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# Correlation of Serum Amylase and Lipase Levels with Clinical Severity in Acute Pancreatitis

**Muhammad Burhan Anjum[1], Iqra[2], Sohail Arshad[3], Romail Haider[4], Muhammad Aizad Khurram[5], Adeeba Fatima[6]**

[1]Alkhidmat Hospital, Sahiwal, Pakistan
[2]Shalamar Hospital, Lahore, Pakistan
[3]Shaikh Zayed Hospital, Lahore, Pakistan
[4]Shalamar Hospital, Lahore, Pakistan
[5]Accident & Emergency Department, Hijaz Hospital, Lahore, Pakistan
[6]ALI Medical Complex, Muzaffarabad, Pakistan

## ARTICLE INFO

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**Correspondence to:** Iqra,
Shalamar Hospital, Lahore, Pakistan
Email: iqraarshad954@gmail.com

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## ABSTRACT

**Background:** Acute pancreatitis is an inflammatory condition of the pancreas with variable clinical presentations, ranging from mild, self-limiting symptoms to severe disease with multi-organ failure. **Objective:** To evaluate the correlation between serum amylase and lipase levels and the clinical severity of acute pancreatitis as defined by the Modified Atlanta Classification. **Methods:** This cross-sectional, observational study was conducted at Shalamar Hospital from October 2024 to March 2025. A total of 185 patients diagnosed with acute pancreatitis were enrolled in the study. Patients were selected through non-probability consecutive sampling technique. Upon admission, detailed demographic data including age, gender, and relevant history were recorded. Blood samples were obtained within 24 hours of presentation to measure serum amylase and lipase levels using standardized enzymatic colorimetric assays. **Results:** Out of 185 patients, 44.3% had mild, 34.6% had moderately severe, and 21.1% had severe acute pancreatitis. Mean serum amylase levels increased across severity groups (612 ± 180 U/L in mild, 685 ± 200 U/L in moderately severe, and 700 ± 220 U/L in severe; $p = 0.09$), but the trend was not statistically significant. Serum lipase levels showed a significant rise (980 ± 250 U/L, 1120 ± 310 U/L, and 1210 ± 340 U/L respectively; $p = 0.01$). A weak positive correlation was found between amylase and severity (Spearman's rho = 0.21, $p = 0.07$), while lipase showed a moderate correlation (Spearman's rho = 0.42, $p < 0.001$). ICU admission and mortality were observed exclusively in the severe group. **Conclusion:** Serum lipase levels demonstrate a moderate and statistically significant correlation with the clinical severity of acute pancreatitis and may serve as a valuable early predictor in triage settings. Serum amylase levels are less predictive of severity.

## INTRODUCTION

Acute inflammation in the pancreas (acute pancreatitis) can cause a disorder called systemic inflammatory response syndrome, problems with organs and extreme morbidity and mortality, especially if it is severe [1-2]. Cases of acute pancreatitis around the world are rising due to more gallstones, alcohol use, hypertriglyceridemia and conditions such as post-endoscopic retrograde cholangiopancreatography pancreatitis [3]. Spotting the early severity of acute pancreatitis within the first 24 to 48 hours after symptoms begin is still a hard challenge for medical staff [4]. An overactivation of digestive enzymes in the pancreas causes the organ to digest itself which leads to inflammation and a series of other effects. The biochemical hallmarks of the disease often include monitoring serum amylase and lipase which are measured regularly [5-6]. Lipase is far more specific to the pancreas than amylase and since it remains in the system longer, it is favored as a marker by certain guidelines. Symptoms usually appear before enzyme levels do and these levels are often seen to climb within the next 6-12 hours. They remain raised for 3 to 5 days. Even so, there is disagreement about whether markers indicate the amount of disease or just its existence.

Many investigations have examined how much more of these enzymes is present in people who have more severe pancreatic damage and a poorer outlook [8]. A few researchers believe that large increases in lipase may suggest severe damage to the pancreas, but others think that the amount of enzyme elevation does not predict how serious the disease is, since enzyme levels can come down with the condition worsening [9-10]. Also, hyperlipasemia and hyperamylasemia might appear with renal insufficiency, intestinal perforation and cholecystitis,

making their use in predicting prognosis less specific [11]. Because of these difficulties, several clinical scoring systems have been designed, for example Ranson's criteria, APACHE II, the Glasgow score, BISAP and the Revised Atlanta Classification, each using both clinical means, lab assessments and imaging tests [12]. Regardless, these instruments need the first few days of patient data and are not feasible in places with little equipment or under emergency conditions that call for fast decisions. Acute pancreatitis results in raised serum amylase levels six to eight hours after symptoms start; activities usually normalize by the third or fourth day [13]. The upper reference limit for amylase is exceeded by four to six times in most cases and the highest concentration is generally present 12–72 hours after symptoms begin. The amount by which serum enzymes increase is independent of the degree of inflammation in the pancreas, but the more they increase, the higher the odds of acute pancreatitis. Within 4–8 hours after an attack of acute pancreatitis, serum lipase activity is higher than normal, remains high for about 24 hours and comes back to normal within 8–14 days [14].

### Objective

To evaluate the correlation between serum amylase and lipase levels and the clinical severity of acute pancreatitis as defined by the Modified Atlanta Classification.

## METHODOLOGY

This cross-sectional, observational study was conducted at Shalamar Hospital from October 2024 to March 2025**.** A total of 185 patients diagnosed with acute pancreatitis were enrolled in the study. Patients were selected through non-probability consecutive sampling technique.

### Inclusion Criteria

- Adults aged 18 years and above
- Diagnosis of acute pancreatitis based on at least two of the following Revised Atlanta criteria:
  1. Characteristic abdominal pain
  2. Serum amylase and/or lipase levels greater than three times the upper limit of normal
  3. Imaging findings consistent with acute pancreatitis (ultrasound or contrast-enhanced CT)

### Exclusion Criteria

- Patients with chronic pancreatitis
- Known pancreatic malignancy
- History of recent abdominal surgery or trauma
- End-stage renal disease
- Patients on medications known to alter serum amylase or lipase levels (e.g., valproate, azathioprine)

### Data Collection

Upon admission, detailed demographic data including age, gender, and relevant history were recorded. Blood samples were obtained within 24 hours of presentation to measure serum amylase and lipase levels using standardized enzymatic colorimetric assays. The severity of acute pancreatitis was assessed using the Modified Atlanta Classification and categorized into three groups:

- Mild (no organ failure, no local or systemic complications)
- Moderately severe (transient organ failure or local complications)
- Severe (persistent organ failure >48 hours)

Additional clinical parameters including vital signs, laboratory values (e.g., CRP, WBC count), and imaging findings were recorded to support classification.

### Statistical Analysis

Data were entered and analyzed using SPSS version 26. Continuous variables such as serum amylase and lipase were presented as mean ± standard deviation or median (IQR) depending on data distribution. Categorical variables were presented as frequencies and percentages. Comparisons between enzyme levels across severity groups were performed using one-way ANOVA. Correlation between enzyme levels and clinical severity scores was assessed using Pearson's correlation coefficients. A p-value <0.05 was considered statistically significant.

## RESULTS

Data were collected from 185 patients, with a mean age of 45.6 ± 12.4 years, and a male predominance of 58.4%. Gallstones were identified as the most common etiology of acute pancreatitis, accounting for 41.6% of cases, followed by alcohol use (29.2%), hypertriglyceridemia (15.1%), and idiopathic causes (14.1%). In terms of clinical severity, 44.3% of patients had mild acute pancreatitis, 34.6% had moderately severe disease, and 21.1% were classified as severe based on the Modified Atlanta Classification.

**Table 1**

*Demographic and Baseline Values of Patients*

| Variable | | Value |
|---|---|---|
| Mean Age (years) | | 45.6 ± 12.4 |
| Gender | Male | 58.4% |
| | Female | 41.6% |
| Etiology (Overall %) | Gallstones | 41.6% |
| | Alcohol Use | 29.2% |
| | Hypertriglyceridemia | 15.1% |
| | Idiopathic | 14.1% |
| Etiology | Gallstones | 77 (41.6%) |
| | Alcohol Use | 54 (29.2%) |
| | Hypertriglyceridemia | 28 (15.1%) |
| | Idiopathic | 26 (14.1%) |
| Clinical Severity | Mild | 82 (44.3%) |
| | Moderately Severe | 64 (34.6%) |
| | Severe | 39 (21.1%) |

Patients with mild disease had a mean serum amylase level of 612 ± 180 U/L and a lipase level of 980 ± 250 U/L. In the moderately severe group, amylase rose to 685 ± 200 U/L, while lipase increased to 1120 ± 310 U/L. The highest enzyme levels were observed in the severe group, with amylase at 700 ± 220 U/L and lipase at 1210 ± 340 U/L.

**Table 2**

*Enzyme Levels by Clinical Severity*

| Severity | Serum Amylase (U/L) | Serum Lipase (U/L) |
|---|---|---|
| Mild | 612 ± 180 | 980 ± 250 |
| Moderately Severe | 685 ± 200 | 1120 ± 310 |
| Severe | 700 ± 220 | 1210 ± 340 |

The correlation analysis revealed a weak positive but statistically non-significant association between serum amylase levels and disease severity (Spearman rho = 0.21, p = 0.07). In contrast, serum lipase levels showed a

moderate and statistically significant correlation with clinical severity (Spearman rho = 0.42, p < 0.001), reinforcing its predictive value. Among patients with severe pancreatitis, 82.1% developed organ failure, 33.3% required ICU admission, and all recorded deaths (mortality rate: 4.3%) occurred within this group, underscoring the clinical impact of severe disease.

**Table 3**

*Correlation and Clinical Outcomes*

| Parameter | Result |
|---|---|
| Amylase vs Severity | Spearman rho = 0.21, p = 0.07 |
| Lipase vs Severity | Spearman rho = 0.42, p < 0.001 |
| Organ Failure in Severe Group | 82.1% |
| ICU Admission in Severe Group | 33.3% |
| Mortality | 4.3% (all in severe group) |

No patients in the mild group required ICU care or experienced mortality. In the moderately severe group, ICU admission was observed in 6.2% of cases, with no deaths reported. However, in the severe group, 33.3% of patients required ICU admission and the mortality rate was notably higher at 10.3%, highlighting the significant risk of adverse outcomes in patients with severe acute pancreatitis.

**Table 4**

*ICU Admission and Mortality by Severity*

| Severity Group | ICU Admission (%) | Mortality (%) |
|---|---|---|
| Mild | 0% | 0% |
| Moderately Severe | 6.2% | 0% |
| Severe | 33.3% | 10.3% |

## DISCUSSION

The aims of this work are to understand if elevated serum amylase and lipase relate to the severity of acute pancreatitis in 185 patients. The results suggest that although amylase and lipase are both higher in patients with acute pancreatitis, lipase correlates stronger with disease severity and is more likely to be statistically significant. Patients with severe disease were found to have much higher lipase levels (1210 ± 340 U/L) than those with moderately severe (1120 ± 310 U/L) or mild disease (980 ± 250 U/L), with a statistically significant p-value of 0.01. The serum amylase values showed a pattern of higher levels with greater severity, but this result was not significant enough to prove so (p = 0.09). The findings are consistent with earlier works suggesting that lipase is more useful for diagnosis and predicting outcomes, thanks to its longer half-life, high specificity to the pancreas and less outside interference [15-16]. Pancreatic damage and systemic inflammation may be better reflected by lipase since it is positively and moderately correlated with the severity of clinical conditions (Spearman's rho = 0.42, p < 0.001). The result for amylase (Spearman's rho = 0.21, p = 0.07) demonstrates the weaknesses noted earlier in other studies related to amylase's ability to diagnose pancreatitis in patients presenting late or if they have renal problems [17-19].

Interestingly, although enzyme levels were high among many patients, some of those with mild and moderately severe cases showed overlapping enzyme values with those in the severe group. As a result, both local and systemic factors, along with a patient's individual background diseases, play a role in determining how severe acute pancreatitis may be. Consequently, measurements of enzyme levels cannot take the place of established clinical classifications, though they can help decide the initial severity of the disease. It was shown in our study that the severe group made up most ICU visits and all cases of death, in line with what is generally found with high-severity pancreatitis. When comparing this cohort to similar populations, the main causes of pancreatitis in our region were gallstones (41.6%), alcohol use (29.2%) and high triglycerides (15.1%). The fact that lipase can forecast severe disease early is very important for doctors working in emergency situations. Still, enzyme tests should be used together with other analyses. A correct diagnosis and outlook for disease continue to depend on combining imaging and clinical parameters.

### Limitations

Because this is a cross-sectional study, it cannot track how changes in enzymes relate to changes over time within patients. Serum enzyme measurement occurred only at the start of treatment and their values were not followed up through the course of illness. Because everything happened at one center, some patients may not match the general population and potential confounders such as timing of presentation, hydration status and laboratory variability were not handled.

## CONCLUSION

It is concluded that serum lipase levels have a moderate and statistically significant correlation with the clinical severity of acute pancreatitis, as categorized by the Modified Atlanta Classification. This suggests that lipase can serve as a useful early biochemical marker not only for diagnosis but also for predicting disease progression and the need for higher-level care. In contrast, serum amylase levels, while elevated in most cases, showed only a weak and statistically non-significant correlation with disease severity, limiting their utility in severity assessment. These findings support the use of serum lipase as part of the initial triage and risk stratification process in patients presenting with acute pancreatitis, especially in emergency and resource-limited settings. However, enzyme levels should be interpreted alongside clinical judgment, imaging, and scoring systems to guide comprehensive management decisions.

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