Role of Biochemical Markers in Acute Pancreatitis

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Introduction

Acute pancreatitis is a disorder characterized by an immediate inflammation of the pancreas. Patients with severe acute upper abdomen discomfort should be suspected of having acute pancreatitis; nevertheless, the diagnosis needs either biochemical or radiologic proof.

Aims and objectives: The goal of this research is to establish the function of a biochemical marker in predicting acute pancreatitis.

Methods: This is retrospective research that was place in the Department of Biochemistry and Surgery at SRM Medical college, Kalahandi from May to November, 2023. Age, gender, serum amylase levels, and lipase amylase lipase ratio were among the information gathered from medical records.

Results: Of the 90 patients, 73.3% were men (n=66) and 26.7% were females (n=24). The patients in this research had a mean age and SD of 38.5±2.2.5 years. The mean and standard deviation for Amylase, Lipase, and Amylase Lipase Ratio were 870.3±754.23, 235.8±124.5, and 3.87±2.45. The sensitivity and specificity of amylase and lipase at three times the normal limit was 83.33% and 84.88%, respectively. Positive predictive value: 85.23%; negative predictive value: 82.95%. Accuracy: 84.09%.

Conclusion: In patients with abdominal discomfort consistent with acute pancreatitis, the ACG practice recommendations regard a lipase and/or amylase rise larger than three times the ULN as diagnostic. Lipase is somewhat more specific to acute pancreatitis than amylase. It increases sooner and remains higher than serum amylase in AP patients. Serum lipase outperformed serum amylase in diagnostic accuracy.

Keywords: Acute Pancreatitis, Amylase, Lipase, Amylase and Lipase Ratio.

Introduction

Acute pancreatitis is the most frequent cause of hospitalization for gastrointestinal disorders, as well as the most common overall ailment. This illness is characterized by significant inflammation of the pancreas. Acute pancreatitis may be minor and need conservative treatment, or severe and complex conditions with a high morbidity and fatality rate.[1] Pancreatitis is prevalent in India, with 2.6-3.2 incidences per 100,000. [2]

Patients with acute pancreatitis have frequent bouts of nausea, vomiting, and stomach discomfort, which reduces their quality of life. [3] As per the American Gastroenterological Association

recommendations. At least two of the following requirements apply: To diagnosis Acute Pancreatitis, stomach pain, biochemical evidence of pancreatitis (e.g., elevated amylase or lipase levels more than three times the upper limit of normal), and/or radiographic evidence on cross-sectional imaging are required. [4] According to the accepted definition of AP, elevated amylase and lipase levels are important diagnostic features. The laboratory tests can determine the etiology of pancreatitis, and the pancreatitis can be treated concurrently with the cause. [5] This research will look at the significance of biochemical markers in predicting acute pancreatitis.

Materials and Methods

The research was a hospital-based retrospective, observational study conducted at the department of Biochemistry and Surgery, SRM Medical college Kalahandi from May to November 2023. Patients with acute pancreatitis over the age of 18 who were hospitalized to the General Surgery Department at GGH Kurnool were included in the research. This research eliminated individuals with chronic kidney disease and liver illness, as well as data that was incomplete. Biochemical Markers Serum Amylase is calculated in the Erba semi-automated analyzer utilizing Enzo Pak (Recon Diagnostic Kit).

Blood amylase levels rose with acute pancreatitis. Sometimes the highest normal level might increase by 6-4 times. Amylase levels rise in conditions such pancreatic duct blockage, cancer, and biliary problems. There are several amylase isoenzymes. Blood and urine may include a variety of tissue types, regardless of acceptable quantities. Pancreatic tissue damage or duct obstruction may cause increased blood amylase levels. The usual amylase concentration range is 15-110. IU/L. [6] Serum Lipase is calculated in the Erba semi-automated analyzer utilizing EnzoPak (Recon Diagnostic Kit). In acute pancreatitis, lipase levels may rise to 10.5 times normal. Lipase levels may increase in conditions such as renal illness, salivary gland inflammation, intestinal blockage, or ulcer, but not at these detected levels. Lipase levels typically range from 10 to 80 IU/mL. [6]

RESULTS

Thirteen individuals showed normal serum lipase levels, whereas 75 had elevated blood amylase levels. 73 individuals exhibited elevated blood lipase levels, whereas 15 had normal serum lipase levels. 54 patients had an Amylase Lipase Ratio greater than 3, whereas 36 had a lower ratio. Graph 1 shows that the average age and SD of patients in this study was 38.5±2.2.5 years, with 31-40 years being the most common age group affected. The mean and standard deviation for Amylase, Lipase, and Amylase Lipase Ratio were 870.3±754.23, 235.8±124.5, and 3.87±2.45. The serum lipase:amylase ratio may therefore be used to predict both alcoholic and non-alcoholic pancreatitis. The sensitivity and specificity of amylase and lipase at three times the normal limit were 83.33% and 84.88%, respectively. Positive likelihood ratio: 5.51; negative likelihood ratio: 0.20. Positive predictive value: 85.23%; negative predictive value: 82.95%. Accuracy: 84.09%. Discussion The current research found that men accounted for 73.3% (n=66) of the total 90 patients, while females accounted for 26.7% (n=24). Patients in this research had a mean age and SD of 38.5±2.2.5 years, with 31-40 years being the most often afflicted age group. This is comparable to previous investigations. Annie E. Cook et al [7] Harish Kumar et al. [8] 13 individuals had normal serum lipase, but 75 had elevated serum amylase. 73 individuals exhibited elevated blood lipase levels, whereas 15 had normal serum lipase levels. The mean serum Lipase level is 235.8 IU/L. The mean serum amylase level is 870.3 IU/L. The serum lipase/amylase ratio, with a cutoff value of 3.0, may help distinguish between alcoholic and non-alcoholic AP. 54 patients had an Amylase Lipase Ratio greater than 3, whereas 36 had a lower ratio. This is comparable to previous investigations. Anitha Devanath et al. [9], and Harish Kumar et al [8] The serum lipase to amylase ratio may be used to predict both alcoholic and non-alcoholic pancreatitis. The current study shows that the sensitivity and specificity of amylase and lipase at three times the normal limit were 83.33% and 84.88%, respectively. Positive likelihood ratio: 5.51; negative likelihood ratio: 0.20. Positive predictive value: 85.23%; negative predictive value: 82.95%. Daignostic Accuracy: 84.09%.

**Table 1: Gender wise distribution of acute pancreatitis**

Gender	Number(n)	Percentage (%)
Male	**66**	**73.3%**
Female	**24**	**26.7%**

Table 1 shows that Among the Total 90 patients males constituted 73.3% (n=66)and Females 26.7%(n=24).

Table 2:

Biochemical Marker	Raised	Normal
Serum amylase	75	13
Serum Lipase	73	15
Serum Amylase Lipase Ratio	54 (>3)	36(<3)

Graph 1: Mean and SD of Age, Amylase, Lipase and Amylase Lipase Ratio
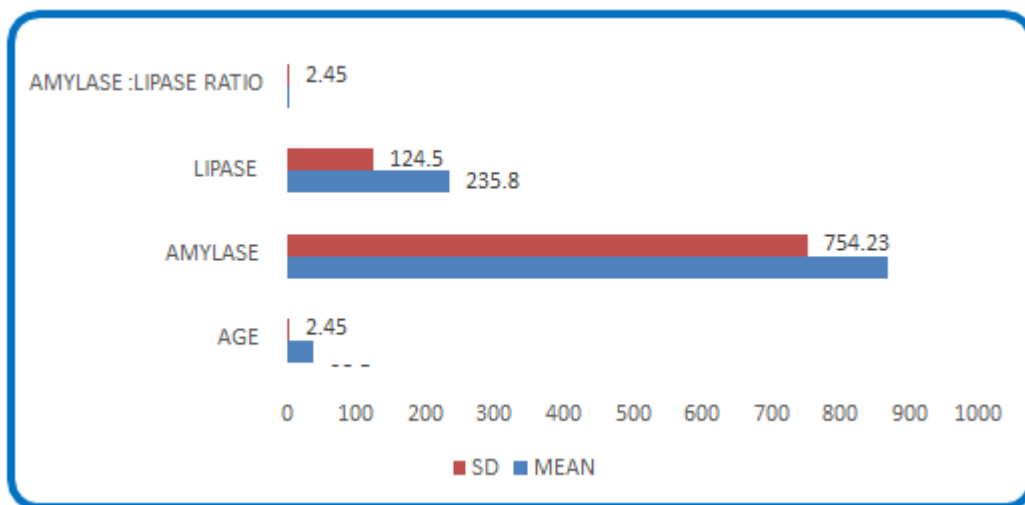
Table 3: Sensitivity, specificity, Positive predictive value, Negative predictive value and respective 95%confidence interval for amylase and Lipase for diagnosing acute pancreatitis

Statistic	Value	95% CI
Sensitivity	83.33%	74.00% to 90.36%
Specificity	84.88%	75.54% to 91.70%
Positive Likelihood Ratio	5.51	3.31 to 9.17
Negative Likelihood Ratio	0.20	0.12 to 0.31
Disease prevalence (*)	51.14%	43.50% to 58.73%
Positive Predictive Value (*)	85.23%	77.61% to 90.57%
Negative Predictive Value (*)	82.95%	75.25% to 88.62%
Accuracy (*)	84.09%	77.83% to 89.16%

Discussion

These findings imply that serum biochemical indicators might help predict acute pancreatitis. One research conducted by Apple et al. reported a sensitivity of 85-100% and a specificity of 84.9-99% in the diagnosis of acute pancreatitis. [10] Anne E. Cook et al. The study found that amylase and Lipase have sensitivity and specificity of 83.3% and 97.4%, respectively. The only two objective diagnostic criteria are increased blood lipase and/or amylase levels and imaging abnormalities typical of acute pancreatitis. Amylase is used in clinical settings prior to lipase. The first pancreatic disease laboratory test was conducted in 1919. Amylase levels typically increase 6 to 24 hours after AP, peak at 48 hours,

and settle within 5 to 7 days. It has a shorter half-life than lipase. As a result, even when pancreatic inflammation continues, amylase levels normalize. Amylase weights fifty thousand Daltons. Its low molecular weight permits it to pass past the glomerulus and into the urine. The kidneys remove it after a two-hour half-life. Previously, urinary amylase was a sensitive indicator of AP. Urine amylase was no more diagnostic than serum amylase and other serum tests. Serum amylase works faster and more accurately. Urinary amylase has limited specificity. As a result, urine amylase estimation is no longer employed in clinical settings. Amylase also increases with age. Infant amylase levels are low and gradually increase to adult levels by age 10. After 80 years, the top limit of normal climbs by 40 percent. [11] In the early 1930s, Cherry and Crandall described lipase for AP diagnosis [12]. Granules of serum lipase form inside pancreatic acinar cells. The apical poles of acinar cells release nearly 99% of the accumulated lipase into the pancreatic ductal system. Under normal conditions, less than 1% diffuses from acinar cells' basilar poles to lymphatics and capillaries, and ultimately into the circulation. Lipase levels rise 4-8 hours after acute pancreatitis, reach a peak at 24 hours, then gradually decline over 8-14 days. Lipase half-life in plasma is 6.7-13.7 hours. It has a longer half-life than amylase, hence its activity stays greater. The glomerulus filters and tubules absorb lipase. Amylase does not undergo tubular reabsorption; therefore, lipase may have a longer half-life. The renal tubules metabolize lipase. [13] In the event of pancreatic inflammation, these enzymes are eventually released into the bloodstream. Lipase is reabsorbed into the bloodstream whereas amylase is excreted via the urine. When a patient has acute pancreatitis, serum activity of both enzymes is considerably increased. Both lipase and amylase have great sensitivity and specificity with Diagnostic accuracy

Conclusion

The outcomes of this research may indicate that the biochemical markers amylase and lipase tests continue to play an essential role in the diagnosis, but they cannot definitively pinpoint the underlying aetiology of acute pancreatitis. The L/A ratio is a valid predictive factor that may distinguish between acute episodes of alcoholic pancreatitis and non-alcoholic pancreatitis patients. While ultrasonography and/or contrast-enhanced computed tomography are still thought to be the gold standard for identifying acute pancreatitis, clinical symptoms such as abdominal pain, serum amylase and/or lipase levels, and other diagnostic techniques are often employed.

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