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Role of Biochemical Markers in Acute Pancreatitis

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Abstract

Introduction:

Acute Pancreatitis is a medical disorder characterized by a sudden and intense inflammation of the pancreas. Patients presenting with severe acute upper abdomen discomfort should be considered for acute pancreatitis. However, to confirm the diagnosis, either biochemical or radiologic documentation is necessary.

Aims and Objectives:

The purpose of this study is to determine the role of biochemical marker in predicting acute pancreatitis.

Methods

The present research is a retrospective investigation carried out at the Department of General surgery, SCB MCH, Cuttack during the period of May 2023 to November 2023. Demographic information obtained from the medical records included age, sex, serum amylase levels, and lipase amylase lipase ratio.

Results:

Out of the total of 90 patients, 73.3% (n=66) were male and 26.7% (n=24) were female. Mean age and standard deviation of patients in this research group were

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38.5±2.2.5 years. The mean and standard deviation of Amylase, Lipase, and Amylase Lipase Ratio measured 870.3±754.23, 235.8±124.5, and 3.87±2.45, respectively. Amylase and Lipase exhibited sensitivity and specificity of 83.33% and 84.88% respectively, when tested three times over the normal range. The positive predictive statistic is 85.23% and the negative predictive statistic is 82.95%.Point accuracy: 84.09%.

Conclusion:

The ACG practice recommendations accept elevated levels of lipase and/or amylase over 3 times the upper limit of normal (ULN) as diagnostic for individuals experiencing stomach discomfort consistent with Acute Pancreatitis. Compared to amylase, lipase is somewhat more specific to Acute Pancreatitis. Elevates sooner and remains higher than serum amylase in individuals with acute pancreatitis. Diagnostic accuracy of serum lipase surpassed that of serum amylase.

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

Introduction

Among gastrointestinal diseases, acute pancreatitis is the leading cause of hospitalization and also the most widespread disorder overall. The presentation of this disease is marked by a profound inflammation of the pancreas.
Acute pancreatitis has a broad spectrum of severity, spanning from mild conditions requiring conservative therapy to severe and very complex diseases with a significant morbidity and fatality rate .The incidence rate of pancreatitis in India is between 2.6 and 3.2 occurrences per 100,000 individuals. [2] Patients with Acute Pancreatitis have recurrent bouts of nausea, vomiting, and stomach discomfort, which significantly impairs their quality of life. The third
In accordance with the rules of the American Gastroenterological Association Medical diagnosis of Acute Pancreatitis requires the presence of at least two of the following criteria: abdominal pain, biochemical indications of pancreatitis (such as elevated amylase or lipase levels more than three times the upper limit of normal), and/or radiographic evidence on cross-sectional imaging. A notable feature in the diagnosis of AP, as per the mainstream description of the disease, is the increase in amylase and lipase levels. The laboratory tests enable the determination of the etiology of pancreatitis, therefore facilitating the combination of pancreatitis treatment with drug therapy for the underlying cause. The objective of this work is to ascertain the significance of biochemical markers in the accurate prediction of acute pancreatitis.

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Methodology and Materials

A hospital-based retrospective observational research was conducted at the department of General Surgery at SCBMCH, Cuttack from May 2023 to November 2023. Exclusion criteria for this research included chronic kidney and liver disease patients, as well as incomplete data. Biochemical markers Serum amylase levels are measured utilizing the Erba semi-automated analyzer with the Enzo Platform (Recon Diagnostic Kit).

Acute pancreatitis is characterized by elevated blood amylase levels. Occasionally, the maximum acceptable amount might increase by a factor of 6-4. The levels of amylase rise in conditions such as pancreatic duct blockage, malignancy, and biliary infections. Distinct amylase isoenzymes are present. Irrespective of acceptable thresholds, blood and urine may include many tissue types.

An increase in serum amylase levels might result from damage to pancreatic tissue or obstruction of the ducts. It should be noted that the prevailing range of amylase concentration is 15-110 IU/L. (6) The measurement of serum lipase is conducted using the Erba semi-automated analyzer with the EnzoPak (Recon Diagnostic Kit).

Acute pancreatitis may cause lipase levels to increase to 10.5 times the usual range. Plasma lipase levels may increase in conditions such as renal illness, inflammation of the salivary glands, intestinal blockage, or ulcer, but not in the amounts measured. The typical range for lipase levels is 10-80 IU/mL. (6)

Statistical Analysis

Descriptive statistics were calculated for all demographic and Biochemical parameter of the patients. Mean±SD were calculated. Frequency tables were drawn for distribution of data. All the statistical data analysis was performed using software SPSS (version 21.0)

Results

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

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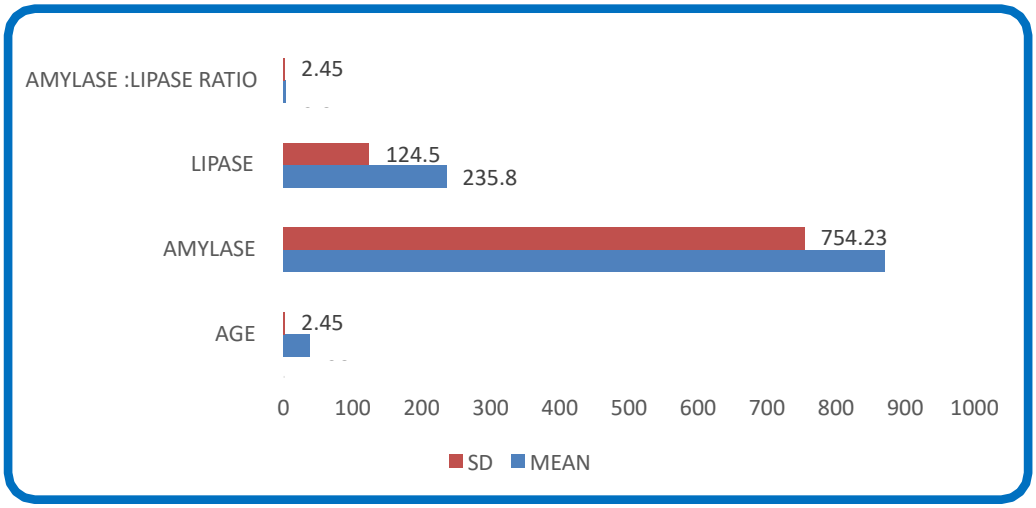
Serum Amylase Lipase Ratio	54 (>3)	36(<3)

13 patients had normal Serum Lipase, and 75 had increased serum amylase. 73 patients had increased serum Lipase and 15 had Normal serum Lipase levels. 54 had > 3 Amylase Lipase Ratio and 36 had <3 AmylaseLipase Ratio.



Graph 1: Mean and SD of Age, Amylase, Lipase and Amylase Lipase Ratio

Graph 1 depicts the mean age and SD of the patients in this study group was 38.5±2.2.5years and commonestage group affected was 31-40 yrs Mean and SD of Amylase, Lipase and Amylase Lipase Ratio was 870.3±754.23, 235.8±124.5 and 3.87±2.45. The serum lipase: amylase ratio can therefore be used as an useful index for predicting the alcoholic and Non-alcoholic pancreatitis.

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%

The sensitivity and specificity of amylase and Lipase at 3 fold above Normal limit were 83.33% and specificity 84.88%. Positive Liklihood ratio 5.51 and Negative Liklihood ratio 0.20. Positive predictive value 85.23% and Negative Predictive value 82.95%. Accuracy 84.09%.

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Discussion

The current investigation revealed that out of the total of 90 patients, 73.3% (n=66) were male and 26.7% (n=24) were female. The average age and standard deviation of the patients in this research group were 38.5±2.2.5 years, with the most often afflicted age demographic being 31-40 years. This is similar to previous investigations. Annie E. Cook and colleagues [7] Harish Kumar and colleagues [8] A total of 13 individuals had normal levels of serum Lipase, whereas 75 patients had elevated levels of serum amylase. A total of 73 individuals had elevated blood Lipase levels, whereas 15 patients had normal serum Lipase measures. The average serum lipase level is 235.8 IU/L. The measured average serum amylase level is 870.3 IU/L.

A set cut off value of 3.0 for the serum lipase/amylase ratio may help distinguish between alcoholic arteriosarcoma (AP) and non-alcoholic AP. 54 were found to have an Amylase Lipase Ratio more than 3, whereas 36 had a ratio less than 3. This is similar to previous investigations. Anaitha Devanath and colleagues [9] and Harish Kumar and colleagues [8]… The serum lipase:amylase ratio is a valuable indicator for distinguishing between alcoholic and non-alcoholic pancreatitis.

The present research demonstrates that the sensitivity and specificity of amylase and Lipase were 83.33% and 84.88% respectively, when the tests were performed three times over the normal range. With a positive likelihood ratio of 5.51 and a negative likelihood ratio of 0.20. Positive prediction accuracy is 85.23% while negative prediction accuracy is 82.95%. The daignostic accuracy is 84.09%. These findings indicate that serum biochemical indicators are accurate predictors of acute pancreatitis.

In one research conducted by Apple et al., the diagnostic accuracy for acute pancreatitis was determined to be between 85-100% sensitivity and 84.9-99% specificity. 10 An investigation conducted by Annie E. Cook et al. revealed that the sensitivity and specificity of amylase and Lipase were 83.3% and 97.4% respectively. The only objective criteria for diagnosis are increased levels of serum lipase and/or amylase and imaging features that are diagnostic of Acute

Pancreatitis. Priority of amylase above lipase in clinical practice. The first laboratory test for pancreatic disease was conducted in 1919. Typically, amylase levels increase 6 to 24 hours after acute pancreatitis (AP), reach their highest point at 48 hours, and then remain stable for 5 to 7 days. Hence, its half-life is less than that of lipase. Thus, amylase levels return to normal even in the presence of ongoing pancreatic inflammation.

The weight of amylase is 50,000 Daltons. By virtue of its low molecular weight,

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it may traverse the glomerulus and enter the urine. The renal system excretes it after a half-life of 2 hours. Previous sensitivity of urinary amylase for acute pancreatitis detection. In comparison to serum amylase and other serum tests, urine amylase did not provide superior diagnostic capabilities. Serum amylase is rapid and very precise of measurement. The selectivity of urinary amylase is minimal. Therefore, urine amylase estimation is no longer employed in clinical practice. Amylase levels also increase according to age. The amylase levels in infants are initially low and gradually increase to reach adult levels by the age of 10. After 80 years, the upper border of normal increases by 40%. [11]
Cherry and Crandall delineated lipase as a diagnostic tool for acute pancreatitis in the early 1930s. [12] Granules of serum lipase are strongly concentrated in pancreatic acinar cells. Almost 99% of the accumulated lipase is released into the pancreatic ductal system by the apical poles of the acinar cells. In typical conditions, less than 1% of the compound diffuses from the basilar pole of acinar cells to the lymphatics and capillaries, and subsequently to the circulation. Plasma lipase levels rise 4–8 hours after acute pancreatitis, reach their highest point at 24 hours, and then decline 8–14 days later. The half-life of lipase in plasma ranges from 6.7 to 13.7 hours. Due to its extended half-life greater than that of amylase, its activity stays greater. Pulmonary lipase is absorbed via the glomerulus filters and tubules. The absence of tubular reabsorption in amylase results in a potentially extended half-life of lipase. The renal tubules catalyze the metabolism of lipase. [13]
Should pancreatic inflammation occur, these enzymes are ultimately released into the circulatory system. During the renal excretion of amylase, lipase is reabsorption into the bloodstream. The serum activity of both enzymes is markedly increased in patients with acute pancreatitis.
Both lipase and amylase exhibit exceptional parameters of sensitivity, specificity, and diagnostic accuracy.

conclusion

The results of this research indicate that the Biochemical markers amylase and lipase tests remain significant in disease diagnosis, but they cannot definitively establish the root cause of acute pancreatitis. In the context of distinguishing between acute episodes of alcoholic pancreatitis and non-alcoholic pancreatitis patients, the L/A ratio is a dependable predictive statistic. Although ultrasonography and contrast-enhanced computed tomography are often regarded as the most reliable methods for identifying acute pancreatitis, the classic clinical symptoms of abdominal pain, serum amylase and/or lipase levels, and other diagnostic techniques are still frequently used.

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