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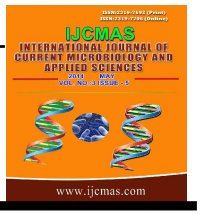

Original Research Article

A study of some biochemical changes in patients with chronic renal failure undergoing hemodialysis

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A B S T R A C T

In present study, 79 patients and (54 males and 25 females) suffering from chronic renal failure who were obtained from AL-Hakeem Hospital, AN Najaf, Iraq, and compared with 79 healthy individuals as control group. The sera were separated from patient's blood samples and subjected to biochemical studies. In this study we found out that the mean values of some biochemical parameters important for the detection of the chronic renal failure. Whereas we found cholesterol and triglyceride, LDL, HDL and VLDL were also studied. It was noticed that high levels of Cholesterol, LDL, TG and VLDL in patients sera whereas HDL was found lower than the Control groups. Moreover, sodium levels decrease but Potassium elevated. Calcium was found decreased in all patients significantly but there were no differences in its concentration between males and female. (Po_4) level increase in all patients significantly but there was no differences in its concentration between males and female. This study conducted to investigate relationship between chronic renal failure and other chronic diseases whereas our results recorded significant relationship between CRF disease and cardiovascular disease by rising levels of atherosclerosis.

Keywords

Lipid profile, CRF disease, electrolytes, LDL, and HDL

Introduction

Chronic kidney disease is a progressive loss in renal function over a period of months or years, and it may lead to one of its recognized complications such as cardiovascular disease, anemia or pericarditis (Nurko, 2006; Herzog *et al.*, 2011). Chronic kidney disease is a well-known risk factor for the end stage of renal disease (Iseki *et al.*, 2003).

Hemodialysis is a method that is used to achieve the extracorporeal removal of waste products such as creatinine and urea and free water from the blood by an artificial kidney machine when the kidneys are in a state of renal failure. The basic principle of the artificial kidney is to pass blood through minute blood channels bounded by a thin membrane. On the other side of the membrane is a dialyzing fluid into which unwanted substances in the blood pass by diffusion (Guyton and Hall, 2011).

Cholesterol is required to build and maintain membranes; it modulates membrane fluidity over the range of physiological temperatures. The hydroxyl group on cholesterol interacts with the polar head groups of the membrane phospholipids and sphingolipids, while the bulky steroid and the hydrocarbon chain are embedded in the membrane, alongside the nonpolar fatty acid chain of the other lipids. Through the interaction with the phospholipid fatty acid chains, cholesterol increases membrane packing, which reduces membrane fluidity (Sadava *et al.*, 2011). In this structural role, cholesterol reduces the permeability of the plasma membrane to neutral solutes (positive hydrogen ions) and sodium ions (Haines, 2001).

Determining structure of LDL has been a tough task because of its heterogeneous structure. First structure of LDL at human body temperature in native condition has been recently found using cryoelectron microscopy and it has resolution of 16 Angstrom (Kumar *et al.*, 2011).

VLDL transports endogenous triglycerides, phospholipids, cholesterol and cholesterol esters. It functions as the body's internal transport mechanism of lipids and its levels have been correlated with accelerated rates of atherosclerosis, and are elevated in a number of diseases and metabolic states (Altman*et al.*, 1993).

Serum albumin is the most abundant blood plasma protein and is produced in the liver and forms a large proportion of all plasma protein. It normally constitutes about 60% of human plasma protein, being synthesized primarily by hepatic parenchymal cells except in early fetal life, when it is synthesized largely by the yolk sac (Johonson *et al.*, 1999).

Materials and Methods

Patients and samples collection

This study included hundred and fifty eight samples were collected from Al-Hakeem General Hospital, AN Najaf, Iraq. Samples were divided into 79 patients and 79 healthy and each set 54 males and 25 females and their ages ranged from 19 to 60 years.

Serum Cholesterol

The cholesterol present in the samples were assessed using CHOD-POD Enzymatic colorimetric (Biolabo/France). We dissolved the contents of vial R2 Enzymes (Cholesterol esterase (CHE) 300 U/L, Cholesterol oxidase (CHOD) 300 U/L, Peroxidase (POD) 1250 U/L & 4 - Aminophenazone (4-AP) 0.4 mmol/L) in bottle of R 1 Buffer (PIPES 90 mmol/L and Phenol 26 mmol/L), then caped and mixed gently to dissolve contents. Then incubated for 5min at 37 C^0 at room temperature and we read the absorption at 500 nm.

Serum Triglyceride

The serum Triglyceride was assessed using colorimetric (Biolabo/France). The contents of vial R2 Enzymes (Lipase, Peroxydase, Glycerol 3 phosphate oxydase, Glycerol Kinase, 4 - Amino – antipyrine, and Adenosine triphosphate) were added into vial R1 Buffer (PIPES 100 mmol/L, Magnesium chloride 9.8 mmol/L and Chloro-4-phenol 3.5 mmol/L). Mixed and lifted stands for 5 minutes at 37°C minutes at room temperature. Then Recorded absorbencies at 500 nm (480-520) against reagent blank.

Assessment of VLDL, LDL and HDL

Very Low Density Lipoprotein were estimated using the following formula: VLDL-c = TG (mmol/l) / 2.2 . Low Density Lipoprotein were estimated using the following formula: LDL-c = TC *(mmol/l)*- VLDL-c*(mmol/l)*- HDL-c*(mmol/l).* Serum High Density Lipoprotein cholesterol was assessed using colorimetric according to manufacture instructions (Biolabo/France).

Determination of Sodium, Calcium, Potassium and Phosphorus

Kit for quantitative determination of Sodium, Calcium, Potassium and phosphate in human serum was supplied by Cypress diagnostics, Belgium (Fossati, 1982)**.** We followed the manufacture instructions.

Statistical Analysis

Megastate and Excel programs were used in this study. All values were expressed as mean ± standard Deviation (SD). The differences were considered significant when the probability (P) was less than 0.05 (P> 0.05).

Results and Discussion

In the present study the plant active In the present study, our results show a significant increased in Cholesterol, LDL,TG and VLDL Levels in both males and females (P□0.05) in patients with chronic renal failure as compared with their parallel control groups but show a significant decreased in levels of (HDL) in CRF Patient compare to control groups as shown in Figures 1 & 2.

The Figures 3&4 shown a significant increase in electrolytes levels (K) and (po_4) and significant decrease in (Ca) (P□0.05), (P>0.05) in (CRF) patients respectively as compared with their control groups, and no significant change in (Na) level in both males and females.

The result in the figures 1 &2 shows a significant increase in serum TG level in patient with CRF when compared with control groups due to down regulation of skeletal muscle and adipose tissue LPL, hepatic lipase, and VLDL receptor and of hepatic LRP is collectively responsible for hypertriglyceridemia, impaired clearance, and elevated plasma levels of VLDL, IDL, and chylomicron remnants .Plasma triglyceride concentration is frequently elevated in patients with CRF (Sakurai *et al.,* 1992; Vaziri *et al*., 2003). In fact, serum TG is elevated due to an enhanced production of TG-rich lipoproteins such as VLDL by the liver, in addition dysfunction of TG degradation result from insufficient mitochondrial beta-oxidation of fatty acids (Schaeffner *et al.*, 2003).

Elevation of plasma total cholesterol and LDL concentration in patients with CRF have been found and studies show the total cholesterol and LDL are only occasionally elevated and this is may be due to our patients in the study have poor compliance to diet control and medications for hypercholesterolemia (McCosh *et al*., 1975). In these circumstances, plasma total cholesterol and LDL cholesterol concentrations are frequently elevated because heavy proteinuria alone or in combination with chronic renal insufficiency which resultsed in acquired LDL receptor deficiency, which plays a central role in the genesis of the associated hypercholesterolemia (Vaziri *et al.,* 2003). Increased LDL may promote nephropathy and atherosclerosis (Alwash, 2011).

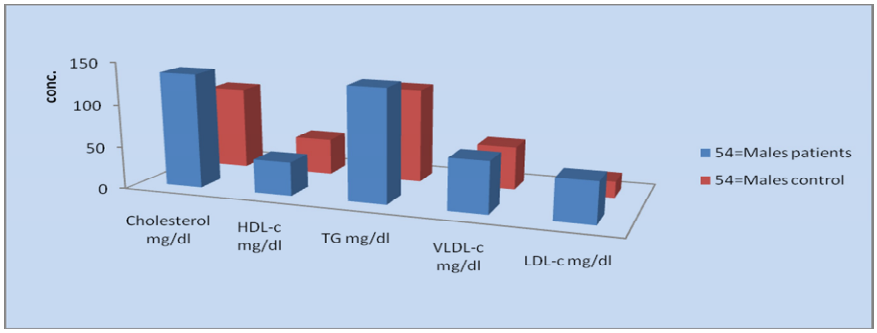

Figure.1 Variability of distribution of Lipid profile in CRF males Patients

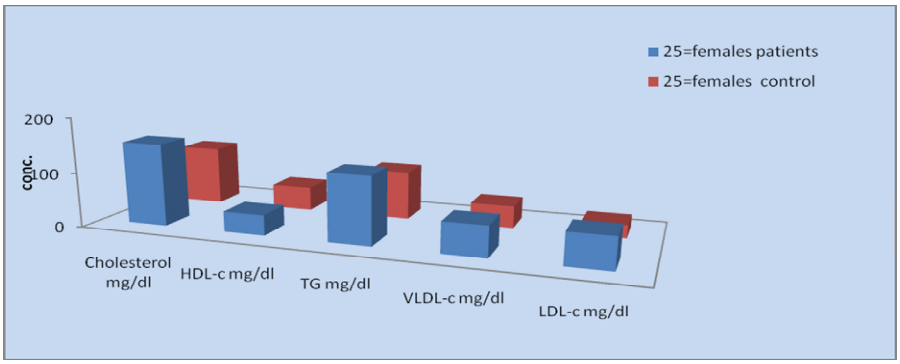

Figure.2 Variability of distribution of Lipid profile in CRF females Patients

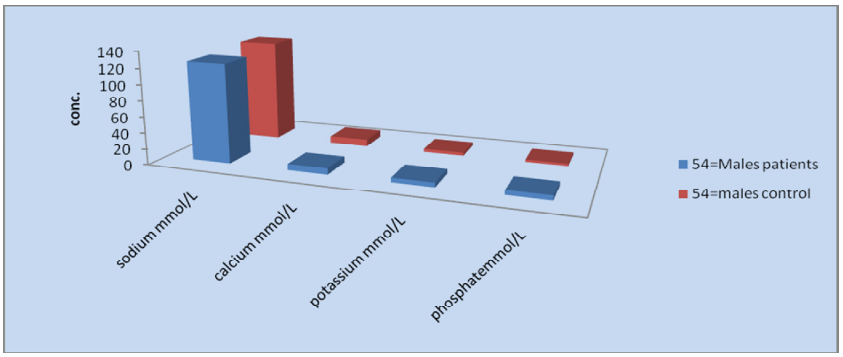

Figure.3. Variability of distribution of Electrolyte in CRF males Patients.

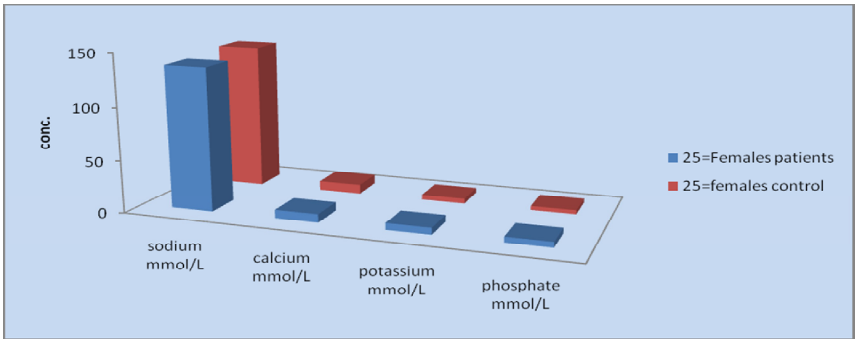

Figure.4 Variability of distribution of Electrolyte in CRF females Patients.

The VLDL values of CRF patients are higher than those of control with statistically significant increase insulin-resistant state impairs the normal suppression of fatty acids released from adipose tissue in the post prandial state. Insulin resistance enhances hepatic VLDL triglyceride secretion (Alwash, 2011).

In same figures, Plasma HDL concentration in renal failure patients is found to be reduced, this is because chronic renal failure results in profound dys-regulation of several key enzymes and receptors involved in the metabolism of lipoproteins, particularly those of HDL, Down-regulation of LCAT, apoA-1, and hepatic lipase together with up-regulation of CETP are largely responsible for the reduction in HDL cholesterol, impaired maturation of cholesterol ester-poor HDL-3 to cholesterol ester-rich HDL-2, increased HDL triglycerides, and depressed plasma apoA- (Kadhum, 2008).

In figures 3 & 4 shown decrease in serum Na^+ concentrations between the CRF patients and control groups without statistically significant decrease result to reduce Na^+ intake and humoral natriuretic factor in CKD which helps to increase sodium excretion and maintain normal Na^+ balance**(**Porth, 2007) . K^+ concentrations a statistically significant increased in CRF patients the hyperkalemia is thought to result from the failure to follow dietary potassium restrictions and ingestion of medications that contain potassium, or from an endogenous release of potassium, as in case of trauma or infection **(**Porth, 2007). In other hands, our data shown significant decrease in serum Ca^+ concentration in CRF patients and this interpreter the reduction of renal production of 1,25-dihydroxycholecalciferol (active metabolites of vitamin D) and hence reduced the intestinal absorption of calcium and lead to hypocalcaemia as well as abnormalities of Ca, phosphate, parathyroid hormone (PTH), and renal osteodystrophy and decreased renal production of calcitriol contributes to hypocalcemia (Nicki *et al.*, 2010).

In the present study 156 samples were collected from hospital and screened for CRF disease. We found in patient group, significant increased in Cholesterol, LDL, TG and VLDL Levels while significant decreased in HDL. In other hands, calcium found decreased in all patients significantly but there were no differences in its concentration between males and female. (Po_4) level increased in all patients significantly but there was no differences in its concentration between males and female.

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