ORIGINAL RESEARCH PAPER

Biochemistry

A STUDY OF SERUM AMYLASE IN PATIENTS WITH CHRONIC KIDNEY DISEASE

KEY WORDS: Serum Amylase, Chronic Kidney Disease (ckd)

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ABSTRACT

Chronic kidney disease results from progressive decline in renal function. Amylase is one of enzyme that is rapidly excreted by kidney, thus patients in chronic kidney disease have elevated serum amylase.

AIMS: The aim of the study was to measure the level of serum amylase in patients with chronic kidney disease and in healthy controls and to find out if there is any correlation between serum amylase levels and urea and creatinine levels.

MATERIAL AND METHOD : 50 patients with end stage renal disease and 50 non dialysed chronic kidney diseases attending Nephrology department, Gauhati Medical College and Hospital, during October 2015-September 2016 were included in this study. Quantitative analysis of urea, creatinine, amylase were done by photometric method.

RESULTS : Present study showed that serum amylase levels were significantly higher in end stage renal disease and chronic kidney disease patients as compared to healthy controls (p value <0.05).

CONCLUSION : Using Serum amylase as a diagnostic tool in recognising acute pancreatitis in chronic kidney patients can lead to false positive results.

INTRODUCTION

Chronic kidney disease (CKD) is characterized by progressive loss of renal function. The NKF-K/DOQI (National Kidney Foundation) guidelines stratify CKD from stage 1 at the milder end of the spectrum to stage 5 with kidney failure or GFR <15ml/min/1.73m^2.[1]

ESRD (End Stage Renal Disease) represents a clinical state or condition in which there has been an irreversible loss of endogenous renal function of a degree sufficient to render the patient permanently dependent upon renal replacement therapy (dialysis or transplantation) in order to avoid life-threatening uraemia.[2,3]

Enzyme Amylase is produced by exocrine pancreas and salivary gland that hydrolyses starch. It normally occurs in human plasma with molecular weights varying from 54,000 to 62,000 Da. The enzyme is thus small enough to pass through the glomeruli of the kidneys, and amylase is the only plasma enzyme normally found in urine.[4] Elevated levels of serum Amylase is one of diagnostic indicators of Acute Pancreatitis. But amylase is elevated in many non-pancreatic conditions also. Renal insufficiency is one of the common causes for such non-specific elevation. Serum amylase is elevated in patients with end stage renal disease in absence of pancreatitis.[4-7] The exact mechanism of the increased levels is unclear. It is known that 24% of circulating amylase is excreted in urine.[8] Hence the increase in serum amylase levels may reflect a decreased clearance by the kidneys and is not due to pancreatic disorders.[9]

The present study was undertaken to study the elevated amylase levels in renal insufficiency and to identify if any relationship is there between magnitude of renal insufficiency and the increase in levels.

AIMS AND OBJECTIVES

1. To measure the level of serum amylase in patients with chronic kidney disease and in healthy controls.
2. To find out if there is any correlation between serum amylase levels and urea and creatinine levels.

MATERIALS AND METHODS:

The study was carried out in Department of Biochemistry and Nephrology department, Gauhati Medical College and Hospital. All the studies and investigations were carried out after obtaining informed consent and after approval by the Institutional Ethics Committee. Patients of either sex, above 18 years of age, clinically diagnosed as having Chronic Kidney disease due to diverse etiologies were included. Blood samples were collected after overnight fasting and were analysed for blood glucose, serum urea, creatinine and amylase. Demographic data were determined by existing standards, medical records and proper history taking.

Patients with the following were excluded –

1. Pancreatic disorders
2. Diabetes Mellitus
3. Hepatobiliary Disorders
4. Peritonitis
5. Smoking or alcohol consumption history

The subjects were divided into 3 groups. Group I included 50 normal healthy individuals. Group II and Group III included age and sex matched 50 non dialysed chronic kidney disease patients and 50 patients with ESRD respectively. Serum creatinine levels were estimated using modified Jaffes method. The normal range is 0.7-1.4 mg/Dl. Blood urea was estimated using Urease –GLDH (Glutamate Dehydrogenase) method. Normal range at our laboratory is 15-40 mg/dL. Plasma Glucose was estimated based on Trinder's GOD/POD method. Normal range of Plasma Glucose (Fasting): 70 - 110 mg/dl. These parameters were analysed using fully automated analyser. Serum amylase was measured using MERCK microlab 300 Semiautoanalyser by CNPG (2-chloro-4-nitrophenol -1-4 galactopyranosylmaltotrioside) method. Reference values = upto 90 U/L at 37°C.

One way Analysis of variance (ANOVA) test were used to analyze differences in baseline characteristics between the studied groups. GraphPad InStat version 3.00 was used for statistical analysis. Results were considered significant when the probability (p value) was <0.05.

RESULT:

SEX DISTRIBUTION

Out of total number of subjects in the case and control group, 32 (60%) were males and 18 (40%) were females.

Table 1: Age Distribution In Studied Groups

Category	Age distribution in years	Frequency	Relative frequency
Group I	21-30	5	0.1
	31-40	10	0.2
	41-50	20	0.4
	51-60	10	0.2
	61 and above	5	0.1
GROUP II	21-30	3	0.06
	31-40	5	0.1

	41-50	18	0.36
	51-60	20	0.4
	61 and above	4	0.08
Group III	21-30	0	0
	31-40	3	0.06
	41-50	15	0.3
	51-60	22	0.44
	61 and above	10	0.2

TABLE 2: Serum Amylase, Blood Urea and Creatinine levels in studied groups

PARAMETERS	GROUP I (mean±SD)	GROUP II (mean±SD)	GROUP III (mean±SD)	p value
SERUM AMYLASE (U/l)	36.8±12.5	92.5±27.3	86.2±21.4	<0.05 *
UREA (mg/dl)	31.86±8.31	56.28±13.57	144.3±56.7	<0.0001 **
CREATININE (mg/dl)	0.81±0.21	2.77±1.00	10.7±4.9	<0.0001 **

*significant(<0.05), **extremely significant(<0.0001)

The present study demonstrated that serum amylase levels were elevated in patients with end stage renal disease and chronic kidney disease when compared with healthy controls and this increase was statistically significant (p<0.05).Chronic kidney patients had higher amylase levels (mean 92.5±27.3SD) than end stage renal disease (mean 86.2±21.4 SD). Serum amylase levels were above the upper limit in 57% of patient and more than twice of upper limit in 12 percent of patients.

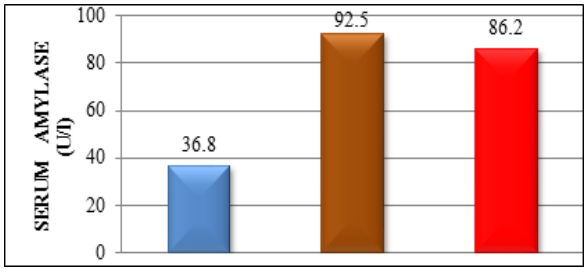

Figure 1: Comparison of means of serum amylase in studied groups

Pearson's correlation of Amylase with urea and creatinine was estimated . Urea and creatinine showed significant positive correlation with Amylase in non dialyzed CKD patients

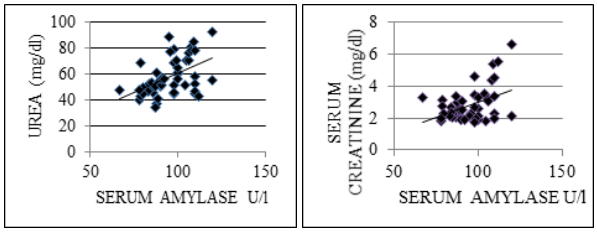

Figure 2: Correlation between serum amylase and urea and creatinine in non dialysed CKD cases

DISCUSSION

The present study demonstrated that serum amylase levels were significantly elevated in patients with ESRD and CKD. Elevations in serum amylase are most likely due to impaired renal clearance. Non Dialysed CKD patients had higher amylase levels (62 %) than ESRD patients. This could be due to clearance of amylase during dialysis and associated malnutrition in ESRD. Similar to our study Berk et al [10] indicated that elevated amylase was found in 50% of their uremic patients, always less than three times the upper limit of normal. Royse et al [11] reported hyperamylasemia in 81% of their patients. Zachee et al [12] showed elevated amylase in 48 % cases.

However Gross et al [13] showed in 63 azotemic patients no significant increase in amylase.

Bailey et al [8] reported that 32% of their 175 uremic patients had hyperamylasemia. Lin et al [14] reported significant elevation of levels of amylase. Ventrucci et al [15] observed hyperamylasemia in 58% of patients. Jian et al [16] in their study on patients with end stage renal disease found high levels of serum amylase in 60.7%. Zachee et al [12] and Lin et al [14] suggested that an amylase value more than 10 times the upper limit may indicate pancreatic injury in patients with renal insufficiency. Similar to our findings Lin et al [14] and Gross et al [13] found there was correlation between the increase in urea and creatinine and amylase increase. The precise mechanism of amylase transfer within the kidney has not yet been clarified. It was earlier concluded that amylase clearance was an essential function of glomerular filtration. [17]Recent work by Johnson et al [18] provides strong evidence in favour of tubular absorption of amylase in man. This has been shown experimentally in the rat.[19] Loss of this preferential clearance of amylase is evident in renal insufficiency and is undoubtedly related to accompanying renal tubular atrophy.[20] Pancreatic isoenzyme can be a better marker for the diagnosis of acute pancreatitis [21] in renal failure patients.

CONCLUSION

Elevation of serum amylase was found to be statistically significant in both ESRD and CKD patients when compared to controls. Patients with uremia commonly have nausea, vomiting and abdominal discomfort, which are also seen in pancreatitis. Due to the significantly elevated levels of pancreatic enzymes in uremia serum amylase as a diagnostic tool in recognising acute pancreatitis leads to false positive results.

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