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Biochemical Variations in Acute Pancreatitis

Usha S Adiga[1], Vickneshwaran V[2], and Sanat Kumar Sen[3]

[1]Assistant Professor, Dept of Biochemistry, IGMCRI, Pondicherry
[2]JRF, Dept of Biochemistry, JIPMER, Pondicherry
[3]Professor & Head, Dept of Biochemistry, Pondicherry Institute of Medical Sciences, Pondicherry.

ABSTRACT

Acute pancreatitis is a pancreatic inflammatory disease. The pathologic spectrum of acute pancreatitis varies from interstitial pancreatitis, which is usually a mild and self-limited disorder, to necrotizing pancreatitis, in which the degree of pancreatic necrosis correlates with the severity of the attack.Pancreatitis results when proteolytic enzymes are activated in the pancreas rather than in the intestinal lumen. Endotoxins, exotoxins, viral infections, ischemia, anoxia, and direct trauma are believed to activate these proenzymes. Activated proteolytic enzymes, digest pancreatic and peripancreatic tissues and bring about a severe damage. Elevated levels of serum amylase and lipase establish the diagnosis of acute pancreatitis.Aim of the study was to, i.determine the ratio of serum lipase to serum amylase(L/A) in alcoholic and nonalcoholic pancreatitis patients as compared to age and sex matched normal healthy persons and also to find out whether this index will be useful in differentiating pancreatitis of alcoholic etiology from that of nonalcoholic. Serum amylase and lipase levels were estimated in fifty acute pancreatitis patients (in which 50% were alcoholic and 50% were nonalcoholic) and fifty age and sex matched normal controls. Assay was done automated clinical chemistry analyzer.Lipase/Amylase was calculated. Both the enzymes were elevated in all acute pancreatitis patients, but the rise in amylase was double in nonalcoholic pancreatitis as compared to alcoholics. The extent of elevation of lipase was the same in both the groups of pancreatitis patients. L/A ratio was more than 4 in alcoholics and more than 2 in nonalcoholic pancreatitis patients. L/A ratio might help to differentiate the alcoholic and nonalcoholic pancreatitis, and thus it might have a significant role in establishing the etiology of the disease.Further studies need to be done in larger population of pancreatitis patients.

Corresponding author

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INTRODUCTION

There are many causes of acute pancreatitis, but the mechanisms by which these conditions trigger pancreatic inflammation have not been identified. Gallstones continue to be the leading cause of acute pancreatitis in most series (30–60%). Alcohol is the second most common cause, responsible for 15–30% of cases [1].

Pancreatitis evolves in three phases. The initial phase is characterized by intrapancreatic digestive enzyme activation and acinar cell injury. It is currently believed that acinar cell injury is the consequence of zymogen activation. The second phase of pancreatitis involves the activation, chemo attraction, and sequestration of neutrophils in the pancreas, resulting in an intrapancreatic inflammatory reaction of variable severity. The third phase of pancreatitis is due to the effects of activated proteolytic enzymes and cytokines, released by the inflamed pancreas, on distant organs. Activated proteolytic enzymes, especially trypsin, not only digest pancreatic and peripancreatic tissues but also activate other enzymes such as elastase and phospholipase. The active enzymes then digest cellular membranes and cause proteolysis, edema, interstitial hemorrhage, vascular damage, coagulation necrosis, fat necrosis, and parenchymal cell necrosis.

The diagnosis of acute pancreatitis is by the detection of an increased level of serum amylase.In acute pancreatitis, a transient increase in serum amylase activity occurs within 2-12 hrs of onset.Levels return to normal by day 3 or 4.The magnitude of elevation of serum amylase activity is not related to the severity of pancreatic involvement, however the greater the rise,greater is the probability of acute pancreatitis.

Serum lipase activity increases in parallel with amylase activity.It increases within 4-8 hours of attack,peaks at 24 hours and decreases by 8-14 days.The lipase remains elevated longer than amylase,the extent of rise may also be greater. Measurement of both enzymes is important as serum amylase tends to be higher in gallstone pancreatitis and serum lipase higher in alcohol-associated pancreatitis.A threefold elevated serum lipase value is usually diagnostic of acute pancreatitis .After 48–72 h, even with continuing evidence of pancreatitis, total serum amylase values tend to return to normal. However, pancreatic isoamylase and lipase levels may remain elevated for 7–14 days [2].

Aim of this prospective study was to, i. determinate ratio of serum lipase to serum amylase(L/A) in alcoholic pancreatitis and in nonalcoholic pancreatitis patients as compared to age and sex matched normal healthy persons ii. Find out whether L/A ratio can be useful in differentiating alcoholic from nonalcoholic pancreatitis.

METHODOLOGY

The study was conducted in Pondicherry Institute of Medical Sciences in 2011.The project was approved by the institutional ethics committee.

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Fifty patients suffering with acute pancreatitis were enrolled in the study at admission; of which 25 were alcoholic pancreatitis patients.Their alcohol consumption was more than 80 grams per day. Twenty five were pancreatitis patients of other etiologies like biliary cause, complicated with diabetes mellitus,hypercholesterolemia,trauma,postoperative complications etc.Study included patients with a mean age of 35 years, ranging from 20 to 50 years. Fifty age and sex matched normal healthy persons, free from systemic illnesses were taken as controls.Informed consent was obtained from all the subjects.Male predominance was seen inalcoholic pancreatitis patients.

Inclusion criteria:

Acute pancreatitis patients including alcoholic as well as nonalcoholic etiologies

Exclusion criteria

All patients with other possible abdominal conditions, chronic pancreatitis such as pancreatic calcifications, pancreatic duct dilatation, and malabsorption syndrome etc.

The diagnosis of acute pancreatitis is based on the evidence of two or more combination of the following presentations: at least three folds increase in serum amylase and/or lipase levels, in addition to history of upperabdominal pain and further confirmed by ultrasonography and computed tomography. The history of alcohol intake, the quantity of consumption and duration of alcoholism was noted.TheirLipase/Amylase ratio was calculated.

Two ml of blood sample was collected from each patient for amylase and lipase estimation.The enzymes were estimated in COBAS INTEGRA,Roche company auto analyzer using reagent kits.

Lipase was estimated with the spectrophotometric method and amylase was estimated by enzymatic kinetic method using 2-chloro-4-nitrophenyl –alpha maltotrioside as substrate [3-5]. Statistical analysis was done by Student's 't' test using SPSS version 16.The level of significance was measured at $p<0.05$.

RESULTS

Normal range of serum amylase is fixed as 50-120 IU/L and that of lipase is 50-175IU/L in our Clinical Biochemistry laboratory. Our results are depicted in table 1.

Table 1: Biochemical variations in Acute Pancreatitis

	Alcoholic Pancreatitis	Nonalcoholic Pancreatitis	Normal healthy controls	
Amylase(IU/L)	550.7± 72.6	1124.3± 64.8*	77.3±10.8	P<0.001
Lipase(IU/L)	2421.6± 54.1	2727.4± 81.4*	143.2±20.6	P<0.05
Lipase/Amylase	4.4±0.54*	2.4±0.09	1.84±0.04	P<0.01

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DISCUSSION

Alcohol is the most common cause of acute pancreatitis [6-10].Pancreatitis is a potentially fatal inflammation of the pancreas often associated with long-term alcohol consumption. Symptoms may result from blockage of small pancreatic ducts as well as from destruction of pancreatic tissue by digestive enzymes. In addition, by-products of alcohol metabolism within the pancreas may damage cell membranes [11].

Our study shows that both amylase and lipase are elevated in alcoholics as well as in pancreatitis of miscellaneous causes and etiologies. The elevation of amylase is highly significant ($P<0.001$) in alcoholics (550.7± 72.6 IU/L) compared to that due to the other causes (1124.3± 64.8 IU/L),but the extent of elevation is only half of that of nonalcoholic pancreatitis (7 fold Vs 14 fold). Serum lipase elevation in pancreatitis of other causes is significant ($P<0.001$),2727.4± 81.4 IU/L as compared to that in alcoholics, 2421.6± 54.1IU/L ,but the extent of elevation is not high.

In controls, L/A is less than 2,whereas in complicated pancreatitis it is more than 2 and in alcoholics it is more than 4 ($p<0.01$).

Increased amylase in the blood has been the “gold-standard” diagnostic test for acute pancreatitis for more than 50 years. However, a few studies indicate that up to one-third of patients with alcoholic pancreatitis may fail to show any significant rise in amylase levels. In such circumstances, measurement of blood levels of lipase can be helpful, because serum lipase levels remain elevated for a longer period than do amylase levels.

It was reported that patientswith acute alcoholic pancreatitis had serumconcentrations of amylase lower than those with nonalcoholicpancreatitis, but the serum lipase concentrationswere similar in the both forms of the disease [12].This study favours our report. The serum lipase/amylase (L/A) ratio was significantlyhigher in alcoholic acute pancreatitis than inthe nonalcoholic form of the disease. On the basis ofthese findings Gumaste et al [13] proposed that this index(L/A ratio >2) could differentiate acute episodesof alcoholic from the nonalcoholic acute pancreatitis.

Previous studies showed that the increase inserum concentration of amylase in patients with alcoholic acute pancreatitis was significantly lowerthan of patients with biliary pancreatitis [12-14], but that serum lipase concentrations were not significantlydifferent [12,14].

In some studies, the serum amylase and lipase concentrations were not able to establish either etiology or to predict the severity of acute pancreatitis. According to Kuo-Chin Changet al, the L/A ratio is not a good predictive factor in distinguishing acute episode of alcoholic and non-alcoholic acute pancreatitis but the L/A ratio > 2 has 89.5 % of negative predictive rate for alcoholic panceatitis [15].

Our results indicate that the L/A ratio is usefulto distinguish alcoholic from nonalcoholic acute pancreatitis. But the limitation of our study is the small sample size because of which we could not standardize the reports; further studies need to be conducted on a larger population of pancreatitis patients to establish this fact.

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