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Research Article

Study of Serum and Urinary Amylase in Renal Disorders

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ABSTRACT

Hyperamylaemia is one of the finding in CRF patients. Acute and chronic renal failure is accompanied by retention of both amylase and lipase. The aim of the study is to evaluate the levels of amylase and its isoforms and to calculate the ACCR in CKD patients. The study included 20 controls and 36 CKD patients. Urea, creatinine, T. amylase, its isoforms P. amylase and S. amylase were measured in serum.urine sample collected for 4hrs period was used to estimate above mentioned parameters. The values obtained were used to calculate ACCR. In our study, the CKD patients showed a significant ($p<0.001$) rise in urea, creatinine, T- amylase, P- amylase, S- amylase and ACCR values for T-amylase (4.8 ± 2.3), P-amylase (6.0±3.0) and S - amylase (4.5±2.8) were also significantly increased when compared to controls. Through this study we conclude, The ACCR can be used for differential diagnosis of diseases.

Keywords: Serum, Urinary, Renal disorders.

INTRODUCTION

Chronic kidney disease (CKD) is increasingly recognized as a global public health problem. Diabetes and Hypertension are the most common causes of CKD. Chronic diseases are now the leading causes of death worldwide. Chronic kidney disease (CKD) is currently defined as a creatinine - based estimated Glomerular filtration rate (GFR) of less than 60 mL/min/1.73m^2 or a urine albumin-to-creatinine ratio (ACR) of 30 mg/g or higher [1]. α-Amylase catalyzes the hydrolysis of α-1,4 glucan linkages in starch, one of the most abundant molecules. Serum amylase consists of two major isomers, pancreatic amylase (P-amylase) and salivary amylase (S-amylase).

The urinary excretion of amylase is governed by glomerular filtration and tubular reabsorption [2, 3]. It has gradually become evident that transport of macromolecules through the glomerular filter is determined not only by the size of the molecule, but also to an important degree by its charge [4-6]. The negatively charged glomerular basement membrane impairs filtration of anionic proteins such as albumin. Because of the differences in charge of P- and S-amylase, one might expect important differences in renal clearance of these isoenzymes. The study was conducted to evaluate the differential clearance of amylase and its isoforms in with various degrees of renal impairment.

MATERIALS AND METHODS

The study includes 20 healthy subjects and 36 CKD patients of age group between (17-75) years. Random blood sample and urine sample of 4hrs period were obtained from patients admitted in nephrology ward and controls attending OP in SRM Hospital, attached to SRM medical college kattankulatur. The blood samples were collected in EDTA coated vaccutainer and were centrifuged at 3000rpm for 5min.

All the estimations were performed in fully automated analyzer Olympus AU- 400 using the kits provided by Diasys for analysis of Total amylase (Diasys α-amylase CC FS) and pancreatic amylase (Diasys pancreatic amylase CC FS) in both serum and urine. Beckmann Coulter SYNCHRON® System(s**) kits** for analyzing Creatinine and urea in both serum and urine samples. The salivary amylase levels were obtained by subtracting pancreatic amylase from that of total amylase in both serum and urine samples.

The Amylase Creatinine Clearance Ratio (ACCR) was calculated using the formula,

$$ACCR = \frac{\text{urinary amylase}}{\text{Serum amylase}} X \frac{\text{serum creatinine}}{\text{urinary creatinine}} X\ 100$$

Statistical analysis was done by using SPSS 15 *version* software. The institutional ethical committee approved the study and informed consent was obtained from the patients. Patients with pancreatitis, parotitis and abdominal disorders were excluded.

RESULTS

The T-amylase its isoforms P-amylase and S-amylase were significantly high when compared to controls ($p<0.001$) (fig 1). CKD patients with various degree of renal insufficiency showed a significant rise in ACCR values for T-amylase (4.8 ± 2.3), P-amylase (6.0±3.0) and S - amylase (4.5±2.8) when compared to controls ACCR values for T-amylase (2.6±0.95),P-amylase (3.95±1.65) and S-amylase (1.7±1.3).(fig 2) (table 1).

DISCUSSION

Acute and chronic renal failure is accompanied by retention of both amylase and lipase. Other study reports also supported our study results showing an increased clearance ratios for pancreatic and salivary amylase, which were significant ($p < 0.05$) [7]. A study conducted by saba Z et.,al showed a significant increase ($P<0.001$) in amylase

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Table 1: mean± sd values of patients and control

Parameters	Control (n=20)	Patients(n=36)
S. Urea	23.20±5.89	128.77±90.09*
S.creatinine	0.95±0.19	6.43±2.9*
t. Amylase	70.71±22.35	209.94±148.33*
p. Amylase	27.02±5.03	74.46±47.93*
s. Amylase	43.69±21.71	134.54±34.32*
u. Creatinine	120.97±40.93	43.46±15.83*
urine t. Amylase	224.33±100.61	58.65±26.32*
urine p. Amylase	135.97±62.50	28.19±18.44*
urine s. Amylase	88.3±19.23	30.46±19.83*
t. Accr	2.62±0.95	4.81±2.31*
p. Accr	3.97±1.65	6.09±3.03*
s. Accr	1.70±1.38	4.52±2.86*

**indicates significant p value*

Fig-1. Mean ± SD values of serum T-amylase and its isoforms

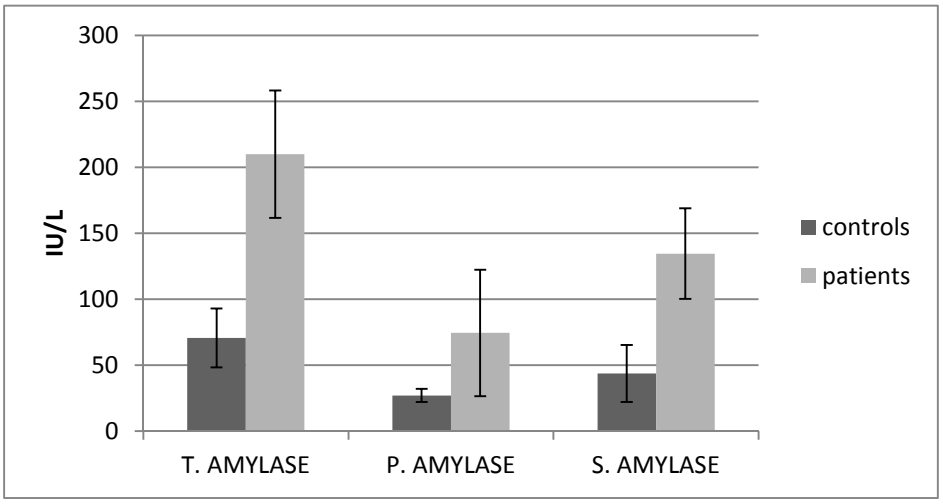
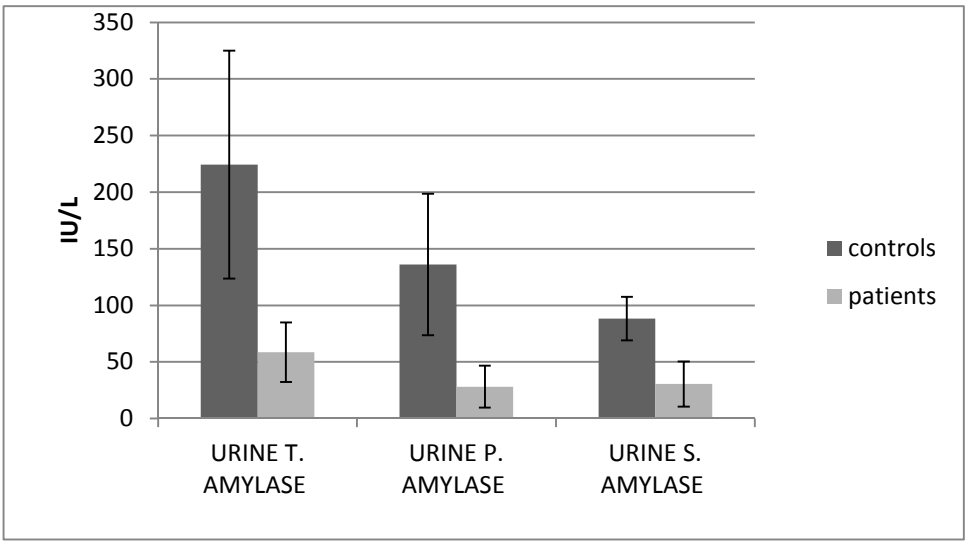


Fig -2. Mean ± SD values of urinary T-amylase and its isoforms



activity in serum of pre and post haemodialysis patients in comparison to control group[8].

The significantly increased rate of pancreatic amylase clearance relative to salivary amylase clearance ($p < 0.0005$) in control subjects has already been reported [9].

This degree of preferential clearance of pancreatic relative to salivary amylase is markedly reduced in patients with renal insufficiency. In terminal disease associated with renal failure a high ACCR need not indicate pancreatic disease.

Present study showed more pancreatic amylase clearance compared to salivary amylase clearance ($p<0.001$). Concordant results were even obtained in a study demonstrating, there is more rapid clearance of pancreatic amylase relative to salivary amylase [9-12], it may be due to a more active reabsorption of salivary amylase by the proximal or distal tubule. Loss of this preferential clearance of pancreatic amylase relative to salivary amylase is evident in renal insufficiency and is undoubtedly related to the accompanying renal tubular atrophy. Loss of tubular function would also explain why there is increase of both salivary and pancreatic amylase/Createnine clearance ratios in renal disease. [7]

CONCLUSION

Therefore, it shows a preferential increase in clearance of P-amylase over S-amylase in patients with renal disease and proteinuria, it seems worthwhile to study further the possible usefulness of fractional excretions of P- and S-amylase as markers of glomerular basement membrane

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