Original Article

Study of Assessment of Change in Lipid Profile Pattern in Patients on Hemodialysis

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Background : Chronic Kidney Disease (CKD) is a debilitating condition associated with high Cardio Vascular Disease (CVD) morbidity and mortality. CVD is the leading cause of death in Hemodialysis (HD) patients accounting for almost 50% of death. One of the main risk factor for cardiovascular events is Dyslipidemia.

Aims and Objectives : Aim of the study is toevaluate the pattern of development of Dyslipidemia in patients on Hemodialysis (HD).

Materials and Methods : A case control study was done from April, 2022 to September, 2022. In 30 patients who were on hemodialysis and age and sex matched 30 healthy controls were included in the study. In all the subjects the serum levels of total cholesterol (CHOD-PAP), LDL cholesterol (Friedwald formula), HDL-cholesterol (CHOD-PAP) and triglycerides (GPO-PAP) were estimated. BMI was calculated in all the subjects as per WHO guidelines.

Results : The study showed there is significant increase in TG and significant decrease in TC, LDL-C, HDL-C and BMI in patients on HD compared to controls.

Conclusion : Patients on HD have significant decrease in TC, LDL-C, HDL-C and BMI depicting malnutrition leading to inflammation accelerated atherosclerosis process and cardiovascular complications.

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Key words **: Cardiovascular Disease, Dyslipidemia, Hemodialysis.**

Chronic Kidney Disease (CKD) is kidney damage defined as reduction of renal function and GFR of less than 60 ml/min/1.73m^2 for more than 3 months[1]. It is estimated that in India 100,000 new patients of ESRD enter renal replacement program annually and an alarming number of about 8 million people are suffering from CKD[2,3]. Chronic Kidney Disease is a debilitating condition associated with high Cardio Vascular Disease (CVD) morbidity and mortality[4,5]. CVD is the leading cause of death in Hemodialysis (HD) patients accounting for almost 50% of death[4]. One of the main risk factor for cardiovascular events is Dyslipidemia. Dyslipidemia has been established as a well known traditional risk factor for CVD in patients on maintenance HD. CKD is known to cause an increase in triglycerides and a decrease in HDL that mimic the lipid abnormalities of the metabolic syndrome, which accelerate the progression of CKD and increase the risk for CVD mortality[6]. The Kidney Dialysis Outcome Quality Initiative (K/DQQI) guidelines state that patients on MHD with fasting Triglycerides (TG) >5.65 mmol/L, Low Density Lipoprotein (LDL) >2.59 mmol/L and non HDL cholesterol >3.36 mmol/L, should be considered for treatment to reduce the cardiovascular complications in these patients[5,6]. Keeping in view the mortality associated with CVD in patients on hemodialysis and the association of cholesterol levels with CVD in HD patients, we planned to study the lipid profile of patients on hemodialysis in comparison with healthy controls. This study was done to know the type of lipid dysfunction in our HD patients to adopt appropriate measures to decrease CVD mortality in them[6].

Editor's Comment :

- Education on dietary modification in patients on HD and implementation of excercise in dialysis centres can prevent the malnutrition and complications associated with malnutrition inflammation leading to atherosclerosis which leads to CVD.

Materials and Methods

A case control study was carried out for a period of 6 months from April, 2022 to September, 2022 in Department of Biochemistry, Bidar Institute of Medical Sciences Bidar. After obtaining approval from Institutional Ethical Committee 60 subjects in the age group of 30-45 years were selected from Department of Medicine (Nephrology) Bidar Institute of Medical Sciences and Hospital. Samples were collected from

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all the subjects after obtaining an informed consent. Clinical history and physical examination of each subject was carried out. The height and weight of all individuals were measured. Body Mass Index (BMI) was calculated in kg/m^2.

Inclusion Criteria :

60 subjects within the age group of 30-45 years of which

- 30 patients with end stage renal disease on HD were taken as cases.
- 30 normal people were taken as controls.

Exclusion Criteria :

Individuals having Hypertension, Diabetes Mellitus, Ischemic Heart Disease, Nephrotic Syndrome, Hypothyroidism, Chronic Liver Disease and patients taking lipid-lowering medications were excluded.

Sample Collection :

After 12 hours of overnight fasting about 5 ml of venous blood was drawn from the subjects including both cases and controls under aseptic precautions in a sterile plain bulb and allowed to clot. The serum was separated by centrifugation and used for estimation of levels of TC by CHOD-PAP method[7], HDL-C by phosphotungstic acid method[7], TG by GPO- Trider end point method[7], with the commercially available kit method for ERBA CHEM-5 v2 plus semiautoanalyser[7]. Serum LDL-C level was calculated from the measured parameters by Friedwald formula[7].

Results

Results were expressed as Mean ± SD. For all the tests, the probability value (p-value) of less than 0.05 was considered statistically significant and <0.001 as highly significant. Decrease in BMI was seen in cases with mean value of 17.22±1.66 and 21.35±1.5 in controls which was highly significant (Table 1). A significant elevation in serum triglycerides (p<0.001) and decreased in serum levels of TC, LDL-C and HDL-C was seen in cases as compared to controls (p<0.001). The mean serum TG is 172.5±9.17 and 138.6±8.6 in cases as compared to controls. The mean serum TC is 142.5±5.5 and 152.33±4.36 in cases as compared to controls.The mean serum HDL-C is 34.513±2.09 and 39.17±1.88 in cases as compared to controls. The mean serum LDL-C is 84.4±3.6 and 119.53±6.2 in cases as compared to controls (Table 2).

Table 1 — *Showing the age and BMI differences between controls and cases*

	Control	Cases	p-value
Age (Mean±SD)	38.9 ± 4.5	38.5 ±3.85	-
BMI (Mean ±SD)	21.35±1.5	17.22±1.66	<0.001

Table 2 — *Comparison of serum Total, HDL, LDL-cholesterol and Triglycerides (TG) in controls and cases*

Parameter		Controls	Cases	P value
TC mg/dl	Mean±SD	152.33±4.36	142.1±5.5	<0.001
HDL-C mg/dl	Mean±SD	39.17±1.88	34.13±2.09	<0.001
LDL-C mg/dl	Mean±SD	119.53±6.2	84.4±3.6	<0.001
TG mg/dl	Mean±SD	138.6±8.6	172.5±9.17	<0.001

Discussion

Dyslipidaemia is highly prevalent in patients on HD, with predominance of the atherogenic triad, ie, hypertriglyceridemia, elevated VLDL and reduced HDL[6,8]. This accelerates the progression of atherosclerosis and increase the risk for Cardiovascular mortality. Patients with CKD are in the highest risk category, ie, a Coronary Heart Disease (CHD) risk equivalent, for risk factor management of CVD.The incidence of Cardio Vascular Disease (CVD) is high in patients on haemodialysis[6]. The present study showed hypertriglyceridemia, reduced TC, LDL-C and HDL-C and significantly lower BMI in cases as compared to controls. These findings are in consistent with the CHOICE study and study done by Pennel P, *et al*[6,9,10]. Hypocholesterolemia is common in chronic dialysis population, however the mechanisms are not well delinated. Hypocholesterolemia in CKD patients on HD is true even after adjusting for confounding factors like age and BMI. Cytokinemia, which may be related to impaired removal of substances or to exposure of dialysis patients to an occult chronic inflammation, can explain the cause. It is also an indicator of declining health or dietary, metabolic and other clinical abnormalities similar to those associated with old age. Low level of serum cholesterol may indicate the existence of malnutrition which is explained by decreased BMI in cases as compared to controls[11,12]. Dialysis patients often have altered lipid and lipoprotein profile; a condition known as uremic dyslipidemia[11]. Uremic dyslipidemia has an abnormal apolipoprotein profile and composition. It is characterized by reduced concentrations of apo A-containing lipoproteins in High-density Lipoprotein (HDL) and increased concentrations of intact or partially metabolized triglyceride-rich apo B-containing lipoproteins in Very-Low-density Lipoprotein (VLDL), Intermediate-density Lipoprotein (IDL) and LDL.5[13]. Hypertriglyceridemia is caused by increased production of apo B protein and a marked decrease in the metabolism of VLDL, primarily as a result of decreased endothelial cell debilitation of VLDL.The lipoprotein abnormalities in HD patients are thought to be a significant factor in increased atherosclerosis. Serum total cholesterol and particularly LDL-cholesterol is known to be correlated

with increased cardiovascular mortality in the general population. A similar correlation has also been reported in dialysis patients[13]. However, it is today generally agreed that in the HD patient group, a low LDL cholesterol level is correlated with malnutrition and increased mortality. In this setting, there is an inverse relationship between mortality and the cholesterol concentration[5,6]. This pattern of reverse epidemiology, ie, hypercholesterolemia associated with decreased mortality and low cholesterol concentration in HD patients associated with increased CVD mortality has been associated with malnutrition inflammation atherosclerosis complex[6,14]. Malnutrition may lead to inflammation and vice versa[15,16]. Malnourished dialysis patients have hypocholesterolemia; deficient of antioxidants and are predisposed to infection that may decrease the ability to remove circulating endotoxins[6]. Uremia and renal replacement therapies result in markedly enhanced oxidative stress, the production of complement fragments and cytokines, increased adhesion molecules in endothelial cells and other pro-inflammatory factors. These factors may provide the proper milieu for the development of accelerated atherosclerosis[6]. Survival among HD patients is enhanced in over weight individuals. Every one unit increase in BMI is associated with reduction of 30% in relative risk of dying[6].

Conclusion

Hypocholesterolemia and decreased HDL-C along with low BMI are prevalent in our MHD patients. This may increase mortality in these patients through malnutrition inflammation atherosclerosis process leading to CVD complications. Dietary education of HD patients, improvement in dialysis practices and inclusion of exercise programs in dialysis centres is likely to improve CVD in HD patients.

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