Research Article

National Journal of Medical and Health Sciences (NJMHS)
2020, Volume 2, No.2, pp. 61-68

Dyslipidemias in the patients with end-stage renal disease on conventional hemodialysis in three months follow-up

Nighat Fatima[1,*], Saifullah Goraya[1], Sheraz Saleem[1]

Abstract

Objective:

The objective of study was to determine the pattern of dyslipidemias in patients with end-stage renal disease on conventional hemodialysis in three months duration.

Material and Methods:

This study was conducted in the Department of Medicine and Dialysis Unit, Sargodha Medical College, District Headquarter Teaching Hospital, Sargodha. We conducted conventional hemodialysis (2cycles/week) for at least three hours and measured fasting lipid profile of 115 subjects with end-stage renal disease.

Results:

Our study included 115 subjects with end-stage renal disease. The mean age was 51.03 ±10.73 years. Out of 115 subjects, 69 (60%) were male and 46 (40%) were female. From study population, 39 (33.9%) patients were smokers and 76 (66.1%) patients were non-smokers. The mean baseline HDL cholesterol was 45.19±4.9 mg/dl, which after the end of study period was 41.07±8.57mg/dl. The difference was statistically significant as indicated by the p-value <0.001. The mean baseline triglyceride was significantly increased before and after the study. Almost all of our sample population exhibited elevated serum triglycerides and decreased HDL.

Conclusion:

The current study findings strongly support the notion that dyslipidemias are more prevalent in patients with end-stage renal disease. It could be an independent causative factor for cardiovascular deaths in end-stage renal disease. Large-scale case-control studies are needed to further strengthen the above statement.

Key Words: *End-Stage Renal Disease, Lipid Profile, Conventional Hemodialysis*

[1]Department of Medicine and Allied, Sargodha Medical College, University of Sargodha, Sargodha
[*]Corresponding Author email address: nighatfatima@gmail.com

INTRODUCTION

Approximately 50% of patients with ESRD die from a cardiovascular event (Omran et al., 2013). Progressive renal failure is associated with characteristic alterations of lipoprotein metabolism and dyslipidemia. Hemodialysis patients have a number of biochemical abnormalities like hyperlipidemia and hypertriglyceridemia which have been incriminated as a risk factor of atherosclerotic vascular disease in these patients (Reddy et al., 2009, Rafieian-Kopaei et al., 2014). Renal dyslipidemias are characterized by elevated triglyceride levels which includes the triglyceride-rich apolipoprotein B containing Very Low Density Lipoprotein (VLDL) and intermediate-density lipoprotein (IDL) particles due to reduction of lipoprotein lipase activity (Omran et al., 2013, Thomas et al., 2008). In addition, there are abnormalities in Low density Lipoprotein-C particle size and higher levels of oxidized Low Density Lipoproteins (LDL) (Visser et al., 2012). Another factor responsible for renal dyslipidemia is the use of low-flux cellulosic dialyzer membranes, and treatment with conventional (mildly contaminated) dialysate which significantly increased the uremic low-grade systemic inflammatory response syndrome (SIRS), augmented uremic dyslipidemia (increasing triglycerides by 21% and decreasing high-density lipoprotein (HDL) by 10% (Schiffl and Lang, 2010).

ESRD is a very common problem in our society and dyslipidemias is a very common association in these patients as demonstrated by studies done in Pakistan (Thomas et al., 2015; Maheshwari et al., 2010) and worldwide (Elkabbaj et al., 2012). Up till now, no such study has been done in our setup (DHQ Hospital Sargodha). The rationale of our study is to determine the pattern of dyslipidemias in patients with end-stage renal disease following conventional hemodialysis (with blood flow rate 300-350ml/min, dialysate flow rate fixed at 500ml/min) in three months' time in a local population so that morbidity and mortality associated with dyslipidemia in patients with ESRD can be reduced.

MATERIALS & METHODS

After taking informed consent and demographic details on pre-designed proforma/questionnaire, blood samples (3 mL) of the patients who got admitted in the Dialysis unit of Divisional Head Quarter Teaching Hospital, Sargodha, with ESRD for hemodialysis were taken after 14 hours of fasting. Blood samples of patients under study were sent to the University Medical and Diagnostic Center, University of Sargodha, for the determination of lipid profile i-e triglycerides and HDL. About 115 patients who were fulfilling the inclusion criteria were included in the study. Serum HDL cholesterol and Triglyceride were determined by kit method using Microlab 300 Semi-Automated Chemistry analyzer in the

University Medical and Diagnostic Center, University of Sargodha (Ahmadi et al., 2008). All collected information was recorded on especially designed proforma. Effect modifiers and bias were addressed by exclusion criteria and analysis.

Data was entered and analyzed through SPSS version 20. Quantitative variables like age and lipid profile were presented as mean ± standard deviation. The qualitative variables like gender and change in lipid profile were presented as frequency and percentages. Data was stratified for age, gender, smoking and obesity to deal with effect modifiers. Post-stratification chi-square test was applied taking p-value ≤ 0.05 as significant.

RESULTS

The current study results indicated that the mean age of all the 115 enrolled patients in the study who were admitted for haemodialysis was 51.03±10.73 years. Out of total 115 patients, 70 (61%) patients were male and 45 (39%) were female. From study population, 39 (33.9%) patients were smokers and 76 (66.1%) patients were non-smokers. Mean body mass index (BMI) of study subjects was 22.32±2.11 while the mean glomerular filtration rate (GFR) was 9.8±1.24 mL/minute. The mean baseline HDL cholesterol was 45.19±4.9 mg/dl, which after the end of study period was 41.07±8.57mg/dl. The difference was statistically significant as indicated by the p value <0.001. The results of HDL before and after the study period were shown in Figure 1 & 2, respectively.

Table 1: Demographic characteristics of patients with ESRD

Total Population	115
Age (Years)	51.03+10.73
BMI	22.32+2.11
GFR (ml/minute)	9.8+1.24

Values are Mean ± SD, where BMI: Body Mass Index, GFR: Glomerular filtration rate

Table 2: Gender distribution of sample population

Gender	Frequency	Percent
Female	45	39
Male	70	61
Total	115	100

Table 3: Smoking percentage of studied population

Total Population	115
Mean	1.66+0.455
Smokers	33.9%
Non-smokers	66.1%

The mean baseline triglyceride was 199.87±49.53 mg/dl, which after end of the study was 241.7±63.60 mg/dl. The difference was statistically significant with p value <0.001 and the results are shown diagrammatically in Figure 3 & 4 for triglyceride level before and after the study, respectively. Stratification of age, gender, obesity, smoking with respect to % change in HDL and TG were given in Tables 4-11.

Almost all the population exhibited elevated serum triglycerides and decreased HDL. Most of them fell in age group between 18-30 years with non-significant p-value of 0.798 and 0.560 for percent change in HDL and TG, respectively. 61% of patients were male and 39% females but gender did not make much of the statistical difference. Out of 115 patients 22 were obese, 83 had normal BMI and 10 had borderline BMI i.e., 25. But in relation to

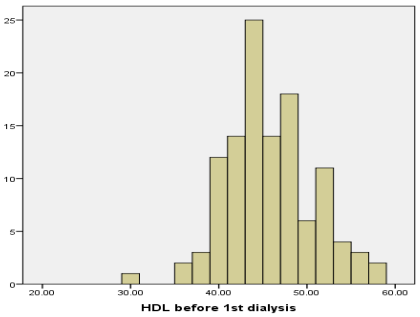

Figure 1: Results showing the frequency distribution of HDL concentration in study population before dialysis.

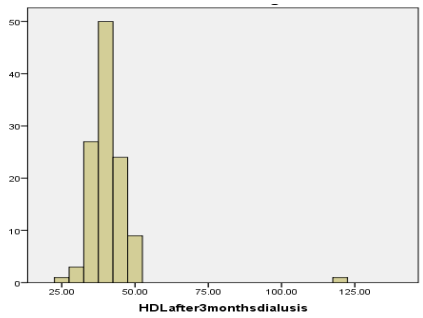

Figure 2: Results showing the frequency distribution of HDL concentration in study population after dialysis.

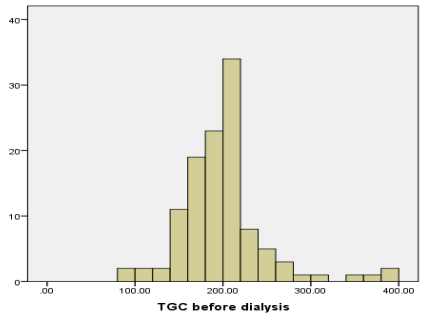

Figure 3: Results showing the frequency distribution of Triglycerides concentration in study population before dialysis.

Percent change in HDL and TG, obesity had an insignificant p-value of 0.238 and 0.146, respectively. 33.9% patients were smokers and rest of 66.1% were non-smokers and only this modifier showed significant statistical difference of p-value for percent change in HDL and TG i.e. 0.05 and 0.002, respectively.

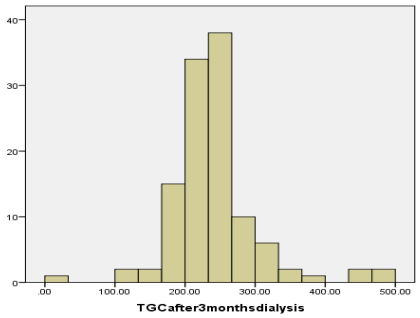

Figure 4: Results showing the frequency distribution of Triglycerides concentration in study population after dialysis.

Table 4: Stratification of age with respect to % change in HDL

HDL% Change	Age (years)		P-value
	18-50	51-80	
0-9	7	0	0.798
9.01-19.0	107	1	
Total	114	1	

Table 5: Stratification of age with respect to % change in Triglyceride

TG % Change	Age		P-value
	18-50	51-80	
18-20	29	0	0.560
20.0-24.0	85	1	
Total	114	1	

Table 6: Stratification of gender with respect to % change in HDL

Gender	Categorical change in HDL		P-value
	1.00	2.00	
Male	4	66	0.835
Female	3	42	
Total	7	108	

Table 7: Stratification of gender with respect to % change in TG

Gender	Categorical change in TG		P-value
	1.00	2.00	
Male	15	55	0.243
Female	14	31	
Total	29	86	

Table 8: Stratification of smoking with respect to % change in HDL

Smoking	Categorical change in HDL		P-value
	1.00	2.00	
Yes	0	39	0.050
No	7	69	
Total	7	108	

Table 9: Stratification of smoking with respect to % change in TG

Smoking	Categorical change in TG		P-value
	1.00	2.00	
Yes	3	36	0.002
No	26	50	
Total	29	86	

Table 10: Stratification of obesity with respect to % change in HDL

Obesity	Categorical change in HDL		P-value
	1.00	2.00	
Yes	0	22	0.238
No	7	76	
Borderline	0	10	

Table 11: Stratification of obesity with respect to % change in TG

Obesity	Categorical change in HDL		P-value
	1.00	2.00	
Yes	3	19	0.146
No	25	58	
Borderline	1	9	

DISCUSSION

Patients undergoing maintenance hemodialysis therapy have increased mortality due to various causes including cardiovascular diseases, and in this relation dyslipidemias appear to be one of the major risk factors. Almost all the study population exhibited elevated serum triglycerides and decreased HDL. Most of them fell in age group between 18-30 years with statistically non-significant differences for percent change in HDL and TG, respectively. 61% of patients were male and 39% females but gender did not make much of the statistical difference. Dyslipidemias is a generalized phenomenon seen in all patients on conventional hemodialysis irrespective of their age, gender and BMI, so we could say that the elevation in serum triglycerides and decreased levels of HDL are due to diminished clearance and microinflammation, respectively (Thomas et al., 2015; Mäkinen et al., 2014). Considering an alteration in the levels of the circulating triglycerides in the serum and perhaps later on the reductions in the activity of the both lipases, lipoprotein lipase and hepatic triglyceride lipase, might lead to the reduction of the triglyceride removal from body (Omran et al., 2013, Thomas et al., 2008). A circulating lipase inhibitor may be retained in renal failure. Such a compound may not be dialyzable with conventional bio-incompatible cellulosic dialysis membranes but may be removed during high-flux dialysis with a biocompatible polysulfone dialyzer. This hypothesis could explain the observation that the lipid profile often improves after high-flux hemodialysis but not by conventional one (Schiffl and Lang, 2010). There is also change in lipoprotein fractions in patients with end stage renal disease. These patients show significantly lower levels of HDL cholesterol. The change in HDL component is favored by microinflammation in uremic patients (Schiffl and Lang, 2010). These findings strongly suggest accumulation of remnants of triglyceride-rich lipoproteins in patients with end stage renal disease and may explain increased incidence of coronary deaths as shown in international studies performed at Department of Nephrology, Medical University of Dublin (Schiffl and Lang, 2010, Huang et al., 2013) showing an increase in triglycerides and decrease in HDL in hemodialysed patients. Also in the interesting study of Maheshwari and colleagues (Maheshwari et al., 2010) performed at the Department of Nephro-Urology, Liaquat University Hospital, Hyderabad, Pakistan. In this interesting work 50 patients included. All of the patients were with end-stage renal disease with maintenance hemodialysis (MHD), and all exhibited similar abnormalities of lipid metabolism like hypertriglyceridemia and low levels of HDL, all of these could lead to the developments of atherosclerosis and ultimately cardiovascular diseases, increasing the morbidity and mortality in such kind of patients. These findings

are consistent with the study which showed an increase in triglycerides in post dialysis patients of 21% and reduction in the HDL lipoprotein of 11%.

These data strongly suggest that hemodialysis is associated with definite changes in lipid profile. All patients of ESRD on conventional hemodialysis showed significantly higher levels of serum triglycerides and lower levels of HDL especially significant change was observed if they were smokers irrespective of their age, gender and BMI. Therefore, smoking could be an effect modifier but from the study findings we could say that conventional hemodialysis associated dyslipidemias could be an independent causative factor for cardiovascular deaths in end stage renal disease. This pattern of lipid abnormality can be decreased by using high flux hemodialysis and different atherosclerosis complications can be prevented as evidenced by different international data. Additional large-scale case-control studies are needed to further strengthen the above statemen.

CONCLUSION

The current study data strongly support the impression that dyslipidemias are more prevalent in patients with end-stage renal disease. It could be an independent causative factor for cardiovascular deaths in end-stage renal disease.

Conflict of interest

All the authors declare that there is no conflict of interest.

Ethical approval

Ethical and other necessary approvals were taken from the Ethical Review Board of the Sargodha Medical College, Sargodha, Pakistan.

Consent for Publication

All author approved manuscript for publication.

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