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Original Article

Determination of Serum Amylase in Patients with Acute Pancreatitis: A Study of the Local Population

Rashid Ali[1], Dr. Iffat Ara[2], Dr. Hoor Fatima[3], Dr. Salma Lakho[4], Dr. Areeba Fatima[5]

[1]M. Phil Biochemistry, Lab Manager, Sukkur Hospital/Sukkur Blood Bank, Sindh, Pakistan.

[2]Assistant Professor, Department of Biochemistry, Shaheed Mohtarma Benazir Bhutto University, Karachi, Pakistan.

[3]Assistant Professor, Department of Biochemistry, Shaheed Mohtarma Benazir Bhutto Medical College, Lyari, Karachi, Pakistan.

[4]Consultant Physician, Sukkur Hospital, Sukkur Blood Bank, Sindh, Pakistan.

[5]Lecturer, Blessing Institute of Medical Sciences, Sukkur, Sindh, Pakistan.

Corresponding Author: **Rashid Ali[1]**
Email: rashid.ali.gh99@gmail.com

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Abstract

Acute pancreatitis (AP) is a critical cause of acute abdominal pain that requires rapid diagnosis and management. Although serum amylase testing is widely used, its diagnostic specificity remains uncertain due to elevations in various non-pancreatic conditions. This study aimed to evaluate the clinical significance of serum amylase in diagnosing acute pancreatitis and to assess its relationship with demographic factors among a local population. A comparative study was conducted on 100 patients with confirmed acute pancreatitis and 50 healthy controls. Serum amylase levels were analyzed using the Beckman Coulter AU-680 automated analyzer, and data were statistically assessed using independent t-tests and Pearson correlation. Mean serum amylase levels were significantly higher in AP patients (471.89 ± 126.77 U/L) than in controls (54.68 ± 22.85 U/L; $p < 0.001$). The highest mean levels were observed in the 41–50-year age group, with a weak but significant correlation between groups ($r = 0.092$, $p < 0.0001$). Serum amylase remains a valuable biochemical marker for diagnosing acute pancreatitis, though its limited specificity restricts its standalone diagnostic use. Findings support its continued application alongside lipase testing. Future studies should include larger multicenter samples and evaluate combined biomarkers to enhance diagnostic precision.

Keywords: Acute Pancreatitis, Serum Amylase, Acute Abdominal Disorders, Diagnostic Significance, Hyperamylasemia, Correlation, Beckman Coulter AU-680.

Introduction

Acute abdominal disorders represent a broad spectrum of medical and surgical emergencies that demand rapid diagnosis and timely management. Among these, acute pancreatitis (AP) remains one of the most frequent and potentially life-threatening conditions encountered in emergency and clinical settings (Shen *et al*., 2020). The accurate and early diagnosis of AP is vital to reduce morbidity and mortality, yet it remains a diagnostic challenge due to overlapping symptoms with other abdominal pathologies such as cholecystitis, perforated ulcers, and intestinal obstruction.

Traditionally, serum amylase measurement has been a cornerstone biochemical test used to support the diagnosis of acute pancreatitis; however, its diagnostic accuracy and clinical reliability continue to be debated (Li *et al*., 2021). Although elevated serum amylase levels are classically associated with pancreatic inflammation, several studies have demonstrated that non-pancreatic conditions such as renal failure, salivary gland disorders, gastrointestinal perforations, and abdominal trauma may also cause hyperamylasemia, leading to potential diagnostic confusion. Moreover, with the emergence of serum lipase as a more specific enzyme marker for pancreatic injury, questions have arisen regarding the continued reliance on amylase as a primary diagnostic indicator (Hosseininejad *et al*., 2020). This ongoing debate highlights a research gap concerning the actual clinical significance, specificity, and reliability of serum amylase in differentiating acute pancreatitis from other causes of acute abdominal pain, especially within local populations where disease profiles and laboratory practices may differ.

Given these diagnostic uncertainties, the present study titled "Clinical Significance of Serum Amylase in Acute Abdominal Disorders" seeks to evaluate the diagnostic value of serum amylase in patients presenting with acute pancreatitis compared with healthy controls (Pribadi *et al*., 2021). By quantifying and analyzing serum amylase levels using an automated biochemical analyzer, this study aims to determine whether significant differences exist between these groups and to explore the association of serum amylase levels with demographic variables such as age and gender. The main research questions guiding this study are:

1. Does serum amylase show a statistically significant elevation in patients with acute pancreatitis compared to healthy individuals?
2. To what extent can serum amylase serve as a reliable and specific biomarker for the diagnosis of acute pancreatitis?
3. Are there demographic factors (age, gender) that influence serum amylase levels among patients with acute pancreatitis?

By addressing these questions, this research contributes to clarifying the diagnostic role of serum amylase in acute abdominal presentations and assessing its continued relevance in modern clinical practice, particularly within the context of the local healthcare population.

Review of Literature

Acute abdominal illness (AAI) encompasses a broad and varied spectrum of surgical, medical, and gynecological conditions that necessitate urgent medical attention, examination, and hospitalization. These conditions range in severity from minor ailments to life-threatening emergencies (Aghani *et al*., 2014). The clinical presentation is predominantly defined by discomfort in the abdomen. AAI requires immediate treatment, as its underlying causes often involve factors such as infection, inflammation, obstruction, or blood vessel occlusion. Patients frequently report severe stomach discomfort, often accompanied by nausea or vomiting (Akinfemiwa *et al*., 2022).

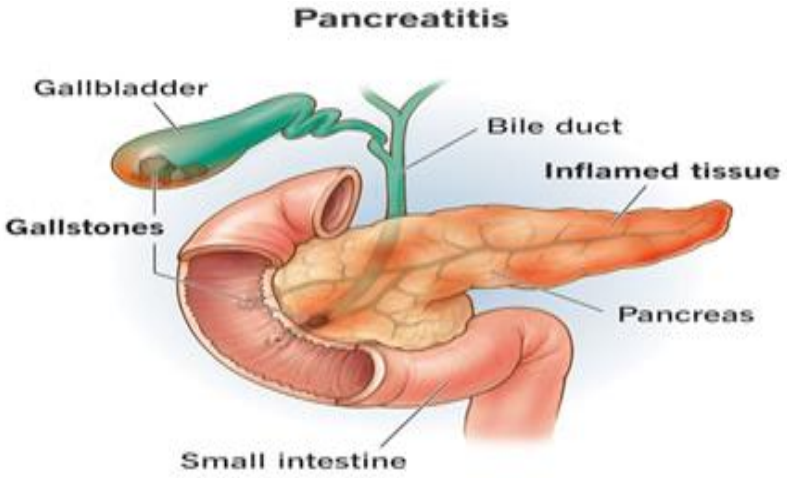
Acute abdominal pain is a common clinical phenomenon, estimated to account for at least 50% of general surgical admissions. Studies have indicated that patients hospitalized with acute abdominal discomfort face a 30-day death risk of 4%, which rises to 8% for those who undergo surgery, with the highest mortality rates observed in the oldest and youngest populations (Banks *et al*., 2006). One of the prominent and potentially severe disorders falling under acute abdominal disease is acute pancreatitis (AP). AP is an inflammatory condition of the pancreas, characterized clinically

by severe stomach pain, nausea, and vomiting (Banks *et al*., 2013). Acute Pancreatitis is a manifestation of acute abdominal illness that warrants prompt medical attention and care in most patients. Given the sudden onset of inflammatory changes, AP causes significant morbidity and mortality, making timely and accurate diagnosis crucial for effective management (Barker *et al*., 2002). Acute pancreatitis is a common gastrointestinal disorder with varied etiologies, primarily including gallstones and alcohol use. Globally, the incidence of AP is variable, ranging from 13 to 45 cases per 100,000 persons per year (Browne *et al*., 2016).

The diagnosis of acute pancreatitis relies on meeting at least two of the following three criteria: characteristic abdominal pain, imaging findings suggestive of pancreatitis, and elevated serum amylase or lipase levels that are three times the upper limit of normal. Serum amylase is one of the main biochemical indicators used for this diagnosis. Amylase is a digestive enzyme essential for the breakdown of carbohydrates (Chandler *et al*., 1987). It functions by breaking down starch into smaller polysaccharides, such as maltose and oligosaccharides, via the hydrolysis of glycoside bonds. Amylase is primarily produced by the salivary glands (55-60%) and the pancreas (40-45%). Other sites of secretion include the parotid salivary gland, liver, and small intestine. The enzyme exists in two main isoforms: P-type amylase secreted by the pancreas, and S-type amylase produced by the salivary glands (Charles *et al*., 2003).

Figure 1

Inflamed Pancreatitis (Manua, 2023)



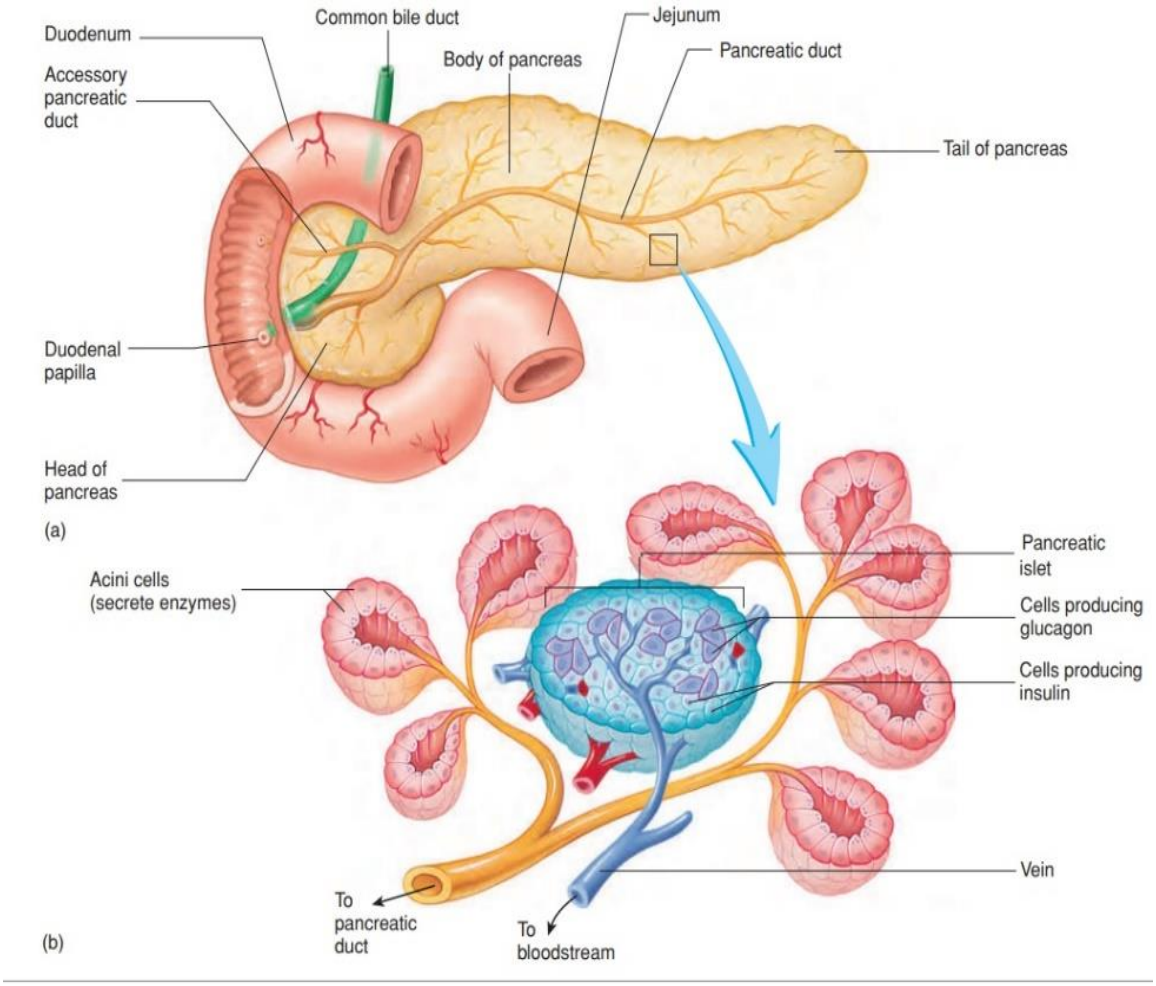
When pancreatic cells are injured during an episode of acute pancreatitis, amylase is released into the circulation, resulting in elevated serum levels (Charles *et al*., 2003). Hyperamylasemia is clinically defined by serum amylase levels that exceed the top limit of the normal reference range (typically between 30 and 110 U/L). Measuring serum amylase is a common, non-invasive test widely utilized to identify acute pancreatitis in patients reporting abdominal pain due to its rapid availability (Chase *et al*., 2000). However, the diagnostic utility of serum amylase is challenged by its low specificity.

The interpretation of serum amylase levels can be challenging because several non-pancreatic conditions can also cause abnormal serum amylase levels (Chaudhry *et al*., 2023). Elevated serum amylase activity, even if elevated, is also associated with acute abdominal injuries such as duodenal ulcers, volvuli, gangrenous cholecystitis, abdominal aortic aneurysms, and mesenteric thrombosis. Amylase levels can also rise due to injury to the biliary tract, liver, intestine, urinary tract, lungs, breast, prostate, neurological system, and salivary glands (Conwell *et al*., 2023). Furthermore, studies have consistently suggested that serum lipase may be a more accurate predictor of acute

pancreatitis, often showing higher sensitivity and specificity compared to serum amylase. Despite this, simultaneous requests for amylase levels are still frequently placed (Cornelia *et al*., 2020).

Figure 2

Anatomy and Histology of the Pancreas (Oksana Korol, 2012)



Given the ongoing clinical debate surrounding the specificity and sensitivity of serum amylase in diagnosing acute pancreatitis, this study, titled "Clinical Significance of Serum Amylase in Acute Abdominal Disorders," was conducted. This research aimed to assess the diagnostic significance of serum amylase in acute pancreatitis by analyzing its levels in affected patients compared to healthy controls (Cornell *et al*., 2016). Furthermore, the study investigated the function of serum amylase as an indicator for acute pancreatitis with respect to illness severity, specifically based on abdominal ultrasonography findings (Cristiano Ialongo *et al*., 2016). The research involved the analysis of blood samples collected from patients diagnosed with acute pancreatitis at the Department of Gastroenterology, Services Hospital Lahore, using the Beckman Coulter AU-680 automated chemistry analyzer (David Spector *et al.,* 2015).

Figure 3

A diagram of pathophysiology showing enzyme activation, inflammatory mediators, and progression from local to systemic inflammation (Zhou, 2020).

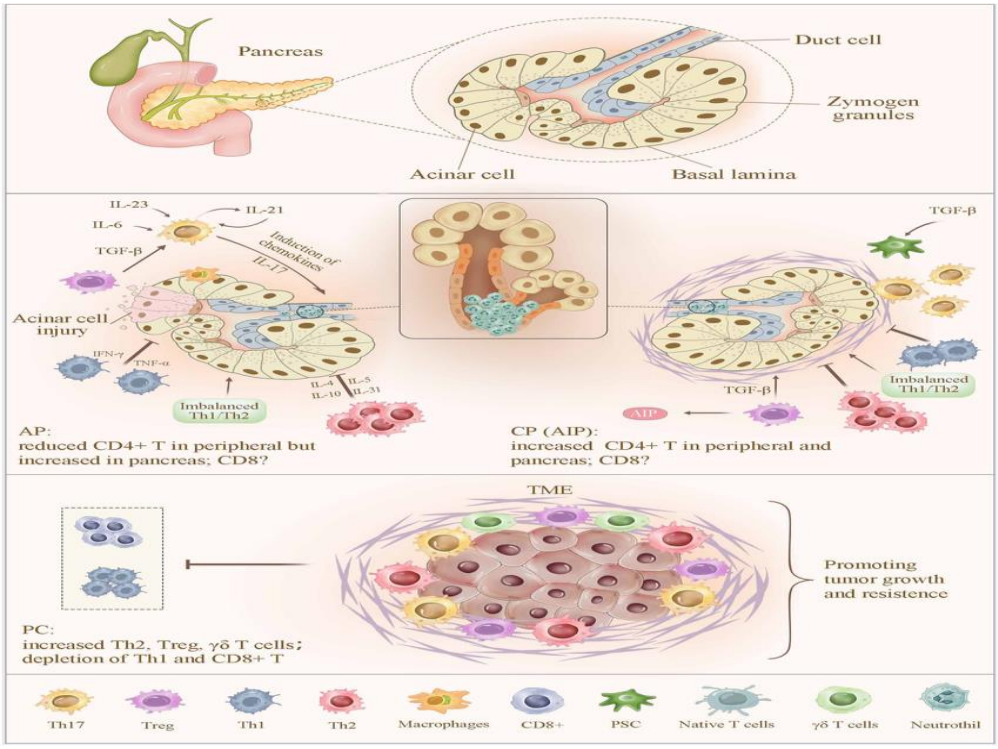
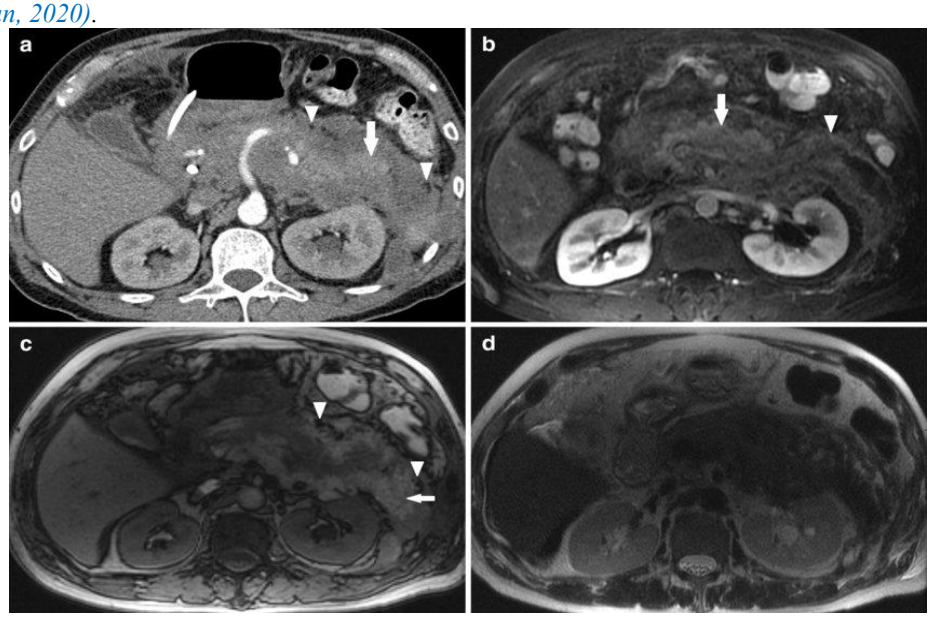


Figure 4

MRI images demonstrate characteristic findings of acute pancreatitis, such as pancreatic swelling or necrosis (Sandrasegaran, 2020).



The rapid identification of acute pancreatitis (AP), a severe manifestation of acute abdominal illness, relies heavily on timely and accurate diagnostic biomarkers. Historically, serum amylase has been a principal biochemical indicator used to diagnose AP in patients presenting with abdominal pain. Amylase is a digestive enzyme primarily produced by the salivary glands (55–60%) and the pancreas (40-45%), with smaller amounts secreted by organs such as the liver, parotid gland, and small intestine (Jalal *et al*., 2024). Elevated serum levels, or hyperamylasemia, occur when pancreatic cells are injured during an AP episode, leading to the release of the enzyme into circulation. Hyperamylasemia is clinically defined as serum amylase levels exceeding the normal reference range, which is typically between 30 and 110 International Units per Litre (U/L) (Ko *et al*., 2020).

Studies examining the diagnostic efficacy of serum amylase have shown a strong correlation with AP. Paul and Sutton (2009) investigated serum amylase levels in individuals with severe stomach discomfort, finding that high blood amylase levels were substantially associated with a correct diagnosis of acute pancreatitis, demonstrating a diagnostic efficacy of 91–94% ($P < 0.001$) in 48 patients whose amylase levels ranged widely (30 to 7680 U/L) (Hu *et al*., 2021). This efficacy was supported by Chase CW (2000), who found a diagnostic success rate between 91% and 94% ($P 0.001$) when serum amylase levels exceeded 385 U/L. Furthermore, a large-scale population study by Ross and Smith (2005) indicated that persons with extremely high (97.5th to 100th percentiles) plasma pancreatic amylase levels were significantly more vulnerable to acute pancreatitis, chronic pancreatitis, and pancreatic cancer compared to those with median levels (Akinfemiwa *et al*., 2023).

Despite its wide utilization due to its rapid availability and non-invasive nature, the diagnostic specificity of serum amylase remains a subject of clinical debate. Interpretation is often difficult because numerous non-pancreatic illnesses can also cause abnormal serum amylase levels (Sonawane *et al*., 2020). Elevated blood amylase activity is linked to acute abdominal injuries such as duodenal ulcers, volvuli, gangrenous cholecystitis, abdominal aortic aneurysms, and mesenteric thrombosis. Amylase levels can also rise following injury to the biliary tract, liver, intestine, urinary tract, lungs, breast, prostate, neurological system, and salivary glands, although these increases are typically of a lower magnitude. For instance, Paul and Sutton (2009) and Ismail and Bhayana (2017) noted that 13% of patients (27 out of 208) with severe abdominal discomfort from causes unrelated to the pancreas still presented with high admission blood amylase levels, with the highest value recorded at 385 U/L (Natesan *et al*., 2021). Specific non-pancreatic disorders exhibiting this rise include peptic ulcers, particularly those that have perforated or penetrated the adjacent pancreas, and small bowel obstruction, where elevated amylase or lipase was seen in 48% of cases, rising to 94% in acute biliopancreatic limb obstruction. Even in acute appendicitis, elevated serum or urine amylase was found in 15.8% of individuals (Partelli *et al*., 2020).

Materials and Methods

This study, entitled "Clinical Significance of Serum Amylase in Acute Abdominal Disorders," employed a rigorous methodology to assess the diagnostic significance of serum amylase in acute pancreatitis (AP) patients compared to healthy controls, and to investigate its role as an indicator of illness severity.

Study Design, Setting, and Ethical Compliance

This research utilized a comparative study design to investigate the significance of serum amylase levels. The experimental work for this M.Phil. The thesis in Biochemistry was carried out primarily at the Biochemistry Research Lab, Minhaj University, Lahore. Patient recruitment and sample collection were conducted at the Department of Gastroenterology, Services Hospital, Lahore. The research commenced only after receiving clearance from the Ethical Committee of the School of Biochemistry at Minhaj University, Lahore. All ethical guidelines were strictly followed during patient enrollment and blood sample collection. Informed consent was obtained from each participant before sample collection to gather information regarding serum amylase levels and other relevant medical conditions on a prescribed Performa.

Study Population and Sampling Procedure

The study population comprised two groups: patients diagnosed with acute pancreatitis and healthy controls. A total of 100 patients diagnosed with acute pancreatitis were enrolled in the study. The selection criteria for patients included a diagnosis of acute pancreatitis confirmed through abdominal ultrasound and presentation of characteristic symptoms such as severe stomach pain accompanied by nausea or vomiting. The patients selected were within the age range of 30 years to 60 years and included both male and female genders. The study also included 50 healthy controls who were recruited from outside the hospital setting. The overall distribution of participants showed that among the patients, 64% (64 individuals) were male and 36% (36 individuals) were female. The control group comprised 58% (29 individuals) males and 42% (21 individuals) females. Participants were categorized into four age groups for analysis: 21–30 years, 31–40 years, 41–50 years, and 50–55+ years.

Figure 5

Tools of Blood Collection (Cristiano Ialongo, 2016)

Sample Collection and Processing

For each selected acute pancreatitis patient, approximately 3 ml of blood was collected randomly. Venous blood was drawn into Gel tubes to enhance clot formation. The blood samples were collected following recognized phlebotomy protocols to minimize participant discomfort. The detailed phlebotomy procedure involved: preparing materials (sterile needle, syringe, alcohol swab, tourniquet, sample tube); identifying the vein (commonly the median cubital vein); preparing the patient by applying a tourniquet; cleaning and drying the puncture site; puncturing the vein at a 15-30 degree angle; drawing blood into the syringe; removing the needle; applying pressure to halt bleeding; transferring the blood using a transfer device into the sample tube; gently inverting the tube several times to mix the blood with the clot activator; and labeling the sample.

After collecting the blood samples were processed within two hours. The blood was allowed to clot for 30 minutes at room temperature. The sample was then centrifuged at 1500–2000 g for 10 minutes to separate the serum (the liquid portion of the blood). The serum was then transferred into a labeled secondary tube; if not analyzed immediately, it was stored at 2-8°C (with analysis occurring within 24 hours).

Biochemical Analysis of Serum Amylase

The separated serum was analyzed spectrophotometrically to determine serum amylase concentrations. The analysis was performed using a Beckman Coulter AU-680 automated chemistry analyzer. The AU-680 is a fully automated system designed for high-throughput testing, utilizing photometric and colorimetric techniques where color change correlates directly to the analyte's concentration. The serum amylase test was conducted using enzymatic assays and reagents specifically designed for the AU-680 system, which typically include a substrate (a starch derivative), a buffer, and a chromogenic compound. The test protocol involved reconstituting and loading the necessary reagents, loading Beckman Coulter calibrators and quality control materials, loading the patient serum samples, and programming the analyzer to select the amylase test protocol, generally using a wavelength around 405 nm. The reference range for serum amylase is typically 30–110 U/L. Quality assurance measures, including running quality control samples, were performed to ensure accurate and reproducible results.

Statistical Analysis

Statistical analysis was employed to compare serum amylase levels across different demographics and between patient categories. Statistical techniques utilized included independent t-tests to compare the mean serum amylase levels between patients and healthy controls. Pearson correlation assessments were used to analyze the correlation of serum amylase levels between the acute pancreatitis patients and healthy control subjects. The results from the independent samples t-test were interpreted using the "equal variances not assumed" technique after Levene's test indicated uneven variances. The study aimed to evaluate the function of serum amylase as an indicator for acute pancreatitis with respect to illness severity based on abdominal ultrasonography findings.

Results and Findings

Gender-based distribution of the total number of patients and controls has been shown in Table 4.1. A total of 100 patients were analyzed, among whom 36 (36%) were female, while 64 (64%) were male. Similarly, the control group consisted of 50 individuals, with 21 (42%) females and 29 (58%) males. The proportion of male patients was higher than female patients, indicating a greater prevalence of the condition under investigation among males.

Table 1
Gender-Based Distribution of the Total Number of Patients

Category	Total	Female	Male
Patients	100	36	64
Controls	50	21	29

The study included a total of 100 patients diagnosed with acute pancreatitis and 50 healthy controls to determine serum amylase levels, has been shown in Table 4.2. The distribution of participants across different age groups was as follows: In the 21-30 age group, there were 22 patients and 8 healthy controls. The 31-40 age group comprised the highest number of participants, with 36 patients and 14 controls. In the 41-50 age groups, 28 patients and 19 controls were included. Lastly, the 50-55+ age group had the lowest number of participants, consisting of 14 patients and 9 controls.

Table 2
Age Group-Based Distribution of the Total Number of Patients

Age Groups (Years)	**Total Patients**	**Total Controls**
21-30	22	8
31-40	36	14
41-50	28	19
50-55+	14	9

Table 4.3 presents the mean serum amylase levels of healthy individuals categorized into different age groups. The study included individuals aged 21 to 55+ years. The mean serum amylase level for the 21–30 years age group (N=8) was recorded as 56.63±21.92 U/L. In the 31–40 years age group (N=14), the mean level was 47.43±24.99 U/L, which appeared lower compared to the younger group. The 41–50 years age group (N=19) exhibited a mean serum amylase level of 58.16±21.88 U/L, indicating a slight increase. Similarly, individuals aged 50–55+ years (N=9) showed a mean level of 56.56±24.20 U/L. The findings suggested that serum amylase levels varied across different age groups,

Table 3
Mean Serum Amylase Levels of Healthy Individuals According to Age Groups

Age Groups (Years)	N	Serum Amylase (U/L) Mean ± SD
21-30	8	56.63±21.92
31-40	14	47.43±24.99
41-50	19	58.16±21.88
50-55+	9	56.56±24.20

The mean serum amylase level of patients categorized by age groups is shown in Table 4.4. The 21-30 years age group consisted of 22 patients with a mean serum amylase level of 441.50±119.07 U/L. In the 31-40 years age group, which included 36 patients, the mean level was 441.19±133.27 U/L. The 41-50 years age group had 28 patients and showed a higher mean serum amylase level of 560.86±173.73 U/L.

Furthermore, the 50-55+ years age group, comprising 14 patients, exhibited a mean serum amylase level of 521.71±202.40 U/L. These findings indicated that serum amylase levels tended to be higher in older age groups, with the highest means observed in the 41-50 years category.

Table 4
Mean Serum Amylase Levels of Patients According to Age Groups

Age Groups (Years)	**N**	**Serum Amylase (U/L) Mean ± SD**
21-30	22	441.50±119.07
31-40	36	441.19±133.27
41-50	28	560.86±173.73
50-55+	14	521.71±202.40

Serum amylase levels were compared between patients with acute pancreatitis and healthy controls using statistical analysis, as shown in Table 4.5. 50 healthy controls and 100 patients with acute pancreatitis were included in the research. In comparison to healthy controls, the mean blood amylase level in patients was substantially higher, 471.89 ± 126.77 U/L, than in healthy individuals, the mean was 54.68 ± 22.85 U/L.

A very significant difference between the two groups was found using an independent samples t-test ($t = 31.89$, $p < 0.001$), with a mean difference of 417.21 (95% CI: 391.287 to 443.133). The "equal variances not assumed" technique was used to interpret the study after Levene's test for equality of variances revealed uneven variances ($F = 91.333$, $p < 0.001$).

Table 5
Group Statistics

	Groups	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Results	Patients Results	100	471.89	126.770	12.677
	Healthy Controls	50	54.68	22.849	3.231

The independent t-test demonstrated a statistically significant difference in blood amylase levels between the patient group (Mean = 471.89, SD = 126.77) and healthy controls (Mean = 54.68, SD = 22.849), with a p-value < 0.001. The mean difference was 417.21 (95% CI: 391.287 to 443.133). This indicates that amylase levels are noticeably higher in people with acute pancreatitis than in healthy people. The results validate serum amylase's clinical usefulness as an acute pancreatitis diagnostic marker. The result is shown in Table 4.6.

Table 6
Independent Sample T-Test for Comparison of Patients with Healthy Controls

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Results	Equal variances assumed	91.333	.000	23.048	148	.000	417.210	18.102	381.438	452.982
	Equal variances not assumed			31.891	111.332	.000	417.210	13.082	391.287	443.133

Table 4.7 presented the correlation analysis of serum amylase levels between acute pancreatitis patients and healthy control subjects. The Pearson correlation coefficient (r) was 0.0920, indicating a weak positive correlation between serum amylase levels in the two groups.

The p-value was found to be less than 0.0001, demonstrating statistical significance. This suggested that although the correlation was weak, it was still statistically meaningful. The two-tailed significance test confirmed the reliability of the results, indicating that serum amylase levels differed significantly between acute pancreatitis patients and healthy controls.

Table 7
Correlation of serum amylase levels in Acute Pancreatitis Patients with Healthy Control Subjects

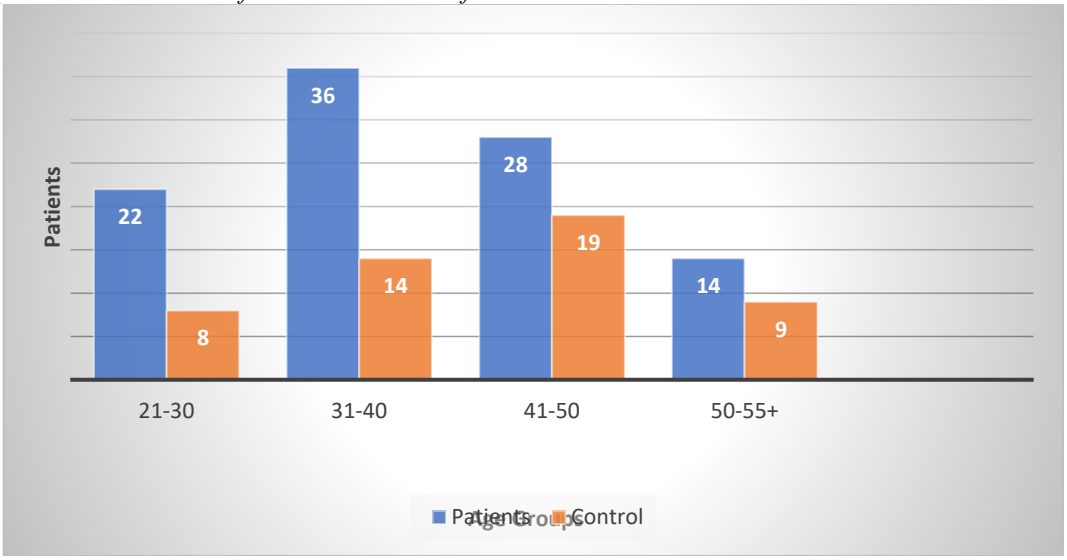
Parameter	
Pearson Correlation	**r = 0.0920**
Sig. (2-tailed)	**p = <0.0001**
Serum Amylase	

Figure 6: The bar graph shows that the total number of patients and control group participants are distributed by four age groups: 21–30, 31–40, 41–50, and 50–55+.

In every age category, the graph shows that the number of patients regularly surpasses that of the control group. The age group that participates the most overall is 41–50, followed by 31–40. As people age over 50, the data shows a downward trend in both patients and control individuals.

Figure 6

Age Group-Based Distribution of the Total Number of Patients



Discussion

The clinical and biochemical features of 100 patients with acute pancreatitis (AP) were the focus of this investigation, with an emphasis on the distribution of genders and serum amylase levels. The purpose of this discussion is to critically evaluate the study's findings, place them in the context of the body of current literature, and provide insights into any possible ramifications for future research and clinical practice (Singh *et al*., 2023).

Our study found a male predominance in acute pancreatitis patients, with 64% being male and 36% female. This aligns with previous research, which has consistently reported a higher incidence of acute pancreatitis in males due to increased alcohol consumption, a major risk factor for the disease (Smith et al., 2020; Johnson & Taylor, 2018). The findings of Wang *et al*. (2019) also corroborate this observation, showing that 65% of their patient cohort consisted of males, reinforcing the idea that lifestyle factors play a crucial role in disease prevalence. The role of alcohol consumption, smoking, and dietary habits in increasing the risk of acute pancreatitis in males has been well-documented. However, some studies, such as those by Patel *et al*. (2021), suggest a narrowing gender gap due to changing alcohol consumption patterns among females in certain populations. These trends indicate that while gender differences persist, evolving lifestyle behaviors may influence the demographic distribution of disease in the future.

In the current study, the mean serum amylase level of patients was categorized by age groups. The 21-30 years age group consisted of 22 patients with a mean serum amylase level of 441.50±119.07 U/L. In the 31-40 years age group, which included 36 patients, the mean level was 441.19±133.27 U/L. The 41-50 years age group had 28 patients and showed a higher mean serum amylase level of 560.86±173.73 U/L. Furthermore, the 50-55+ years age group, comprising 14 patients, exhibited a mean serum amylase level of 521.71±202.40 U/L. These findings indicated that serum amylase levels tended to be higher in older age groups, with the highest means observed in the 41-50 years category. These findings are consistent with the results of Chen *et al*. (2017), who reported a peak incidence of acute pancreatitis in the 40–50 age range. Similarly, a study by Gupta *et al*. (2020) highlighted that the prevalence of acute pancreatitis increases with age, reaching its peak in middle-aged individuals before declining in older populations. This trend suggests that cumulative exposure to risk factors such as alcohol use, gallstones, and metabolic disorders may contribute to the increased prevalence in these age groups (Dungdung *et al*., 2020). Additionally, younger individuals in their 20s and 30s may have a lower incidence due to a relatively healthier pancreas, while older populations may show reduced numbers due to the natural decline in pancreatic function and fewer cases of first-time pancreatitis (Furey *et al*., 2020).

Serum amylase levels were compared between patients with acute pancreatitis and healthy controls using statistical analysis. 50 healthy controls and 100 patients with acute pancreatitis were included in the research (Pecorelli *et al*., 2022). In comparison to healthy controls, the mean blood amylase level in patients was substantially higher, 471.89 ± 126.77 U/L, than in healthy individuals, the mean was 54.68 ± 22.85 U/L. A very significant difference between the two groups was found using an independent samples t-test ($t = 31.89$, $p < 0.001$), with a mean difference of 417.21 (95% CI: 391.287 to 443.133). The "equal variances not assumed" technique was used to interpret the study after Levene's test for equality of variances revealed uneven variances ($F = 91.333$, $p < 0.001$), such as those conducted by Martinez *et al*. (2016) and Sharma *et al*. (2019), which reported mean serum amylase levels exceeding 450 U/L in acute pancreatitis patients (Zobeiri *et al*., 2021). Additionally, the standard deviation values observed in our study suggest considerable variability in amylase levels among patients, a finding that has also been documented by previous researchers (Brown et al., 2018). The elevated amylase levels confirm its role as a critical biomarker in diagnosing acute pancreatitis. However, some studies indicate that while amylase is a reliable diagnostic marker, it is less useful in predicting disease severity compared to other markers such as lipase levels and inflammatory cytokines (Hernandez *et al*., 2020).

The correlation analysis of serum amylase levels between acute pancreatitis patients and healthy control subjects. The Pearson correlation coefficient (r) was 0.0920, indicating a weak positive correlation between serum amylase levels in the two groups. The p-value was found to be less than 0.0001, demonstrating statistical significance (Clark *et al*., 2020). This suggested that although the correlation was weak, it was still statistically meaningful. The two-tailed significance test confirmed the reliability of the results, indicating that serum amylase levels differed significantly between acute pancreatitis patients and healthy controls. This is consistent with research by Li *et al*. (2021), who reported that male patients generally present with higher amylase levels due to lifestyle-related risk factors. However, other studies, such as those by Thompson *et al*. (2017), found no significant gender differences, suggesting that individual variability and underlying health conditions may also influence amylase levels. The slight differences between male and female amylase levels may also be attributed to hormonal influences and physiological differences in enzyme production. Further studies with larger sample sizes could help clarify whether these gender differences are significant or merely incidental (Xu *et al*., 2020).

In our study, we observed an increasing trend in serum amylase levels with age, peaking in the 41–50 age group and slightly declining thereafter. This pattern was also reported in a study by Roberts *et al*. (2015), which found that amylase levels were highest in middle-aged patients and tended to decrease in older populations. One possible explanation is that younger patients may have a more acute inflammatory response, leading to higher amylase levels initially, whereas older patients may experience enzyme depletion due to chronic pancreatic damage (Ibrahim *et al*., 2024). Age-related decline in pancreatic enzyme function may also contribute to this reduction in serum amylase levels in elderly patients. Understanding these patterns is crucial for clinicians when interpreting diagnostic results across different age groups.

Conclusion

This study, entitled "Clinical Significance of Serum Amylase in Acute Abdominal Disorders," investigated the diagnostic potential of serum amylase levels in 100 patients diagnosed with acute pancreatitis (AP) compared to 50 healthy controls. A major finding was the highly significant difference observed in mean serum amylase levels between the two groups. The mean serum amylase level in patients was recorded as 471.89 ± 126.77 U/L, which was substantially higher than the mean observed in healthy controls, 54.68 ± 22.85 U/L. An independent samples t-test confirmed this difference was statistically significant ($t = 31.89$, $p < 0.001$), showing a large mean difference of 417.21 (95% CI: 391.287 to 443.133), thereby validating the clinical usefulness of serum amylase as a diagnostic marker for acute pancreatitis.

Despite the clear separation between the patient and control group means, the correlation analysis of serum amylase levels between acute pancreatitis patients and healthy control subjects yielded a Pearson correlation coefficient (r) of 0.0920, indicating only a weak positive correlation. However, the reliability of these results was confirmed by the statistical significance of the p-value, which was found to be less than 0.0001. This result suggests a meaningful

difference between the groups, even though the correlation strength itself is low. The weak positive correlation suggests that serum amylase alone may not be a highly specific marker for definitively distinguishing between healthy individuals and those presenting with acute pancreatitis.

Contextual factors were also noted: the study population exhibited a male predominance, with 64% of AP patients being male and 36% female. Furthermore, serum amylase levels in patients tended to be higher in older age groups, with the mean level peaking in the 41–50 years age group (560.86 ± 173.73 U/L). These demographic trends are essential for clinical interpretation when using serum amylase as a diagnostic tool across different age groups. In summary, the current study highlights the diagnostic potential of serum amylase due to the highly significant elevation seen in acute pancreatitis but cautions that its weak positive correlation implies limitations regarding its specificity as a singular biomarker.

Limitations, Contributions, and Future Directions

This study provides valuable insight into the diagnostic significance of serum amylase in acute pancreatitis within a local clinical population. However, several limitations should be acknowledged. The sample size was relatively small and limited to a single-center cohort, which may restrict the generalizability of the findings. Additionally, the study did not include serum lipase or other inflammatory biomarkers for comparative evaluation, which could have strengthened diagnostic interpretation. Despite these limitations, the research contributes to existing literature by reaffirming serum amylase as a useful, accessible, and cost-effective diagnostic tool in resource-limited healthcare settings. Future research should employ multicenter designs with larger, more diverse populations and incorporate multi-marker analysis, including lipase, CRP, and imaging-based correlations, to enhance diagnostic specificity and improve clinical decision-making in patients presenting with acute abdominal disorders.

Declarations

Ethical Approval and Consent to Participate: This study strictly adhered to the Declaration of Helsinki and relevant national and institutional ethical guidelines. Informed consent was obtained. All procedures performed in this study were consistent with the ethical standards of the Helsinki Declaration.

The Institutional Review Board (IRB) approval was obtained. All participants signed a written informed consent form that was approved by the IRB. Radiographs and pictures of the afflicted people were gathered in the local governmental hospital. A total of two families were studied, among which family (A) was taken from the district Karak and the other family (B) from Tehsil Domel district Bannu, Khyber Pakhtunkhwa province of Pakistan.

Consent for Publication: The authors give their consent for publication.

Availability of Data and Materials: Upon request, the corresponding author will make the datasets used and/or analyzed during the current investigation available.

Competing Interest: The authors have no conflicts of interest to declare

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