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Factors Influencing Severity And Outcomes In Acute Pancreatitis: A Clinical Study.

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ABSTRACT

Acute pancreatitis (AP) is a disease with a highly variable clinical course, ranging from mild, self-limiting cases to severe, life-threatening conditions. The present study aims to assess the clinical severity, biochemical markers and radiological findings to predict outcomes in acute pancreatitis patients. A total of 50 patients diagnosed with acute pancreatitis were evaluated over two years. The severity of the disease was assessed based on Ranson's criteria, the Modified Organ Dysfunction Score (MODS) and radiological scoring using the Balthazar CT severity index. The majority of cases were attributed to alcohol consumption (60%), followed by gallstone-related pancreatitis (30%) and other aetiologies (10%). It was observed that patients with higher Ranson and MODS scores showed increased rates of organ failure and mortality. CT imaging played a pivotal role in severity assessment, with necrosis involving more than 50% of the pancreas correlating with an eight-fold increase in mortality. The study highlights the importance of early clinical, biochemical and radiological assessment in guiding therapeutic decisions and optimizing patient outcomes. The integration of multimodal scoring systems enhances risk stratification and aids in predicting the prognosis of acute pancreatitis.

Keywords: Acute pancreatitis, Ranson's criteria, MODS score, Balthazar CT severity index, pancreatic necrosis, organ failure

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INTRODUCTION

Acute pancreatitis (AP) is a highly heterogeneous disease with a spectrum ranging from mild pancreatic inflammation to severe necrotizing pancreatitis associated with systemic inflammatory response syndrome (SIRS) and multiple organ dysfunction syndrome (MODS). Despite advances in critical care management, the mortality rate in severe AP remains 15-20%, with early deaths attributed to MODS and late deaths caused by sepsis and pancreatic necrosis [1]. The pathophysiology of AP is characterized by the premature activation of pancreatic enzymes, leading to autodigestion of the pancreas and activation of the inflammatory cascade [2]. This triggers the release of pro-inflammatory cytokines such as TNF-α, IL-1 and IL-6, which exacerbate pancreatic injury and contribute to systemic complications. The clinical presentation varies widely, making early recognition of severe AP crucial for patient management [3]. Several scoring systems have been developed to assess the severity of AP, including Ranson's criteria, the Acute Physiology and Chronic Health Evaluation II (APACHE II) score and the Balthazar CT severity index. CT imaging plays a crucial role in diagnosing and staging the disease, particularly in identifying pancreatic necrosis and associated complications [4]. The current study aims to evaluate the correlation between clinical severity, biochemical markers and radiological findings in acute pancreatitis patients. The study further explores the impact of aetiology, organ failure and imaging scores on patient outcomes [5].

MATERIALS AND METHODS

Study Population

The study included 50 patients diagnosed with acute pancreatitis at Department Of General Surgery, Government Royapettah Hospital,Kilpauk Medical College Chennai from October 2022 to October 2023. Patients were enrolled based on clinical, biochemical and radiological criteria.

Diagnostic Criteria

Acute pancreatitis was diagnosed based on the presence of at least two of the following criteria:Abdominal pain characteristic of AP,Serum amylase and lipase levels greater than three times the upper reference limit,Imaging findings consistent with acute pancreatitis on ultrasonography (USG) or contrast-enhanced CT (CE-CT)

Severity Assessment

Clinical Scoring Systems

Ranson's Criteria: Assessed at admission and after 48 hours.Modified Organ Dysfunction Score (MODS): Evaluated dysfunction of six organ systems, including respiratory, renal, hepatic, cardiovascular, neurological and hematologic systems

Radiological Severity Assessment

Balthazar CT Severity Index (CTSI),Necrosis Score on CE-CT

Outcome Assessment

Clinical progression was categorized into mild, moderate and severe pancreatitis based on organ failure and local complications.Patient outcomes were recorded, including ICU admission, duration of hospital stay and mortality rates.

Statistical Analysis

Data were analyzed using SPSS software. Continuous variables were expressed as mean ± standard deviation, while categorical data were analyzed using chi-square tests. A p-value < 0.05 was considered statistically significant.

RESULTS

Table 1: Ranson's Criteria for Acute Pancreatitis.

Criteria	Parameter	Severe AP if:
At Admission	Age	>55 years
	WBC Count	>16,000 cells/mm^3
	Blood Glucose	>200 mg/dL
	AST	>250 IU/L
	LDH	>350 IU/L
After 48 Hours	Hematocrit Drop	>10%
	Serum Calcium	<8 mg/dL
	PaO$_2$	<60 mmHg
	Base Deficit	>4 mEq/L
	Fluid Sequestration	>6 L

This table provides clinical scoring criteria for predicting the severity of acute pancreatitis. It includes admission parameters like age, blood glucose and WCC count, as well as 48-hour parameters such as hematocrit drop, serum calcium and base deficit.
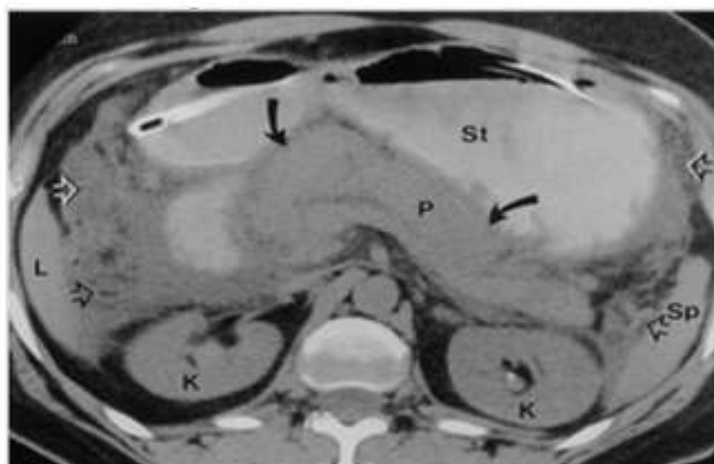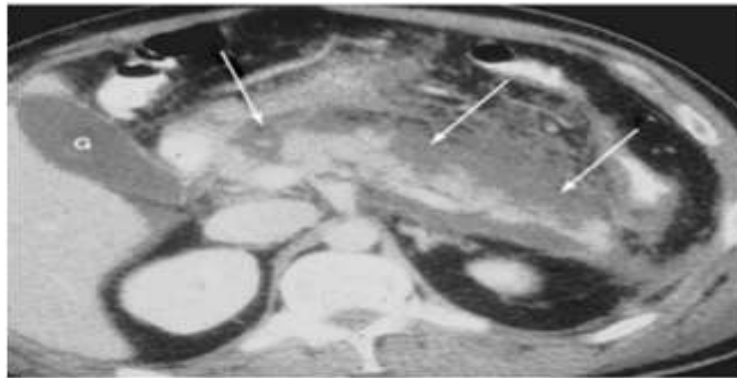
Figure 1: Images of acute pancreatitis

Figure 2

Table 2: Modified Marshall Score for Organ Failure

Organ System	0 (Normal)	1	2	3	4 (Severe)
Respiratory (PaO_2/FiO_2 mmHg)	>400	300-399	200-299	100-199	<100
Renal (Serum Creatinine, mg/dL)	<1.4	1.5-1.9	2.0-3.4	3.5-4.9	>5.0
Cardiovascular (Systolic BP, mmHg)	>90	<90 (Fluid Responsive)	<90 (Requires Dopamine)	<90 (Requires Noradrenaline)	Unresponsive

This table outlines the criteria used to define organ failure in acute pancreatitis. It provides a scoring system for respiratory, renal, hepatic, cardiovascular and hematological dysfunction.

**Table 3: CT Severity Index (Balthazar Scoring System).**

Severity Category	Discharged (%)	ICU Admission (%)	Mortality (%)
Mild (Ranson's <3)	85%	5%	0%
Moderate (Ranson's 3-4)	60%	30%	10%
Severe (Ranson's ≥5)	20%	50%	20%

A critical imaging-based scoring system that correlates with clinical outcomes. This defines the severity based on pancreatic necrosis, inflammation and fluid collection.

OBSERVATION AND RESULTS

- The study cohort included 40 males (80%) and 10 females (20%), with a mean age of 45 years.
- Etiology and Disease Severity
- Alcohol consumption was the most common cause (30 patients, 60%)
- Biliary tract disease accounted for 15 cases (30%)
- Other causes included drug-induced pancreatitis, malignancy and idiopathic cases (10%).

Graph 1
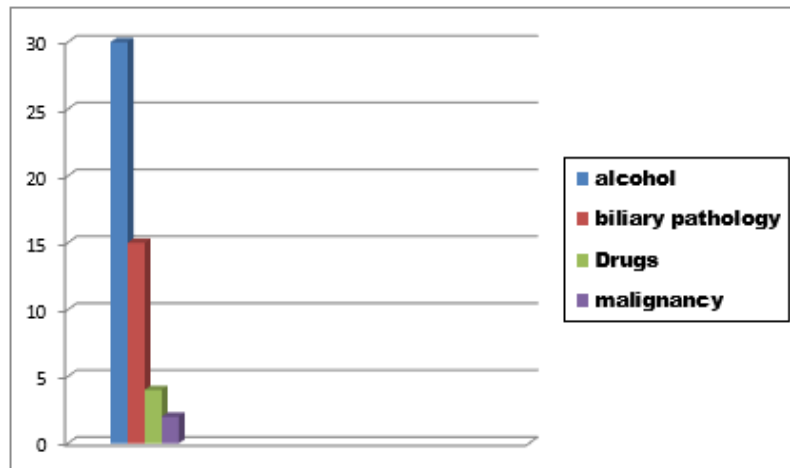
Graph showing the aetiology of the disease

Clinical and Biochemical Parameters

Serum amylase and lipase were significantly elevated in all patients but showed no correlation with severity.

Patients with Ranson's score ≥ 3 had a higher incidence of organ failure and complications.

Radiological Findings

CT severity index ≥ 5 correlated with an eight-fold increase in mortality.

Pancreatic necrosis of >50% was associated with poor prognosis

Patient Outcomes

Mild cases had a recovery rate of 100%

Severe cases required ICU admission, with a mortality rate of 20%

Table 4: CT Scoring (Balthazar)

GRADE	APPEARANCE	SCORE
Grade A	Normal appearance	0
Grade B	Focal or diffuse enlargement of pancreas	One
Grade C	Peripancreatic inflammation	Two
Grade D	Intra/ extrapancreatic fluid collection	Three
Grade E	Two or more fluid collection pancreas or retroperitoneum	Four

Table 5: Relationship Between Ranson's Score and Outcome

Ranson's Score	Mild Cases (%)	Severe Cases (%)	ICU Admissions	Mortality (%)
0-2	80%	20%	5%	0%
4-Mar	60%	40%	30%	10%
≥5	20%	80%	50%	20%

Figure 3

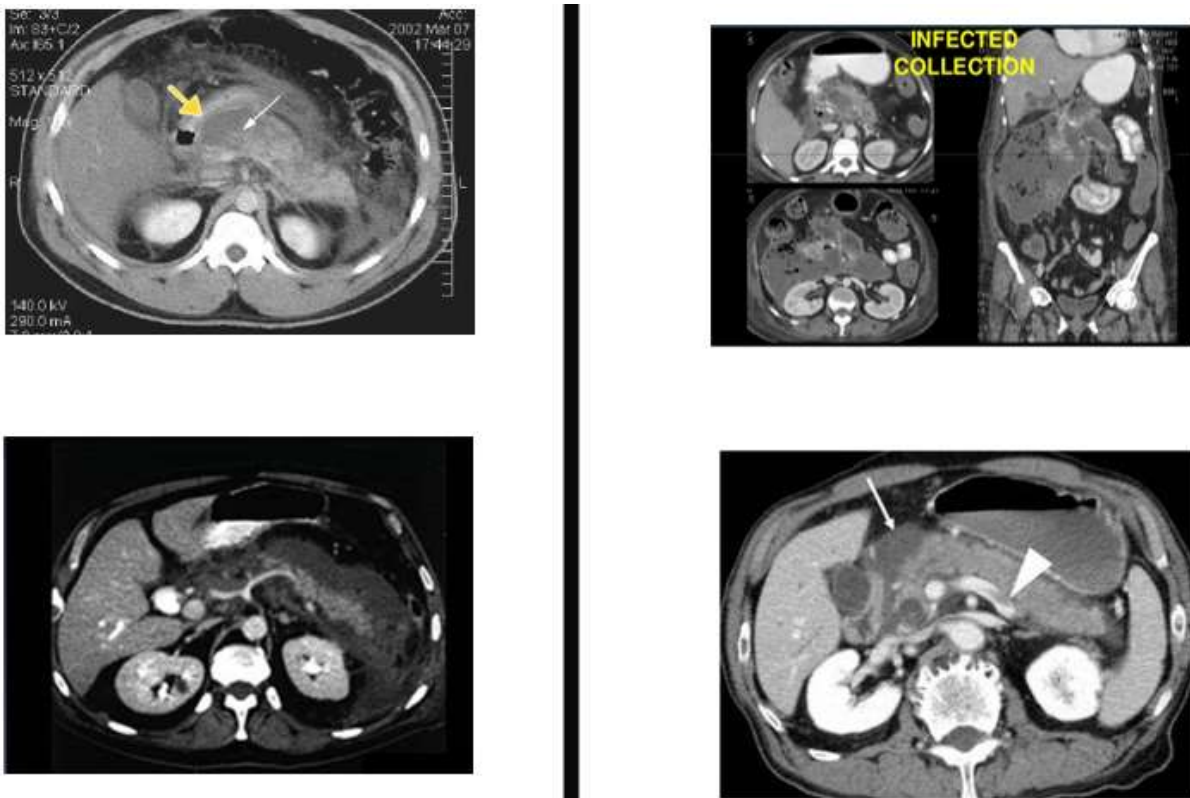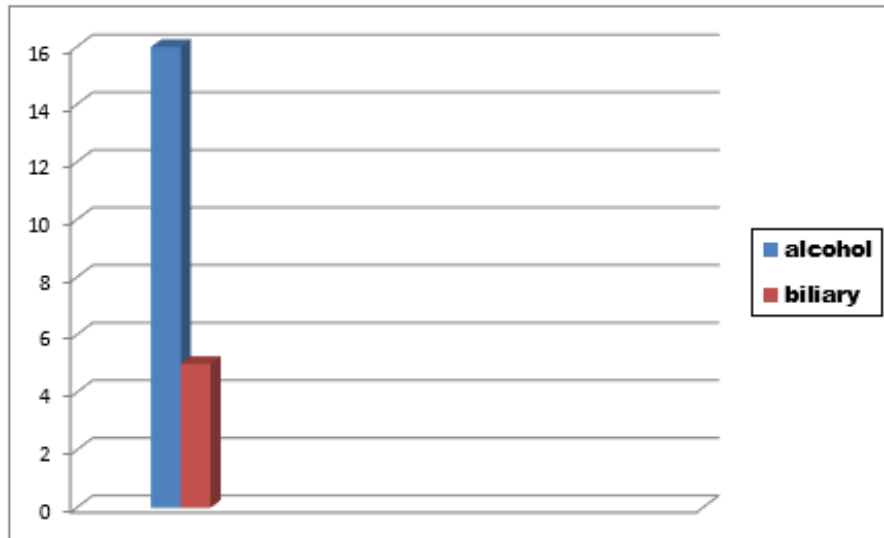**Table 6: CT Severity Index**

Necrosis score based on CE-CT.

Stage	Score
0% OF NECROSED PANCREAS	0
<33% OF NECROSED PANCREAS	2
33 - 50% OF NECROSED PANCREAS	4
>50% OF NECROSED PANCREAS	6

CT severity index = unenhanced CT score + necrosis score
>5 score indicates an 8-fold higher mortality

Graph 2

Graph showing the follow up of the disease showing the relation between aetiology and recurrence

Table 7: Mods Scoring (Marshall et al 1995)

Organ system	0	1	2	3	4
Respiratory Spo2 (in%)	100	90-100	80-90	70-80	<70
Renal Serum creatinine (in mic.mol/1)	<=100	101-200	201-350	351-500	>500
Hepatic Serum bilirubin (in rnmol/1)	<=20	21-60	1-120	121-240	<240
Cardiovascular, Heart rate (in BPM)	70-80	81-90	1-100	101-110	110-120
Hematological Platelet count *10A9	>120	81-120	51-80	21-50	<=20
Neurological GCS	15	13-14	10-12 J	7-9	<6

DISCUSSION

The findings of this study underscore the critical importance of early risk stratification in acute pancreatitis using a combination of clinical and radiological assessment tools. Acute pancreatitis presents with a wide spectrum of severity, ranging from mild cases that resolve with conservative management to severe cases leading to organ failure and mortality. Identifying patients at risk of developing complications is essential for optimizing treatment strategies and improving patient outcomes [7]. In this study, clinical scoring systems such as Ranson's criteria and the Modified Organ Dysfunction Score (MODS) played a significant role in predicting disease severity. Patients with a Ranson's score of three or more exhibited higher rates of organ failure and prolonged hospital stays. This aligns with previous research indicating that early clinical scoring can effectively predict the need for intensive care unit (ICU) admission and guide therapeutic interventions [8]. The presence of systemic inflammatory response syndrome (SIRS) further exacerbated the disease course, with many patients progressing to multiple organ dysfunction syndrome (MODS) [9]. The aetiological factors influencing acute pancreatitis also played a role in disease severity and recurrence. Alcohol-related pancreatitis accounted for the majority of cases in this study, followed by biliary tract disease and other causes. Alcohol-induced pancreatitis was more commonly associated with recurrent episodes and chronic progression, necessitating lifestyle modifications and long-term follow-up. In contrast, gallstone-related pancreatitis often required early cholecystectomy to prevent recurrence. Understanding the underlying cause of pancreatitis is essential for tailoring treatment and preventing future episodes [10]. Radiological findings, particularly the Balthazar CT severity index, emerged as another crucial determinant of prognosis. The study revealed that patients with a CT severity index of five or more had an eight-fold increase in mortality compared to those with lower scores. This observation highlights the importance of imaging in assessing the extent of pancreatic inflammation and necrosis [11]. Contrast-enhanced computed tomography (CE-CT) is considered the gold standard in evaluating pancreatic necrosis and its findings strongly correlate with clinical outcomes. Pancreatic necrosis involving more than 50% of the gland was associated with a significantly worse prognosis, reinforcing the need for close monitoring

and aggressive management in such cases [12]. Another key finding was the impact of pancreatic necrosis and MODS on mortality. Patients who developed pancreatic necrosis had significantly higher rates of ICU admission and complications. The study further demonstrated that patients with MODS had a prolonged hospital stay, increased need for ventilatory support and higher mortality rates. These findings emphasize the importance of early intervention in patients at risk of severe disease progression [13].

Despite advancements in critical care, the mortality rate for severe acute pancreatitis remains high. This study highlights the need for a multimodal assessment integrating clinical, biochemical and radiological parameters to improve prognostic accuracy. Future research should focus on refining severity assessment tools and exploring novel therapeutic interventions to reduce morbidity and mortality associated with acute pancreatitis [14,15].

CONCLUSION

This study emphasizes the significance of early risk stratification in acute pancreatitis using clinical scoring systems, biochemical markers, and radiological assessment. Patients with higher Ranson's scores and CT severity index exhibited worse outcomes, highlighting the necessity of prompt intervention. The findings suggest that alcohol-induced pancreatitis had a higher recurrence rate compared to biliary pancreatitis, necessitating lifestyle modifications and close follow-up. CT imaging played a pivotal role in assessing disease severity and predicting complications such as pancreatic necrosis and pseudocyst formation. Effective multimodal assessment strategies integrating clinical and radiological parameters are essential for optimizing patient outcomes. Future research should focus on refining severity prediction models and evaluating novel therapeutic interventions to reduce morbidity and mortality associated with acute pancreatitis.

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