

Serum Lipid Profile in Chronic Renal Failure and Haemodialysis Patients

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ABSTRACT

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 renal disease. Serum Triglycerides, Cholesterol, LDL, VLDL concentration in renal failure patients were found to be significantly high compared with control group ($p < 0.001$). Serum HDL and Albumin concentration in renal failure patients were found to be significantly lower compared with control group ($p < 0.001$). Plasma total cholesterol and LDL cholesterol concentrations are frequently elevated because heavy proteinuria alone or in combination with chronic renal insufficiency results in acquired LDL receptor deficiency, which plays a central role in the genesis of the associated hypercholesterolemia.

KEY WORDS: Chronic Renal failure, Hemodialysis, Lipid Profile, C- Reactive protein, LDL Cholesterol

Introduction

Renal failure refers to a condition where the kidneys lose their normal functionality, which may be due to various factors including infections, auto immune 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 throughout the world [1,2].

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 renal disease [3,4]. In addition, post-transplant dyslipidemias have been associated with an increased risk of ischemic heart disease and have been shown to increase risk of chronic rejection, altered graft function and mortality [5,6]. The impact of lipid abnormalities on renal function has been evaluated in various studies [7-10]. In these studies, unfavorable lipoprotein profiles interacted as risk factors for progressive renal decline. Abnormal lipid profiles start to appear soon after renal function begins to deteriorate

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[10]. Common 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 [11]. All of which have been associated with increased atherosclerotic risk [8,11].

Epidemiological studies have also suggested a role for hyperlipidemia in the progression of diabetic nephropathy [12-14]. Analyses and prevalence reports have estimated that about 45-50% of haemodialysis and peritoneal dialysis patients have lipid abnormalities [15-16]. With the implication of plasma lipids in the pathogenesis of atherosclerosis and ischemic heart disease, it becomes worthwhile to study the behavior of various lipid fractions in CRF patients [17].

Material and Methods

Twenty five patients with Chronic renal failure and Twenty five with end stage renal disease on maintenance hemodialysis attending the dialysis unit in the Department of Medicine, Sri Lakshmi Narayana Institute of Medical Sciences were recruited into the study after informed consent. Thirty age and sex matched healthy individuals from among the patient’s relatives and hospital staff were taken as controls.

5ml of venous blood samples were collected from the patients and healthy subjects in the morning, after an overnight fast in heparinized bulbs. The samples were centrifuged at 2000 RPM for 15min, plasma separated and stored in vials at -80° C until analysis. The samples were processed for Lipid profile, Urea, Creatinine, Albumin and CRP. All the parameters were quantitatively measured on Siemens fully automated analyzer using commercial kits. All values obtained were expressed as Mean (± SEM). Mann Whitney U test was performed to compare the difference in the means between controls and study group. A ‘p’ value <0.05 was considered as statistically significant. Statistical analysis was performed using SPSS for Windows –Version 11.5.

Results

Serum Triglycerides, Cholesterol, LDL, VLDL concentration in renal failure patients were found to be significantly high compared with control group (p<0.001). Serum HDL and albumin concentration in renal failure patients were found to be significantly lower compared with control group (p<0.001). The result demonstrated significant (p < 0.001) elevation in serum Cholesterol, Triglyceride, LDL-Cholesterol, VLDL concentration in renal failure patients when compared with those of the control group, while HDL- Cholesterol,

S.No.	Serum Lipid Profile	Control	Patients	p Value
		Mean ± SD	Mean ± SD	
1	Cholesterol (mg/dl)	175.26 ± 23.78	228.13 ± 57.31	< 0.001
2	Triglycerides (mg/dl)	176.12 ± 23.84	188.41 ± 79.16	< 0.001
3	HDL cholesterol (mg/dl)	52.84 ± 9.46	38.98 ± 9.12	< 0.001
4	LDL cholesterol (mg/dl)	94.28 ± 28.32	152.96 ± 58.32	< 0.001

Table.1: Serum Lipid Profile and Albumin Concentration in Renal Patients and Control group.

Serum albumin concentration is significantly lower ($p < 0.001$) in renal failure patients when compared with those of the control group.

are composed of fats deposited from the bloodstream. When the deposits become sufficiently large, they block blood vessels and decrease the flow of blood. These

S.No.	Serum Lipid Profile	Male	Female	p Value
1	Cholesterol (mg/dl)	238.05 ± 63.20	229.08 ± 58.00	Non significant
2	Triglycerides (mg/dl)	168.76 ± 81.38	203.03 ± 75.38	Non significant
3	HDL cholesterol (mg/dl)	39.82 ± 9.32	40.86 ± 9.29	Non significant
4	LDL cholesterol (mg/dl)	159.12 ± 59.23	144.58 ± 56.78	Non significant
5	Albumin (g/dl)	3.93 ± 0.68	3.98 ± 0.58	Non significant

Table.2: Effect of Sex on Serum Lipid Profile and Albumin Concentration in Renal Failure Patients

The statistical analysis demonstrated that there is no significant difference between male and female patients regarding their Cholesterol, Triglyceride, Low density lipoprotein, High density lipoprotein, Very low density lipoprotein, Serum albumin levels.

deposits result in a disease process called atherosclerosis. There is a syndrome called familial hypercholesterolemia. Affected persons have consistently high levels of LDL. Though it is unclear if elevated TGs independently contribute to cardiovascular

S.No.	Serum Lipid Profile	First Visit M± SD	Fifth Visit M± SD	p Value
1	Cholesterol (mg/dl)	238.38 ± 40.12	206.54 ± 12.52	< 0.001
2	Triglycerides (mg/dl)	184.62 ± 35.16	162.4 ± 40.54	< 0.001
3	HDL cholesterol (mg/dl)	38.58 ± 4.62	128.87 ± 41.56	< 0.001
4	LDL cholesterol (mg/dl)	156.18 ± 36.17	128.87 ± 41.56	< 0.001

Table.3: Serum Lipid Profile was conducted to evaluate the effect of Dialysis on Serum Lipid Profile.

Discussion

Dyslipidemia is elevation of plasma cholesterol, triglycerides (TGs), or both, or a low high density lipoprotein level that contributes to the development of atherosclerosis. Causes may be primary (genetic) or secondary. Hypercholesterolemia increases the risk of heart disease. Elevated levels of circulating cholesterol cause deposits to form inside blood vessels. These deposits, called plaque,

disease, they are associated with multiple metabolic abnormalities that contribute to CAD (eg, diabetes, metabolic syndrome). Consensus is emerging that lowering elevated TGs is beneficial. Lipoprotein(a), or Lp(a), is a specialized form of glycoprotein-LDL-cholesterol complex. A number of retrospective studies have shown that LP(a) is a risk factor for myocardial infarction. The risk is related to the atherogenic and thrombogenic properties, especially due to its sequence homology with

plasminogen and may be critical in increasing the risk of myocardial infarction.

In ARF, general therapeutic measures are important that they include avoiding drugs that require renal excretion, balancing fluid intake with output, high carbohydrate and low-protein diet, essential amino acid replacement and at least 100gms of glucose per day, decreased intake of salt and potassium, vitamin supplements, prevention of injury or infection, weight management, electrolytes monitoring, and monitoring of vital signs, monitoring of cardiac status, and mental status. Peritoneal haemodialysis is the treatment of choice when other measures fail. Drugs that are used to reduce the blood pressure like diuretics (drugs that increase urine output) are used in some cases to increase blood flow unless oliguria is present. Antibiotics maybe needed to treat associated infections [18-31].

In CRF, general measures include low sodium, potassium and phosphate diet but high in calories and supplemented with essential amino acids are required. Other measures include balanced fluid intake, monitoring weight changes and vital signs, Electrolyte balance, monitoring of cardiac and mental status [32,33].

Drug therapy including Anti-hypertensive for hypertension [34-39], diuretics for oedema and hypertension [40-41], phosphate binders for hyper-phosphatemia[42-46], antibiotics, anticonvulsants for seizures, anti emetics (drugs that prevent vomiting) for nausea, laxatives for constipation, calcium, recombinant human erythropoietin for anemia [47-48].

Haemodialysis removes waste and excess fluid from the blood when the kidneys cannot do so sufficiently. The blood is drawn intravenously, sent through a machine called a dialyzer, and returned to the body through a blood vessel. Inside the dialyzer, the blood is passed over a

membrane that filters waste and fluid into a dialysate solution. The dialysate is then pumped out to a disposal tank and new dialysate is pumped in. The process of removing excess fluid is known as ultra-filtration. The blood is circulated and diffused numerous times during a dialysis session; each circulation through the machine removes more waste and excess fluid. Haemodialysis is usually performed three or more times a week for 4 hours or more [49-53]. In our study we found that the kidney failure was peaked in the age 50 to 60 years in contrast with other studies in western countries in which peak incidence is older than 75 years [54-56], our explanation is due to that most of Iraqi people suffer from diabetes mellitus or hypertension (which are the most common cause of chronic renal failure) have either poor compliance to the drugs or under controlled therapy. Limited medical services and delay medical consultation may be another cause for such incidence [57].

Regarding the patients gender we found that female patients(58%) is higher than male patients(42%) with female to male ratio 1.3:1 unlike what have been reported in western studies, in which annual incidence was twice as high in males than in females(54- 56), this is probably attributed to that female patients presented in our study are in reproductive age group with more liability for urinary tract infection, post partum hemorrhage (which represent (4%) of causes of acute irreversible renal failure)[57]. Another finding, patients who were treated with hemodialysis (63%) is higher than those treated with peritoneal dialysis (37%), this is because of advantages of hemodialysis.

Conclusion

Plasma triglyceride concentration is frequently elevated in patients with CRF. This Elevation is accompanied by increased plasma concentration and impaired clearance of VLDL,

which is associated with the accumulation of atherogenic VLDL remnants, commonly known as IDL. Plasma total cholesterol and LDL cholesterol concentrations are frequently elevated because heavy proteinuria alone or in combination with chronic renal insufficiency results in acquired LDL receptor deficiency, which plays a central role in the genesis of the associated hypercholesterolemia.

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