Original Research Article

Evaluation of pancreatic enzymes in mild and moderate renal failure patients: A hospital based prospective study

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Abstract

Background: Renal failure is a condition characterized by decreased glomerular filtration rate (GFR). Renal failure can lead to the development of other co-morbid conditions including pancreatitis. The present study is aimed at evaluating the pancreatic enzymes in patients suffering with mild and moderate renal failure. **Materials and Methods:** This study was conducted in the department of Biochemistry, Sree Mooakmbika Institute of Medical Sciences, Kulasekharam, Tamil Nadu. Renal failure patients were selected for the study and divided into mild and moderate renal failure patients. Informed consent was obtained from the study population. Blood and urine samples were collected for the estimation pancreatic and renal parameters by standard methods. **Results:** Serum amylase, Serum creatinine and urine-amylase clearance, showed statistical significance in mild renal failure compared with moderate renal failure patients. Urine amylase, serum lipase, Serum calcium and Serum phosphorous showed increase in moderate renal failure compared with mild renal failure but not statistically significant. **Conclusion:** Renal failure significantly affects the pancreatic enzymes. More attention has to be given for pancreatitis when patients have renal failure.

Key Words: Pancreas, renal failure, amylase, creatinine, lipase, GFR

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INTRODUCTION

Chronic Renal Failure (CRF) is characterized by a progressive and generally irreversible decline in GFR[1]. Renal failure can be defined as either a decreased level of GFR (< 60 ml/mt/1.73 m^2) for more than three months which is accompanied in most cases by signs and symptoms of uraemia, structural or functional abnormalities of the kidney with normal or decreased GFR in the beginning, but progresses to decreased GFR with time[2,3]. CRF is caused by many diseases, out of which glomerulonephritis is the most important cause. Increase in the blood levels of non-protein nitrogenous substances is referred to as azotemia which is the hallmark of Kidney failure. When azotemia is associated with signs and symptoms of end stage renal failure it is termed as uraemic syndrome which is the terminal manifestation of renal failure. It is characterized by failure of renal excretory functions as well as metabolic and endocrine abnormalities[4-6]. It is also associated with electrolyte disturbances, anaemia, atherosclerosis and hypertension leading to cardiovascular dysfunctions, poor immunity due to leucocyte dysfunctions altered calcium metabolism leading to renal osteodystrophy, gastrointestinal abnormalities causing anorexia, nausea, vomiting and even gastrointestinal bleeding, neuromuscular abnormalities, myopathy and very rarely acute pancreatitis also[7]. Pancreatitis occurs with a high frequency in uraemic patients. Hemodialysis patients are more likely to suffer from triglyceridemia which is a predisposing factor for pancreatitis. Diagnosis of these

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complications of CRF is also important as we can prevent the further worsening of the condition of the CRF patient. Most of the complications of CRF can be diagnosed based on clinical signs and symptoms. Some symptoms of CRF like abdomen pain and vomiting can also be due to the development of acute pancreatitis in these patients. Therefore pancreatic enzymes like amylase and lipase should be quantitated, which will show a marked raise in their levels, when compared to the minimal raise of these enzymes in CRF, if acute pancreatitis had complicated the CRF[8-10]. Even though acute pancreatitis is a complication of CRF, the incidence and aetiopathology of acute pancreatitis complicating CRF is not known in our population. So the present study was done to study the variations in pancreatic enzymes levels in CRF patients without already known pancreatitis and also to determine the incidence of acute pancreatitis in CRF patients.

MATERIALS AND METHODS

Study settings and time: The present study was carried out at the Nephrology unit of Sree Mookambika Institute of Medical Sciences, Kulasekaram from August 2012 to May 2013 for a time period of 10 months. This cross sectional study was approved by the institutional Human Ethical Committee. Voluntary informed consent was taken from all the subjects of the study. This is a cross sectional study.

Inclusion Criteria

- Serum Urea levels between 40-100 mg/dL
- Age between 30-80 years

Exclusion Criteria

- Chronic alcoholics
- Patients having portal hypertension
- Known case of Chronic Pancreatitis

Groups

Group I: Mild chronic renal failure patients (Serum Urea 40-80 mg/dL and serum creatinine 0 to 3 mg/dL)

Group II: Moderate chronic renal failure patients (Serum Urea 81-100 mg/dL and serum creatinine 3.1 to 4.5 mg/dL)

Procedure: The total of 50 patients was considered in the study. Based on the Serum Creatinine levels they were divided into two groups. In the patients studied, a sample of timed 4 hours urine was collected in sterile containers during which period about 5 ml blood was collected in a red capped Vaccutainer. Blood samples were then centrifuged at 3000 rpm for 10 minutes and the serum was separated for further tests. The parameters Serum Urea, Serum Creatinine, Serum Amylase, Serum Lipase, Serum Calcium, Serum Phosphorus, Urine Creatinine, Urine Amylase, Urine Creatinine clearance (Ccr) and Urine Amylase clearance (Cam) were studied by standard methods[11-13].

Statistical Analysis: The data was expressed in mean and standard deviation. Statistical Package for Social Sciences (SPSS 16.0) version used for analysis. Unpaired t test applied to find the statistical significant between the groups. P value less than 0.05 ($p<0.05$) considered statistically significant at 95% confidence interval.

RESULTS

Moderate renal failure patients showed significant increase in serum amylase, serum creatinine, urine amylase clearance compared to mild renal failure patients ($p<0.05$). There was no significant difference observed in urinary amylase, serum lipase, calcium, phosphorous and Cam/Ccr % between mild and moderate renal failure patients ($p>0.05$). Moderate renal failure patients showed lesser urinary amylase levels compared to mild renal failure patients ($p=0.07$)

Table 1: Comparison of Serum Amylase Urinary amalyse and Amylase clearance between the mild and moderate renal failure patients

Groups	Serum Amylase U/100ml	Urinary amylase U/100ml	Amylase clearance (C_{am}) ml/min	Serum creatinine
Mild renal failure	158.36±31.45	101.15±25.45	1.44±0.41	2.52±0.26
Moderate renal failure	185.72±71.28*	83.94±27.85	0.62±0.25*	3.68±0.63*
T-value	2.08	3.44	47.05	0.46
P-value	0.16	0.07	0.00	0.03
Significance	NS	NS	S	S

(*p<0.05 significant compared mild renal failure with moderate renal failure patients)

Table 2: Comparison of serum lipase, calcium and phosphorus between the mild and moderate renal failure patients

Groups	Serum Lipase U/L	Serum Calcium mg%	Serum phosphorous mg%
Mild renal failure	153.32±73.81	8.4±0.65	4.88±0.71
Moderate renal failure	166.53±99.64	8.19±0.46	5.07±0.62
T-value	0.19	1.17	0.68
P-value	0.67	0.29	0.42
Significance	NS	NS	NS

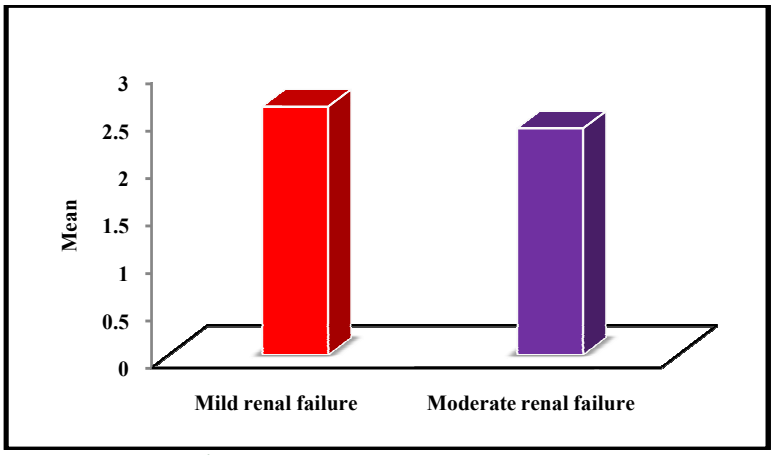

Figure 1: Comparison of Cam/Ccr% values between the mild and moderate renal failure patients

DISCUSSION

Increased levels of pancreatic enzymes have been studied in patients with renal failure. Seno *et.al*., and Duanne WC et.al., have showed that the increase in serum lipase is approximately three times the reference value[14,15]. The vast difference in the significance of lipase can be accounted as being due to enormous variation in the percentage of increase in its level as the disease progresses. The profound increase in serum lipase level in mild renal failure is not maintained thereafter in moderaterenal failure. The urinary lipase is normally undetectable in urine as lipase is completely reabsorbed by the tubules[16], when compared to the tubular reabsorption of amylase. The normal reference interval for serum calcium by arsenazo 111 method is 8.6 to 10.3 mg%. But the serum calcium values were 8.4 mg% and 8.19 mg% in mild and moderate renal failure respectively. This lowering of serum calcium in CRF is attributed to decreased absorption of calcium from the gut. This is due to impaired synthesis of 1, 25-Dihydroxy cholecalciferol (calcitriol) which is the active form of vitamin D, which is synthesized by the kidney and is essential for the absorption of dietary calcium from the gut. The normal reference interval for serum phosphorus by molybdate/UV method is 2.5 to 5 mg%. The serum phosphorus values in this study were 4.88 mg% and 5.07 mg% in mild and moderate renal failure respectively. This increase in serum phosphorus level from the normal range is due to decreased renal phosphate clearance. On trying to correlate the levels of serum amylase with serum urea and serum creatinine in various study groups, it is observed that there is almost no correlation in their levels in various study groups except in moderate renal failure where there is a significant correlation between serum amylase and serum creatinine. However the reason for this correlation only in moderate renal failure is unexplainable. The non-correlation of these parameters in the other study groups is because only a small proportion of amylase is being handled by the kidney as opposed to the nearly entire proportion of urea and creatinine being handled by the kidneys with some reabsorption of urea and no reabsorption of creatinine by the renal tubules[17]. When amylase clearance was compared with serum creatinine there is an inverse correlation in moderate renal failure ($P<0.05$). This is because some amount of amylase is cleared by urinary excretion. Renal excretion of amylase occurs by glomerular filtration and tubular reabsorption[18,19]. When the Cam/Ccr ratio of various study groups is compared, there is no correlation between their levels in mild and moderate renal failure. This correlation is said to be due to more rapid fall of creatinine clearance than amylase clearance as the renal impairment progresses[20]. It is evident that serum calcium level has inverse non-significant correlation with serum creatinine. It explains the correlation of serum creatinine and serum phosphorus. The serum phosphorus gradually increases as the extent of renal damage increases, but the increase is not significant as renal phosphate clearance is less. The correlation between serum calcium and serum phosphorus is significant in mild renal failure. This is because of the hyper phosphatemia which increases PTH levels which decrease serum calcium up to certain extent of creatinine clearance after which this correlation is not of much significance[21]. From the observations made so far, it is clear that there is a gradual increase in the level of serum amylase, lipase and phosphorus and a decrease in the level of urinary amylase, amylase clearance and serum calcium as the disease advances in severity. Having analyzed the results of various study groups, on keeping in mind the aim of this study, i.e., to determine the presence of acute pancreatitis in renal failure cases, in the fifty cases of renal failure investigated, as the analysis of the parameters did not reveal the picture as specified above, it is inferred both from biochemical results and

clinical picture that there was no case of renal failure with the complication of acute pancreatitis at the time of study. This compares well with the documented literature that this complication is rare in renal failure.

CONCLUSION

Moderate renal failure can affect the pancreatic enzymes. From this study observation it can be concluded that there is a requirement of special knowledge to treat renal failure patients with diabetes.

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