for the CTSI score was  $5.575 \pm 2.458$ .

Based on the  $p$ -value calculated, the Glasgow scoring system showed significant accuracy in detecting mild and severe acute pancreatitis. However, the Glasgow score did not reveal a significance in predicting moderate, severe acute pancreatitis ( $p=0.472$ ). The CTSI score showed the highest accuracy in detecting the severity of pancreatitis according to all grades of Atlanta Classification, hence making it superior to Glasgow scoring ( $p<0.05$ ). A study done in Peshawar, Khyber teaching hospital showed that doing early CTSI on admission in patients showed higher accuracy and a better prognosis and superior to Ranson score.<sup>7</sup> In a study done in Bangalore, India, 55 patients were chosen to use CTSI and serum CRP to detect the severity of acute pancreatitis. For CTSI  $>3$ , their sensitivity and specificity (84.6% and 97.6%, respectively).<sup>18</sup> Hence, CTSI is the superior of the scoring systems for detecting the severity of acute pancreatitis. In our study, we chose the value greater than or equal to 7 for CTSI and greater than or equal to 3 for Glasgow because of more extended hospital stay, a higher incidence of complications and severe acute pancreatitis in our patients. However, our sensitivity (100%) for the CTSI (score  $>7$ ) was significantly higher than our specificity (96.55%). Whereas the Glasgow scoring system had a sensitivity also 100%, but specificity was 93.10%.

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## LIMITATION OF STUDY

Using CTSI instead of modified CTSI scoring, there was no way to consider extra-pancreatic complications like pleural effusions. However, modified CTSI is poor in detecting early pancreatic necrosis and local complications (abscess) within 24 hours after admission. It usually shows pancreatic necrosis after 2-3 days.

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Our sample size was 40, which was less in number than other research studies done in Pakistan, and the sample size was calculated from the WHO calculator for several reasons. Firstly, travel restrictions due to the COVID pandemic resulted in fewer patients coming to the hospital. Patients preferred to go to their private clinics/hospitals (near their houses) rather than travel to tertiary care hospitals in cities. Secondly, during the pandemic, Combined Military Hospital, Rawalpindi, primarily for Army Personnel, decreased the number of civilian patients admitted due to a lack of bed availability and a large influx of COVID-19 patients.

### CONCLUSION

CTSI scoring is more accurate in detecting the severity of acute pancreatitis. Glasgow was close behind, but it is not an accurate indicator.

**Conflict of Interest:** None.

### Authors' Contribution

FK: Discussion and research analysis, IAS: Proof reading, SH: Data Collection, YA: Discussion, KM: Proof reading, FH: Data compilation.

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