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To Study the Effect of On-Admission Serum Triglyceride Levels on the Severity and Outcome of Patients with Acute Pancreatitis

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KEYWORDS

Serum Triglyceride Levels, Acute Pancreatitis, Acinar Cell Injury, Diagnosis, Hypertriglyceridemia, Prognostic Marker, Lipotoxicity

ABSTRACT:

Importance: Acute pancreatitis (AP) is a potentially severe inflammatory condition of the pancreas with variable clinical presentations and significant morbidity and mortality. Early identification of severity predictors is crucial for optimizing patient management and outcomes.

Objective: To evaluate the clinical features of acute pancreatitis and assess the impact of on-admission serum triglyceride levels on disease severity and outcomes.

Design: It is a prospective hospital-based observational study conducted from November 2021 to October 2022 in the Department of General Surgery, Government Medical College Hospital, Jammu, India.

Setting: It included a total of 115 patients admitted with acute pancreatitis within 72 hours of symptom onset, meeting diagnostic criteria and consenting to participate. Patients with prior acute pancreatitis or significant comorbidities were excluded. Clinical, biochemical, and imaging assessment alongside serum triglyceride measurement was done at admission and patients were stratified into two groups based on triglyceride levels (<200 mg/dL vs. ≥200 mg/dL). The main outcomes were severity of acute pancreatitis assessed by Ranson and APACHE II scores, presence of complications including systemic inflammatory response syndrome (SIRS), pleural effusion, acute respiratory distress syndrome (ARDS), and hospital course parameters.

Results: Of the 115 patients, 82 had triglycerides <200 mg/dL (Group I) and 33 had triglycerides ≥200 mg/dL (Group II). Group II patients were younger and predominately male. Severity scores were significantly higher in Group II (mean APACHE II 5.33 vs 4.21, p=0.005; Ranson score 1.75 vs 1.24, p=0.017). Complications including pleural effusion (36.36% vs 17.07%, p=0.02), ARDS (12.12% vs 1.21%, p=0.02), and SIRS (33.33% vs 9.7%, p=0.002) were significantly more frequent in Group II. No significant difference in hospital stay length or local complications was observed.

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Conclusion: Elevated serum triglyceride levels (≥200 mg/dL) at admission are associated with increased severity and systemic complications in acute pancreatitis. Early measurement of triglycerides can serve as a valuable prognostic marker to identify high-risk patients warranting intensified monitoring and management.

Introduction

Acute pancreatitis (AP) is an inflammatory condition of the pancreas characterized by pancreatic acinar cell injury, activation of digestive enzymes, and varying degrees of pancreatic necrosis and systemic inflammatory response syndrome (SIRS) with potential multi-organ failure.[1] The global incidence of AP ranges from 5 to 30 cases per 100,000 people and is expected to increase, imposing a substantial burden on healthcare systems.[2] Diagnosis of AP requires at least two of the following criteria: typical abdominal pain, serum amylase or lipase elevation to three times the upper limit of normal and characteristic findings on abdominal imaging.[3] Gallstones and alcohol consumption are predominant etiological factors, while hypertriglyceridemia (HTG), defined as serum triglycerides exceeding 11.3 mmol/L (1000 mg/dL), represents the third most common cause.[4–6] The clinical course of AP varies widely from mild, self-limiting disease to severe generalized inflammation with high morbidity and mortality.[7] Early identification of patients at risk of severe disease is critical for guiding management and improving outcomes.[8] Although HTG is an established cause of AP, the relationship between levels of serum triglycerides and disease severity remains incompletely elucidated, with some evidence suggesting serum triglyceride levels ≥200 mg/dL may predict increased complications.[9–13] The pathophysiology involves lipotoxicity induced by free fatty acids released from triglyceride hydrolysis, triggering inflammatory cascades and microcirculatory disturbances.[14–16] This prospective study aims to evaluate the effect of on-admission serum triglyceride levels on the severity and clinical outcomes of patients with acute pancreatitis admitted within 72 hours of symptom onset. Understanding this association may support the use of serum triglycerides as an early prognostic marker to stratify patient risk and tailor therapeutic interventions accordingly.

Materials and Methods

A prospective observational study was conducted from November 1, 2021, to October 31, 2022, in the Department of General Surgery, Government Medical College, Jammu, India, after taking consent from Institutional Ethics Committee. Patients admitted with acute pancreatitis within 72 hours of symptom onset were enrolled after obtaining written informed consent. Inclusion criteria included patients presenting with clinical features consistent with acute pancreatitis, biochemical evidence (serum amylase and/or lipase greater than three times the upper limit of normal), and/or characteristic abdominal imaging findings. Patients with prior episodes of acute pancreatitis, chronic pancreatitis, or significant comorbidities such as cardiovascular, renal, hepatic, respiratory disorders, immunological or oncological diseases, and pregnancy were excluded. On admission, demographic data, clinical presentation, history of previous episodes, and comorbidities were recorded. Blood samples (5 mL) were collected via the antecubital vein, and serum triglyceride levels were measured using an Abbott Architect fully automated analyzer. Patients were stratified into two groups based on serum triglyceride levels following the National Cholesterol Education Program-Adult Treatment Panel III (NCEP-ATP III) criteria: Group I (<200 mg/dL) and Group II (≥200 mg/dL). Disease severity was evaluated using Ranson's criteria and Acute Physiology and Chronic Health Evaluation II (APACHE II) scoring systems. Scores were calculated at admission and within the first 48 hours to classify severity and predict outcomes. Clinical outcomes including complications, duration of hospital and intensive care unit (ICU) stay, need for ICU admission, and morbidity were recorded. The presence of systemic inflammatory response syndrome (SIRS), pleural effusion, acute respiratory distress syndrome (ARDS), acute kidney injury (AKI), and local pancreatic complications were documented. Data were managed in Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS)

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software. Continuous variables were expressed as means ± standard deviation, while categorical variables were presented as frequencies and percentages. Comparisons between groups were conducted using Student's t-test for continuous variables and chi-square or Fisher's exact test for categorical variables. A p-value <0.05 was considered statistically significant.

Results

A total of 115 patients with acute pancreatitis were enrolled, with 82 (71.3%) patients classified in Group I (serum triglycerides <200 mg/dL) and 33 (28.7%) patients in Group II (serum triglycerides ≥200 mg/dL). The mean triglyceride level was 111.24 ± 36.88 mg/dL in Group I and 339.68 ± 177.88 mg/dL in Group II (p < 0.001). The mean age was significantly lower in Group II (40.48 ± 15.69 years) compared to Group I (47.36 ± 16.92 years) (p=0.047). A higher proportion of males was observed in Group II (51.5%) relative to Group I (30.5%) (p=0.034). No significant differences were noted in the prevalence of diabetes or alcohol consumption between groups.

Table 1: Summarizing Patient Demographics and Baseline Characteristics by Serum Triglyceride Group

Characteristics	Group I(<200mg/dl, n=82)	Group II (≥200 mg/dL, n=33)	P-Value
Mean Age (Years)	47.36 ± 16.92	40.48 ± 15.69	0.047
Male, n (%)	25 (30.5%)	17 (51.5%)	0.034
Diabetes, n (%)	7 (8.5%)	2 (6.1%)	1.0
(Alcohol Consumption), n(%)	13 (15.9%)	5 (15.2%)	1.0

Severity assessment using APACHE II scores revealed a significantly higher mean score in Group II (5.33 ± 5.94) compared to Group I (4.21 ± 3.96), with 36.4% of Group II patients vs 13.4% of Group I patients having scores >8 (p=0.005). Similarly, Ranson scores were elevated in Group II (mean 1.75 ± 1.76) versus Group I (1.24 ± 1.49), and 39.4% of Group II patients had scores >3 compared to 18.3% in Group I (p=0.017).

Table 2: Comparing Severity Scores between Serum Triglyceride Groups

Severity Measure	Group I (<200 mg/dL, n=82) |	Group II (≥200 mg/dL, n=33)	P-value
Mean Ranson Score	1.24 ± 1.49	1.75 ± 1.76	0.017
Ranson Score >3, n (%)	15 (18.3%)	13 (39.4%)	
Mean APACHE II Score	4.21 ± 3.96	5.33 ± 5.94	0.005
APACHE II Score >8, n (%)	11 (13.4%)	12 (36.4%)	

Complications such as pleural effusion occurred more frequently in Group II (36.4% vs 17.1%, p=0.02), as did acute respiratory distress syndrome (ARDS) (12.1% vs 1.2%, p=0.02) and systemic inflammatory response syndrome (SIRS) (33.3% vs 9.7%, p=0.002). There was no significant difference in acute kidney injury (AKI) (6.1% vs 2.4%, p=0.14), altered mental status (6.1% vs 2.4%, p=0.57), or local pancreatic complications (30.3% vs 30.5%, p=0.98) between groups. The length of hospital stay was comparable between groups (mean 6.84 ± 5.44 days in Group II vs 7.14 ± 4.04 days in Group I, p=0.748). Intensive care unit admission was more frequent in Group II (10%) than in Group I (1.2%), though not statistically significant (p=0.07). These findings indicate that patients with elevated serum triglycerides at admission are more likely to experience severe acute pancreatitis and systemic complications.

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Table 3: Comparing Complications and Clinical Outcomes by Serum Triglyceride Group

Complication/Outcome	Group I (<200 mg/dL, n=82)	Group II (≥200 mg/dL n=33)	P-value
Pleural Effusion, n (%)	14 (17.1%)	12 (36.4%)	0.02
ARDS, n (%)	1 (1.2%)	4 (12.1%)	0.02
SIRS, n (%)	8 (9.7%)	11 (33.3%)	0.002
Acute Kidney Injury, n (%)	2 (2.4%)	3 (10%)	0.14
Altered Mental Status, n (%)	2 (2.4%)	2 (6.1%)	0.57
Local Pancreatic Complications, n (%)|	25 (30.5%)	10 (30.3%)	0.98
Length of Hospital Stay (days)	7.14 ± 4.04	6.84 ± 5.44	0.748
ICU Admission, n (%)	1 (1.2%)	3 (10%)	0.07

Discussion

This prospective observational study evaluated the impact of on-admission serum triglyceride levels on the severity and clinical outcomes of patients with acute pancreatitis (AP). Our findings indicate that elevated triglycerides (≥200 mg/dL) are significantly associated with increased severity scores, systemic complications, and intensive care unit (ICU) admissions compared to patients with triglyceride levels below 200 mg/dL. The observed younger age and male predominance in the high triglyceride group align with previous reports highlighting demographics prone to hypertriglyceridemia-induced pancreatitis.[6,7]. The significantly higher mean APACHE II and Ranson scores in this group suggest that triglycerides may serve as valuable early prognostic markers.[9–13] These results concur with prior studies demonstrating that triglyceride-driven lipotoxicity exacerbates pancreatic inflammation and systemic disease via the generation of free fatty acids, triggering extensive cellular injury.[14–16] Complications such as pleural effusion, acute respiratory distress syndrome (ARDS), and systemic inflammatory response syndrome (SIRS) were more frequent in patients with elevated triglycerides, reinforcing their role in predicting clinical deterioration. This aligns with the pathophysiological understanding that hypertriglyceridemia contributes to a more severe inflammatory milieu.[4,12,15] Although acute kidney injury (AKI) and altered mental status showed trends toward higher occurrence in the high triglyceride group, these differences were not statistically significant, possibly due to sample size limitations. Hospital stay length did not differ significantly, suggesting that while triglyceride levels predict severity and complications, their direct effect on recovery duration may be influenced by other clinical factors. ICU admission was higher but did not reach significance, warranting further studies with larger cohorts. Our study's strengths include strict inclusion of patients within 72 hours of symptom onset and standardized measurement of triglycerides, allowing timely risk stratification. Limitations encompass the single-center design and exclusion of patients with comorbidities, which may affect generalizability. Additionally, we did not assess long-term outcomes or mortality, which merit evaluation in future research. Clinically, measuring serum triglycerides at admission can aid in early identification of patients at risk of severe AP and guide resource allocation, intensive monitoring, and therapeutic interventions, including plasma exchange or lipid-lowering strategies.[8,9,16]

Conclusion

Elevated serum triglyceride levels at admission are independently associated with increased severity and systemic complications in acute pancreatitis. Early identification of patients with hypertriglyceridemia may improve risk stratification and guide prompt therapeutic interventions. Incorporating routine serum triglyceride measurements into clinical protocols for acute

pancreatitis could enhance patient management and potentially improve outcomes. Further multicenter studies are warranted to validate these findings and evaluate the efficacy of targeted lipid-lowering therapies in this high-risk population.

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Conflicts of Interest

The authors declare no conflicts of interest related to this study.

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Ethics Approval and Consent to Participate

This study is approved by institution ethics committee, Government Medical College, Jammu under no. IEC/GMC/2022/1230. The consent has been taken from all participants of the study.

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