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STUDY OF SERUM LIPID PROFILE AND LIPID RATIOS IN PATIENTS WITH RENAL FAILURE

SAAD AL-FAWAEIR (PhD)* [1] | HEBA AL-SHAWABKEH (CHEM. ENG) [2]

[1] Department of Biochemistry, King Husain Medical Center, AMMAN-JORDAN.

ABSTRACT

Background: The burden of kidney disease is increasing rapidly worldwide and has become a major health issue. An association between lipid profile and renal failure has been recently reported in many studies in several countries.

Aim: The current study was undertaken to examine the association of serum lipids, lipid ratios with Chronic Renal Failure in Jordan population.

Methods: The study was carried out on 75 pre-dialysis chronic kidney disease patients attending out-patient clinic in Prince Zaid Military Hospital in Al-Tafilah in Jordan from February to October 2014 and 50 control subjects, all factors that may lead to dyslipidaemia were excluded in all subjects. Lipid profiles were measured by standard methods. Data were analyzed using a statistical software SPSS version 20.0, p-value <0.05 was considered significant.

Results: Subjects with Chronic Renal Failure have significant higher total cholesterol concentrations compared with control group (214.32 ± 75.15 Vs. 177.41 ± 35.37 mg/dL, p< 0.05); also they have significant higher triglyceride concentrations (189.46 ± 68.53 Vs. 147.67 ± 94.35 mg/dL , p< 0.05). The mean ratio of total cholesterol/HDL-cholesterol was significantly higher in the Patients group than healthy subjects (4.53 ± 1.43 Vs. 3.81 ± 1.72, p< 0.05). LDL-cholesterol concentrations were lower in healthy groups (125.14 ± 63.39 Vs. 113.76 ± 35.63 mg/dL, p< 0.05). HDL-cholesterol concentrations were higher in healthy groups (54.14 ± 13.49 Vs. 43.16 ± 15.42 mg/dL, p< 0.05). The LDL-C/HDL-C ratios were higher in patients group (2.14 ± 1.49 Vs.1.16 ±0.92 mg/dL, p< 0.05).

Conclusion: Abnormalities in lipids levels are common in pre-dialysis chronic kidney disease patients. It is valuable to investigate and treat dyslipidaemia early in the course of the disease as it may prevent further progression of the renal damage.

Keywords: Chronic Renal Failure, Dyslipidaemia, Lipid profile, Lipid ratios.

INTRODUCTION

Kidneys main function is to help filter waste products from the blood. They are also involved in regulating blood pressure, electrolyte balance, and red blood cell production in the body [1].

Renal failure refers to a condition in which the kidneys lose their normal functionality, which may be due to various factors including infections, autoimmune diseases, diabetes and other endocrine disorders, cancer, and toxic chemicals. It is characterized by the reduction in the excretory and regulatory functions of the kidney; it is the ninth leading cause of death in United States as well as most industrialized nation in the world [2].

Dyslipidemia independently or in combination with elevated blood pressure, can cause deterioration in renal function. Abnormalities in lipid metabolism and dyslipidemia are known to contribute to glomerulo-sclerosis and are common in kidney renal diseases [3].

Post-transplant dyslipidemia have been found to increase risk of chronic rejection and have been associated with an increased risk of ischemic heart disease [4].

Recently, in several studies the influence of lipid abnormalities on renal function has been evaluated [5]. In these studies, lipoprotein profiles interacted as risk factors for progressive renal decline. Lipid abnormalities start to appear immediately after renal function begins to appear [6]. General characteristics of the lipid profile include an elevation of serum triglycerides, a decrease in the high-density lipoprotein (HDL) cholesterol, and some elevation in the low-density lipoprotein (LDL) cholesterol and marked oxidation of LDL cholesterol. All of which have been associated with increased atherosclerotic risk [7].

Epidemiological studies have also suggested a role for hyperlipidemia in the progression of diabetic nephropathy [8]. About 45-50% of haemodialysis and peritoneal dialysis patients have lipid abnormalities, this finding has been estimated in recent studies. It becomes worthwhile to study the behavior of various lipid fractions in chronic renal failure (CRF) patients [9].

The current study was designed to identify whether there is any relationship between serum lipid profile and (CRF) patients in Jordan population sample.

SUBJECTS AND METHODS

Subjects

Blood samples were collected from125 patients, the patients group consist of 75 patients were 44 males and 31 females and their ages ranged from 32 to 76 years, these patients were diagnosed as CRF patients. The control group comprised of 50 subjects, who were free of features of kidney disease and having normal blood urea and serum creatinine level. The control group was selected from medical staff and their relatives, 28 males and 22 females and their ages ranged from 21 to 62 years. The subjects of this study were identified at the out-patient internal medicine clinic in specialty clinics in Prince Zaid bin Al-Hussain Military Hospital in Al-Tafilah city in Jordan during the period between March to September 2014. Ethical Committee approval was obtained for the collection of samples from the patients.

We excluded from this study patients with diabetes, thyroid disease, being treated for hyperlipidemia, receiving parenteral nutrition, or with clinical evidence of infection, and liver dysfunction resulting from hepatitis, biliary obstruction or cirrhosis. None of the patients studied was pregnant, had nephrotic syndrome, or had a chronic inflammatory disorder such as rheumatoid arthritis.

Blood samples were collected between 8:00 and 10:00 h into serum separated tubes after a minimum 14 –h overnight fast. The samples were allowed to clot for 15 minutes at room temperature then similarly were centrifuged at 4000g for 10 minutes then analyzed immediately.

Analysis

The triglyceride, total cholesterol and high- density lipoprotein cholesterol concentrations (HDL-cholesterol) were measured using Cobas 501 (Roche Diagnostics GmbH, Mannheim, Germany), levels of LDL-cholesterol were calculated by Friedwald formula.

Statistical analysis

Results are reported as mean ± standard deviation (SD), All statistical analysis were performed using SPSS for windows 20.0 (SPSS Inc. Headquarters, Chicago, III., USA) software program and Microsoft Excel 2007 program. Their observed differences in mean ± SD values were analyzed for statistical significance using Student's t-test and P-value < 0.05 was considered to be statistically significant.

RESULTS

The study group consisted of 125 subjects (72 male, 53 female), aged between 21 and 76 years (51.9±12.6 mean ±SD), the subjects were divided into 75 (60 %) patients with CRF and 50 (40 %) healthy patients (Table 1). The patient group subjects were older than the healthy subjects 51.9±12.6 years versus 41.7 ±18.7 years as mean ± standard deviation ($p<0.05$), males were the predominant in patients subjects (59 %).

Table 1: Characteristics in both groups

	Patients group	**Control group**	***P*-value**
n	75	50	0.48
Age (mean ±SD)	51.9±12.6	41.7 ±18.7	0.03
Male	44	28	0.018
Female	31	22	0.034

Subjects with CRF have significantly higher total cholesterol concentrations compared with control group (214.32 ± 75.15 Vs. 177.41 ± 35.37 mg/dL, $p< 0.05$); also they have higher triglyceride concentrations (189.46 ± 68.53 Vs. 147.67 ± 94.35 mg/dL , $p< 0.05$). The mean ratio of total cholesterol/HDL-cholesterol was significantly higher in the Patients group than healthy subjects (4.53 ± 1.43 Vs. 3.81 ± 1.72, $p< 0.05$). LDL-cholesterol concentrations were lower in healthy groups (125.14 ± 63.39 Vs. 113.76 ± 35.63 mg/dL, $p< 0.05$). HDL-cholesterol concentrations were higher in healthy groups (54.14 ± 13.49 Vs. 43.16 ± 15.42 mg/dL, $p< 0.05$). The LDL-C/HDL-C ratio was higher in patients group (2.14 ± 1.49 Vs 1.16 ± 0.92 mg/dL, $p< 0.05$) (Table 2).

Table 2: Serum lipid concentrations in patients group and healthy group, the results given as mean ±SD.

Factor	unit	*Patients group*	*Control group*	*P*-value
Total Cholesterol	mg/dL	214.32 ± 75.15	177.14 ± 35.37	0.04
Triglyceride	mg/dL	189.46 ± 68.53	147.67 ± 94.35	0.019
HDL-C	mg/dL	43.16 ± 15.42	54.14 ± 13.89	0.079
LDL-C	mg/dL	125.14 ± 63.19	113.76 ± 35.63	0.045
CH/HDL-C		4.35 ± 1.43	3.81 ± 1.72	0.02
LDL-C/HDL-C		2.14 ± 1.49	1.16 ± 0.92	0.038

DISCUSSION

Chronic kidney disease (CKD) is becoming a major health problem due to increasing incidence and prevalence, high cost, poor outcome [10]. This kind of disease (CKD) is characterized by specific metabolic abnormalities of serum lipids both qualitatively and quantitatively [11]. Common lipid abnormalities encountered are increased serum triglycerides and decreased serum HDL-cholesterol with small changes in other serum lipoprotein fractions [12]. This may be a significant risk factor for vascular complications leading to increased mortality and morbidity in CKD patients.

Hyperlipidemia can accelerate progression of renal disease by several mechanisms. First: by re-absorption of fatty acids, phospholipids, and cholesterol contained in the filtered proteins (albumin) by tubular epithelial cells formation, and tissue injury [13]. Second: accumulation of lipoproteins in glomerular mesangium can promote matrix production and glomerul-sclerosis [3].

In present study we found the age distribution in renal function disease shows a peak level in the page between (45-60) years, this finding unlike what have been reported in western studies in which peak level was older than 75 years [14].

In this study we found that male patients (59 %) is higher than female patients (41%) with male to female ratio 1.4:1 in agreement with that which had been reported in western studies [14].

In our study most cases of renal failure were found to be of unknown etiology (51%), stones (25%), 8% associated with infection, 5% because of single kidney, 6% for polycystic kidney, 3% for renal agenesis, and 2% for post-partum hemorrhage.

In our study the results show a significant increasing in cholesterol, triglyceride and LDL levels in patients with CRF in comparison with control group healthy group, and also show a significant decreasing in HDL levels in patients group.

A significant increased was shown in serum triglyceride in patients group due to down regulation of skeletal muscle and adipose tissues, very low density lipoproteins VLDL receptors and hepatic lipase. This finding has been reported in many studies [15, 16]. In fact, serum triglyceride levels increased due to an enhanced production of triglyceride -rich lipoproteins such as VLDL by the liver, in addition dysfunction of triglyceride degradation results from insufficient mitochondrial beta-oxidation of fatty acids [5].

Increasing in serum total cholesterol and LDL levels in CRF patients has been found in our study, in many studies results showed that total cholesterol and LDL concentrations are only occasionally elevated this because in our study patient have poor compliance to diet control and medication for hypercholesterolemia [16]. Serum total cholesterol and LDL concentrations are frequently increased due to heavy proteinuria alone or in combination with chronic renal insufficiency which resulted in acquired LDL receptor deficiency, which by turn plays an important role in the genesis of the associated hypercholesterolemia [17]. Increasing in LDL concentrations promote nephropathy and atherosclerosis [18].

In current study we found that HDL concentration in CRF is found significantly lower, this because CRF results is profound dysregulation of several key enzymes and receptors involved in the metabolism apolipoproteins , particularly those of HDL and hepatic lipase together responsible for the reducing in HDL cholesterol [19]. The pattern of lipid profile did not change with severity of disease and dyslipidaemia in patients were more in triglycerides 68.3% and HDL, 63.5% than in TC, 22.2% and LDL, 17.5%.

CONCLUSION

On consideration of our study results it is assume that there is an association between serum lipid profile alterations and chronic renal failure diseases Jordanian populations. It is highly recommended lipid profile and lipid ratios should be monitored in pre-dialysis patients in order to avoid more damage of kidneys.

Table 1: Characteristics in both groups

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