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Analyzing the etiology of acute pancreatitis by measuring the serum lipase and amylase levels in children

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Abstract

Objective: The purpose of this research is to determine the significance of serum lipase: amylase ratio in predicating the cause of acute pancreatitis among children.

Study Design: A cross sectional study

Duration and place of study: department of pediatric Hayatabad medical complex from April 2023 to April 2024

Methods: Total 72 children with acute pancreatitis were included in this study. Detailed demographics of enrolled cases were recorded after taking informed written consent. In cases of acute biliary pancreatitis, acute gallstone pancreatitis, and idiopathic pancreatitis, the serum lipase/amylase ratio has been analyzed. In order to evaluate all of the data, SPSS 25.0 was utilized.

Results: There were majority 43 (59.7%) males and 29 (40.35) females in this study. Patients mean age was 11.10± 6.47 years. Abdominal pain was the most common symptom followed by nausea and vomiting. The results of the data analysis demonstrated that acute gallstone pancreatitis was associated with lower serum lipase levels than acute biliary pancreatitis ($p<0.002$). Serum amylase levels were significantly greater in patients with acute gallstone pancreatitis compared to those with acute biliary pancreatitis ($p<0.002$). Research on the lipase: amylase ratio revealed that 24 out of 33 individuals with acute biliary pancreatitis had a ratio of 3 or above. There was a statistically significant finding that 20 out of 25 individuals with acute gallstone pancreatitis had a lipase: amylase ratio less than 3.

Conclusion: For a definitive diagnosis of acute pancreatitis in children, it is recommended that serum lipase, and serum amylase be continued along with imaging. The measurements of serum amylase and non-diagnostic lipase were performed simultaneously, which assisted in the diagnosis of acute pancreatitis.

Keywords: Acute pancreatitis, children, amylase, lipase, Imaging

INTRODUCTION

Among the many gastrointestinal conditions that land Americans in the hospital, acute pancreatitis ranks high [1]. The death rate is high, with some studies reporting it as high as 21% [2,3]. India had the highest number of incident cases globally with 618,862 new cases [4]. The updated Atlanta criteria stated that in order to diagnose acute pancreatitis, one must have consistent upper abdominal pain, serum lipase or amylase activity three times higher than the permitted level of normal, and imaging tests like transabdominal ultrasonography, contrast-enhanced CT, or magnetic resonance imaging (MRI) that reveal characteristic features of the condition.

After gallstones, hypertriglyceridemia,biliary disorders is also a cause of acute pancreatitis [5]. To differentiate between various causes of acute pancreatitis, Gumaste et al. [6] suggested a new measure called the lipase/amylase (L/A) ratio in 1991. Multiple follow-up investigations have provided further evidence for these conclusions [7,8,9]. There was no meta-analysis that we could locate in the literature that evaluated the L/A ratio's diagnostic accuracy in distinguishing between various etiologies/causes of acute pancreatitis.Clinicians can better identify the etiology and recommend lifestyle changes if they know if an L/A ratio of three or higher accurately diagnoses alcoholic pancreatitis.

The diagnostic criteria for acute pancreatitis (AP) include imaging, serum lipase, and amylase. The question of whether or not to track both enzymes is contentious; some have even proposed eliminating amylase testing entirely because serum lipase is so much more sensitive and specific.The diagnostic utility of concurrently testing serum amylase and AP blood lipase in individuals with non-diagnostic results is uncertain.[10,11]

Within 2-12 hours of illness start, serum amylase activity in acute pancreatitis increases to a maximum in 12-72 hours, and levels return to normal by the third or fourth day.Some conditions, such as pancreatic tumors, abscesses, or traumatic lesions, might cause an increase in serum amylase activity. High amylase activity

can result from any damage to the salivary gland, including infections (such as mumps), trauma (such as surgery), tumors, calculus, or any other kind of injury. Kidney failure, ovarian and lung tumors, cholecystitis, a ruptured ectopic pregnancy, brain injury, and diabetic ketoacidosis are some potential causes of hyperamylasaemia. Following 4–8 hours of an attack, acute pancreatitis patients may notice an increase in lipase activity in their blood. This rise will peak at around 24 hours and return to normal by 8–14 days.[12] Since there are no alternate pathways for lipase to enter the bloodstream, measuring serum lipase is a very precise indicator of pancreatic dysfunction compared to amylase.[12] Blockage of the pancreatic duct by calculus or cancer of the pancreas is another cause of elevated serum lipase activity. For more precise diagnoses, some researchers suggested measuring serum lipase and amylase at the same time. [13] It has long been known that cases of acute pancreatitis with aberrant blood concentrations of biliary origin can be diagnosed by testing for aspartate or alanine transaminases. In gall stone acute pancreatitis, the serum lipase amylase (L/A) ratio was much greater than in the biliary variant of the illness.[14]
Those whose acute pancreatitis is biliary in origin require specific treatment tactics, whereas those whose pancreatitis is due to gall stones in origin just require surgery. Nevertheless, the clinical presentation remains same irrespective of the cause.Past studies have shown that biliary acute pancreatitis is characterized by a much greater blood lipase to amylase ratio than gall stone acute pancreatitis.[15] Consequently, the purpose of this research was to analyzing the etiology of acute pancreatitis by measuring the serum lipase and amylase levels in children.

MATERIALS AND METHODS

This cross sectional study was conducted at Hayat abad medical complex and comprised of 72 children with acute pancreatitis. All three diagnoses Acute pancreatits, recurrent pancreatitis, and chronic pancreatitis were confirmed by reviewing the medical records according to standard diagnostic procedures. Pancreatitis was determined when a patient met two out of the three requirements: stomach discomfort, elevated blood amylase or lipase levels more than or equal to three times the upper limit of normal (ULN), or imaging abnormalities that might indicate pancreatitis (enlarged pancreas, swelling, heterogeneous parenchyma, peripancreatic fluid collection). People who weren't able to be diagnosed were not included in the study.

The Statistical Package for the Social Sciences (SPSS 25; IBM Corp., New York, NY, USA) was used for data analysis. Amylase, lipase, and imaging subgroup categorical variables were tested using the chi-square test, which is represented as a percentage. A P-value of less than 0.05 with 95% confidence intervals was considered statistically significant.

RESULTS

There were majority 43 (59.7%) males and 29 (40.3%) females in this study. Patients mean age was 11.10± 6.47 years. Abdominal pain was the most common symptom followed by vomiting. Most common etiology was acute biliary pancreatitis, followed by acute gallstone pancreatitis, and idiopathic pancreatitis. Mean value of lipase was 197.5±127.3 IU/L and amylase value was 678.3±547.1 IU/L.(table 1)

Table-1: Demographics of the enrolled children

Variables	**Frequency (72)**	**Percentage**
Gender		
Male	43	59.7
Female	29	40.3
Mean age (years)	11.10± 6.47	
Symptoms		
Abdominal pain	44	61.1
Nausea ,Vomiting	28	38.9
Pancreatic etiology		
acute biliary pancreatitis	33	45.8
acute gallstone pancreatitis	25	34.7
idiopathic pancreatitis	14	19.4
Mean lipase (IU/L)	197.5±127.3	
Mean amylase (IU/L)	678.3±547.1	

The results of the data analysis demonstrated that acute gallstone pancreatitis was associated with lower serum lipase levels than acute biliary pancreatitis ($p<0.002$). Serum amylase levels were significantly greater in patients with acute gallstone pancreatitis compared to those with acute biliary pancreatitis ($p<0.002$).(table 2)

Table-2:Serum lipase and amylase mean values

Variables	**Lipase**	**Amylase**	**P value**
Acute Pancreatitis			
Mean biliary	2532.2±120.3	495.1±328.0	0.002
Mean gallstone	1234.17±135.1	754.1±35.2	0.002
Mean idiopathic	512.0 ± 217.2	278.5 ± 125.2	0.001

Research on the lipase: amylase ratio revealed that 24 out of 40 individuals with biliary pancreatitis had a ratio of 3 or above. There was a statistically significant finding that 20 out of 25 individuals with acute gallstone pancreatitis had a lipase: amylase ratio less than 3.(table 3)

Table-3: A breakdown of participants based on lipase:amylase ratio

lipase: amylase ratio	**Frequency/%age**
0-2.99	24(33%)
3-6	20(27.8%)
6-9	16(22.2%)
>9	12(16.7%)
Mean	4.5±3.2

DISCUSSION

Imaging and pancreatic enzymes were shown to play a role in determining the etiology of acute Pancreatitis in this cross sectional study that involved 72 children. Either pancreatic enzymes or imaging alone were employed. Furthermore, we sought to determine if a concurrent evaluation of serum amylase

may be beneficial for children whose serum lipase levels were below twice the upper limit of normal (ULN).

Our findings corroborate those of other research published in the pediatric literature that have shown lipase to be superior over amylase. It was discovered that serum amylase had a diagnostic accuracy ranging from 25% to 86% and lipase from 73% to 100%.[15,16]. Possible explanations for this large range of results include: the enzymes' comparison to the gold standard, the enzyme the threshold level, the duration between the start of symptoms and blood collection, the existence of hypertriglyceridemia, kidney failure, macro-amylasemia, and other medical conditions. [17] Some of these traits, on the other hand, seem to be less prevalent in children.

According to our findings, gallstone pancreatitis is more frequent in girls than biliary pancreatitis in males. In contrast to biliary pancreatitis, which is more frequent in men, biliary pancreatitis was more common in females, according to many research.[18,19] This situation might be explained, in part, by the fact that bile duct blockage is more commonly reported in males than females in the Indian population. Furthermore, biliary pancreatitis and other causes of pancreatitis have been associated with a far higher number of cases of acute pancreatitis in women than biliary-related pancreatitis.

The data analysis discovered that acute gallstone pancreatitis was associated with lower blood lipase levels than acute biliary pancreatitis ($p<0.002$). The levels of blood amylase were significantly greater in study population diagnosed with acute gallstone pancreatitis compared to those diagnosed with acute biliary pancreatitis ($p<0.002$). Research on the lipase to amylase ratio found that 24 out of 40 patients with acute biliary pancreatitis had a ratio of 3 or above. Twenty of the twenty-five patients diagnosed with acute gallstone pancreatitis had a lipase:amylase ratio below three. There was a statistically significant finding here. Acute biliary pancreatitis was shown to have greater mean serum lipase levels compared to acute gallstone pancreatitis, according to research by Pacheco et al. [20,21,22]. However, biliary acute pancreatitis was shown to have a substantially higher median amylase than biliary acute pancreatitis, according to studies conducted by King et al. [23] and Chang et al. [24].

CONCLUSION

For a definitive diagnosis of acute pancreatitis in children, it is recommended that imaging, serum lipase, and serum amylase be continued. The measurements of

serum amylase and non-diagnostic lipase were performed simultaneously, which assisted in the diagnosis of acute pancreatitis.

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