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# Serum Lipase Alone in Diagnosing Acute Pancreatitis

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***Abstract:***
***Background:*** *Acute pancreatitis is a very common surgical cause of acute abdomen with many associated morbidities and mortality. Therefore it is imperative to diagnose the condition at an early stage and accurately. Serum amylase or lipase levels when elevated to more than 3 times the upper limit of normal can accurately diagnose acute pancreatitis in most of the cases. Serum lipase has a better sensitivity and specificity than serum amylase, still serum amylase is the most frequent biochemical test performed worldwide for diagnosis of acute pancreatitis. The levels of these enzymes have no correlation with the severity of the disease.*
***Aim of study:*** *The aim of this study was to evaluate whether serum lipase alone can help in the diagnosis acute pancreatitis and additionally to perform cost analysis of the two tests.*
***Material & methods:*** *This was a prospective cohort study conducted in a tertiary care setting over a period of 4 years. All patients admitted with suspected acute pancreatitis to surgical & medical wards of the hospital from January 2013 to December 2016 were included in the study. Data collated included aetiology, demographics and laboratory results for all the patients.*
***Results:*** *Serum lipase alone is a good marker for diagnosing or ruling out acute pancreatitis as it had the maximum sensitivity and negative predictive value.*
***Keywords:*** *Acute pancreatitis; lipase; amylase; combined lipase and amylase.*

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## I. Introduction

The diagnosis of acute pancreatitis involves finding of 2 of the following 3 features: (1) acute upper abdominal pain radiating through to the back; (2) serum amylase or lipase more than 3 times the upper limit of normal; and (3) imaging consistent with the diagnosis of acute pancreatitis.[1] However normoamylasemia is not an unheard entity during an attack of pancreatitis and at least 19% of all patients show this finding due to (1) alcoholic etiology (2) repeated attacks of alcoholic pancreatitis and (3) longer gap between onset of symptoms and admission.[2] Similarly it may be elevated in a number of non-pancreatic conditions[3.] Serum lipase has a better sensitivity and specificity than serum amylase, but in practice serum amylase is still the most frequent biochemical test performed worldwide for diagnosis of acute pancreatitis.[4] The levels of these enzymes have no correlation with the severity of the disease.[5]

## II. Materials and methods:

This study focuses on examining the practice of performing serum amylase analysis in the light of cost analysis in a tertiary care setting. The aims of the study were to assess the clinical usefulness and diagnostic accuracy of serum amylase and lipase in the diagnosis of pancreatitis in the current patient population and to perform a cost analysis of these tests of patients admitted with acute pancreatitis. This was a prospective cohort study conducted in a tertiary care setting over a period of 4 years. All patients admitted with pancreatitis (2 of the 3 criteria of pain, at least one raised biochemical marker and imaging) to surgical & medical wards from January 2013 to December 2016 were included in the study. Data collated included aetiology, demographics and laboratory results. The cost for enzyme assay for lipase and amylase varies between laboratories and the method used.

## III. Results

A total of 820 patients who presented with acute abdomen were included in the study, out of which 610 were diagnosed with acute pancreatitis. In those with acute pancreatitis gallstone disease was found to be the most common etiology (Figure 1). Combined serum amylase and lipase were raised in most of the patients with acute abdomen (Figure 2 & 3). For the diagnosis of acute pancreatitis serum lipase had the maximum sensitivity (96.77%) and negative predictive value (81.82%). Estimation of combined levels of serum amylase and lipase had the maximum specificity (61.90 %) and positive predictive value (85.74%). On serial estimation, serum lipase was found to be significantly raised even on the fifth day after the acute attack of pancreatitis. Whereas, the serum amylase level was found to be significantly raised in the initial 48 hours after the acute attack of

pancreatitis but the serum level dropped drastically after the 3rd day and from 5th day onwards most of the patients were found to have normal serum amylase levels (Table 3).

**Table1:** Showing enzyme levels in patients with acute pancreatitis due to various etiologies.

| **Acute pancreatitis (n=610)** | **Raised lipase & amylase** | **Raised lipase & normal amylase** | **Normal lipase & amylase** |
|---|---|---|---|
| Gallstone (265) | 223 | 32 | 10 |
| Alcohol (115) | 89 | 26 | 0 |
| Idiopathic &worms (190) | 144 | 36 | 10 |
| Drug induced (25) | 25 | 0 | 0 |
| Tumours (10) | 0 | 10 | 0 |
| Trauma (5) | 0 | 5 | 0 |

**Figure 1:** Pie chart showing etiologies of acute pancreatitis.

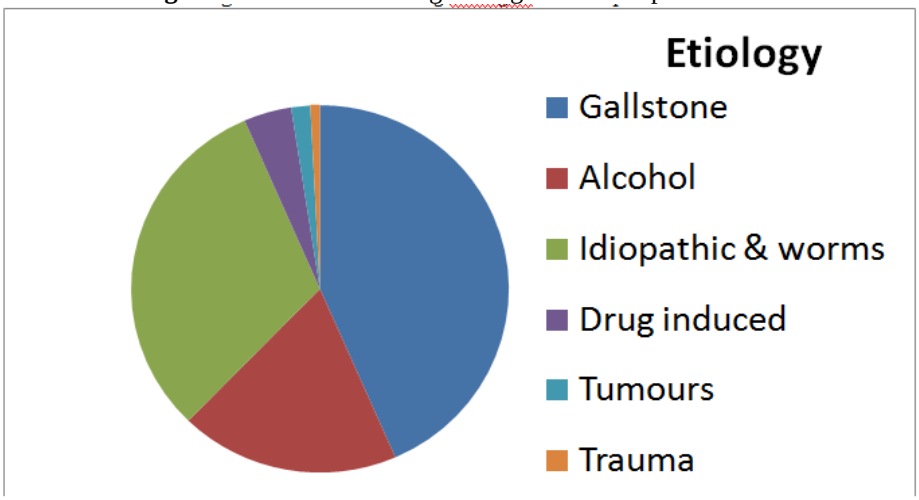



**Figure 2**: Bar diagram showing enzyme levels in acute pancreatitis.

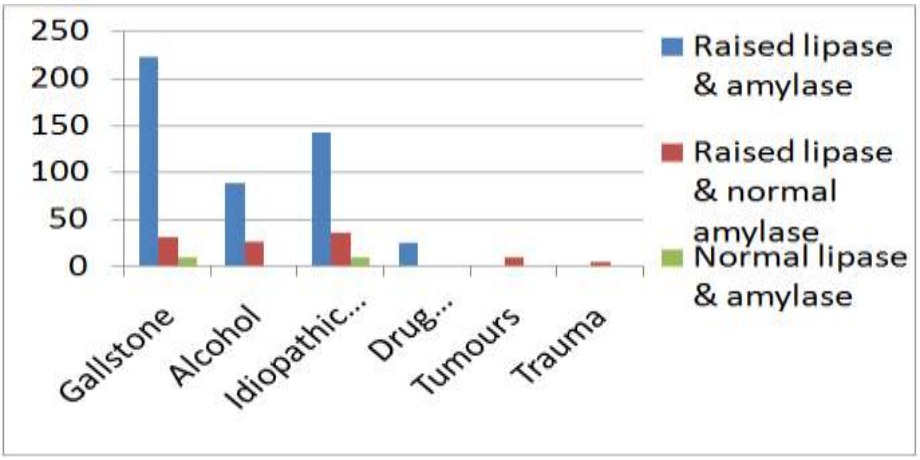



Table 2: Enzyme levels in non-pancreatitic pathologies of acute abdomen.

| **Pathology other than pancreatitis (n=210)** | **Raised lipase & amylase** | **Raised lipase with normal amylase** | **Raised amylase with normal lipase** |
|---|---|---|---|
| Ruptured ectopic pregnancy | 45 | 20 | 30 |
| Perforated duodenal ulcer | 30 | 15 | 25 |
| Acute cholecystitis | 0 | 0 | 15 |
| Acute intestinal obstruction | 5 | 5 | 20 |

**Figure 3:** Bar diagram showing enzyme levels in non-pancreatitic pathologies of acute abdomen.

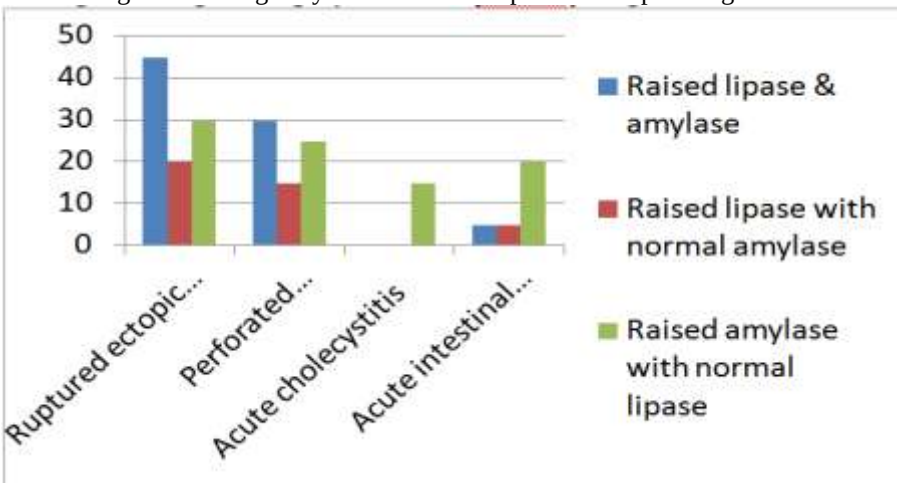
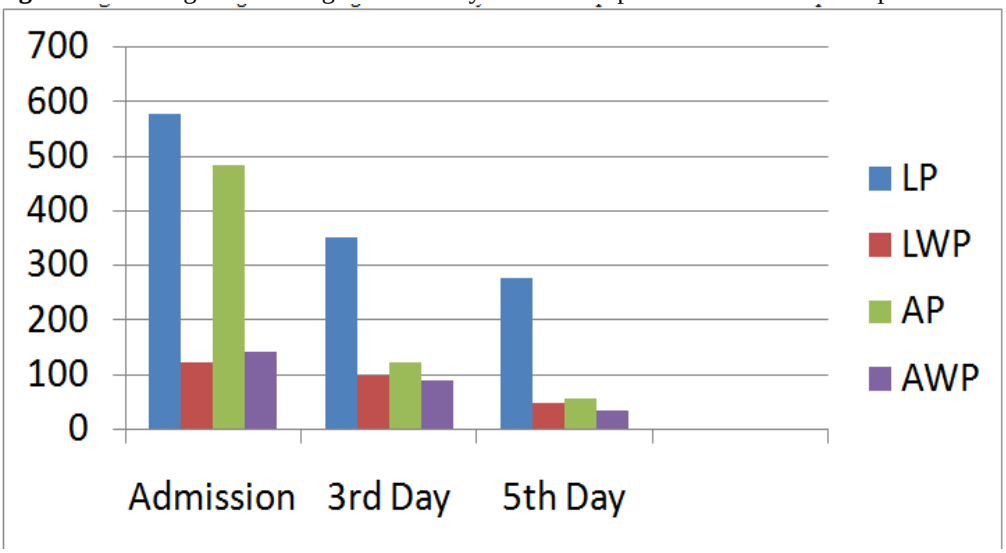



**Table 3:** Trend of enzyme levels in patients with or without pancreatitis

| Enzyme | Pathology | On admission | On 3rd day | On 5th day |
|---|---|---|---|---|
| Lipase | With pancreatitis | 578± 108.90 | 351± 66.72 | 278± 76.30 |
| | Without pancreatitis | 123± 45.62 | 97± 31.24 | 48± 23.15 |
| Amylase | With pancreatitis | 484± 67.36 | 123± 27.90 | 56± 17.62 |
| | Without pancreatitis | 141± 81.22 | 89± 21.40 | 34± 18.60 |

**Figure 4:** Bar diagram showing trend of enzyme levels in patients with or without pancreatitis.



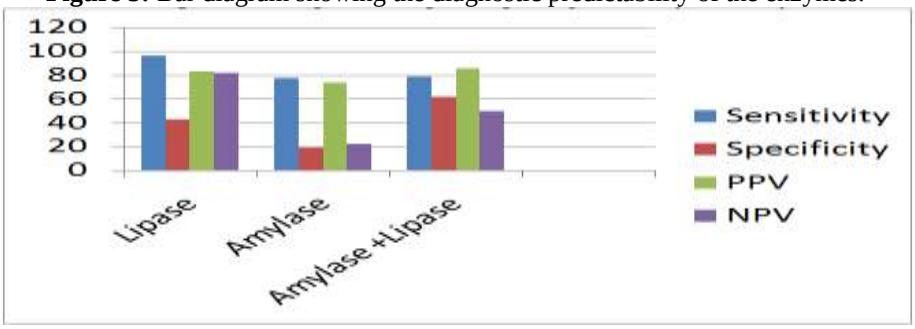

LP – Lipase level in acute pancreatitis
LWP – Lipase level without pancreatitis
AP – Amylase level in acute pancreatitis
AWP – Amylase level without pancreatitis

**Table 4:** Showing the diagnostic predictability of the enzymes

| Enzyme | Sensitivity (95% C I) | Specificity (95% C I) | PPV* (95% C I) | NPV# (95% C I) |
|---|---|---|---|---|
| Lipase | 96.77% (95.06% to 98.02%) | 42.86 % (36.07% to 49.85%) | 83.33% (81.63% to 84.91%) | 81.82 % (73.99% to 87.68%) |
| Amylase | 77.58% (74.09% to 80.81%) | 19.05 % (13.97% to 25.02%) | 73.89% (72.35% to 75.36%) | 22.35% (17.36% to 28.28%) |
| Amylase + lipase | 78.85% (75.39% to 82.03%) | 61.90 % (54.97% to 68.50%) | 85.74% (83.43% to 87.77%) | 50.19 % (45.55% to 54.84%) |

*Positive predictive value
#Negative predictive value

**Figure 5:** Bar diagram showing the diagnostic predictability of the enzymes.




## IV. Discussion

As per the revised Atlanta classification scheme of 2012, acute pancreatitis is diagnosed in presence of two of the following three features: (1) abdominal pain suggestive of acute pancreatitis (2) serum lipase or amylase at least three times greater than the upper limit of normal values; and (3) characteristic findings on contrast-enhanced computed tomography (CECT) and sometimes magnetic resonance imaging (MRI) or transabdominal ultrasonography.[1] Serum amylase level became the most frequently performed test for biochemical diagnosis of acute pancreatitis worldwide, partly due to the ease of availability and rapidity of performing the analysis, however it is associated with poor sensitivity and specificity.[4] The plasma half life of amylase and lipase differs due to the differences in renal excretion of the two enzymes. In acute pancreatitis, serum amylase rises within 5–8 h of onset and normalizes by the third or fourth day. A 4-6 times elevation above the upper limit of normal is common and maximal concentration is attained in 12–72 h. whereas serum lipase activity increases within 4–8 h, peaks after 24 h, and declines within 8–14 days[5]. Similar observations were made in this study. This explains why in patients with delayed presentation and normal renal functions, normoamylasemia is common. Hence, lipase is a better serum marker in such cases. With increasing availability of serum lipase analysis, which has overcome the disadvantages of the previous techniques; the diagnosis is quick, reliable, and inexpensive[4], but combined estimation serum amylase and lipase is found to have the maximum specificity (61.90 %) and positive predictive value (85.74%).

Considering that serum levels of lipase and amylase are usually repeated between intervals during the course of management of acute pancreatitis, testing for serum lipase alone would translate into a cost benefit practice reasonably without affecting treatment decisions/outcome.

## V. Conclusions

It can be inferred that serum lipase alone is very sensitive as an initial serum marker for patients with acute pancreatitis and also for those patients who present late as the serum level of lipase remains elevated for a relatively longer duration as compared to level of serum amylase. Serum lipase also has been found to have good negative predictive value; hence, may be used as a serum marker to diagnose or to rule out acute pancreatitis in patients presenting with acute abdomen.

It is noteworthy that using serum lipase without serum amylase can reduce both cost as well as number of blood investigations.

**Conflicts Of Interest:** None to declare.

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