ISSN : 2309-3234

TMSS MEDICAL COLLEGE JOURNAL

Volume 04, No. 01, January 2015

An Official Publication of TMSS Medical College, Bogra

TMSS Medical College Journal

January 2015

An Offical Publication
of
TMSS Medical College, Bogra

TMSS Medical College Journal

Vol.3, No. 1, January 2015

An Offical Publication of TMSS Medical College, Bogra, Bangladesh

Published by

Dr. Md. Abdul Mazid
on behalf of the TMSS Medical College

Graphic Designer

Md. Sirajul Islam
TMSS, Bogra

Printed by

TMSS Printing Press
Bogra, Bangladesh

Address of Correspondence

Executive Editor, TMSS Medical College Journal
TMSS Medical College, Rangpur Road
Thengamara, Bogra, Bangladesh.
Phone: 051-61830, Fax : 051-61830
e-mail: editortmcjournal@gmail.com
Web: www.tmssmedicalcollege.com

Pattern of Lipid Profile in Patients of Chronic Kidney Disease on Maintenance Hemodialysis

Mazumder P[1*], Sultana N[2], Chowdhury SN[3], Rahman T[4], Rahman MH[5]

1. Dr. Pinke Mazumder, Assistant professor, Department of Biochemistry, Army Medical college, Bogra.
2. Dr. Nasima Sultana, Professor & Head of the Department of Biochemistry, Dhaka Medical college, Dhaka.
3. Dr. Sanjeela Nahreen Chowdhury, Assistant professor, Department of Biochemistry, Universal Medical college, Dhaka.
4. Dr. Taniza Rahman, Assistant professor, Department of Biochemistry, MH Samorita Medical college, Dhaka.
5. Dr. Mohammad Hafizur Rahman, Associate Professor, Department of Biochemistry Dhaka Medical college, Dhaka.

* Corresponding Author

Abstract

Background: Dyslipidemia is a very common complication of chronic kidney disease (CKD) patients with maintenance hemodialysis (MHD). CKD is an increasing health problem all around the world. End stage renal disease (ESRD) patients are treated with hemodialysis. It is a recognized risk factor of cardiovascular disease and progression of renal disease of various etiologies. **Objective:** To observe the lipid profile in CKD patients with MHD. **Methodology:** This cross sectional comparative study was carried out in the Department of Biochemistry, Dhaka Medical College, Dhaka during the period of July 2013 to June 2014. A total number of 100 subjects of both sexes were selected with age ranging from 18 to 60 years. Among them, 50 CKD patients with maintenance hemodialysis (MHD) were included in group I and 50 health subjects in group II. Serum lipid profile of all the groups was assessed and statistically compared. For statistical analysis unpaired student t-test was performed using SPSS for windows version 16. **Results:** The mean (±SD) of serum TG level was significantly higher and serum HDL-C level was significantly lower in CKD patients with MHD (172.22 ± 32.83 and 33.60 ± 5.45) than healthy control group (140.44 ± 37.99 and 39.94 ± 9.26). **Conclusion:** Dyslipidemia is more common in CKD patients with MHD than the healthy control.

Key Words: Chronic kidney disease, Dyslipidemia, Maintenance hemodialysis, cardiovascular disease.

Introduction

Chronic kidney disease (CKD) is becoming a worldwide health problem due to increasing incidence and prevalence.[1] It is a pathophysiological process with multiple etiologies resulting in the inexorable attrition of functional nephrons and frequently leading to end stage renal disease (ESRD) necessitating hemodialysis as a mandatory therapeutic measure. Kidney Disease Outcomes Quality Initiative (K/DOQI) defines CKD as either kidney damage for≥3months, as defined by structural or functional abnormalities of kidney, with or without decreased glomerular filtration rate (GFR) or GFR <60 ml/min/1.73m^2 for ≥ 3 months, with or without kidney damage.[2] CKD causes metabolic abnormalities of plasma lipids both qualitatively and quantitatively.[3] The incidence and prevalence of chronic kidney diseases (CKD) are increasing worldwide and has become a major health problem[4]. Approximately 50% of patients with end-stage renal disease (ESRD) die from cardiovascular events, 5 which indicate that cardiovascular mortality is 30-times higher in CKD patients. The Kidney Dialysis Outcome Quality Initiative (K/DOQI) 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 of dyslipidemia to reduce the cardiovascular complications in these patients.[6] Dyslipidemia has been established as a well known traditional risk factor for CVD in the general population as well as in CKD patients on MHD. CKD is known to cause an increase in triglycerides and a decrease in high-density lipoprotein that mimic the lipid abnormalities of the metabolic syndrome, which accelerate the progresssion of CKD and increase the risk for cardiovascular mortality. Hemodialysis patients usually display elevated TG, reduced

serum high density lipoprotein (HDL) cholesterol and elevated concentration of lipoprotein-a (LP-a). Total and LDL cholesterol levels usually remain within normal limits.[7] Cholesterol levels may be lower in MHD patients. There is an inverse relationship between mortality and the cholesterol concentration.[8] This pattern of reverse epidemiology, i.e., hypercholesterolemia associated with decreased mortality and low cholesterol concentration associated with increased CVD mortality seen in MHD patients has been related to the malnutrition-inflammation-atherosclerosis complex.[9] Keeping in view the mortality associated with CVD in patients on MHD, we investigated the serum lipid status in CKD patients undergoing long-term hemodialysis (>3 months) treatment and compared the values with healthy subjects.

Materials and Methods

The present study was a cross sectional comparative study, which was conducted in the Department of Biochemistry, Dhaka Medical College, Dhaka during the period from July 2013 to June 2014. A total number of 100 subjects of both sexes were selected purposively with age ranging from 18 to 60 years. Among them, 50 patients were CKD patients on MHD (Group I) and 50 were healthy comparison group (Group II). Patients were selected from Nephrology ward of Dhaka Medical College Hospital, Dhaka. Patients taking lipid lowering medications, hypothyroidism patients, chronic liver diseases patients, pregnancy, age <18 years and > 60 years and malignancy were excluded from the study. After selection of subjects, the objectives, nature, purpose and benefit of the study were explained in detail in each subject. Informed consent was taken. Data were collected in pre designed structured questionnaire form by the researcher herself. Age, sex, occupation and marital status were noted as per statement of the participants at the time of interview. History regarding smoking habit, duration of dialysis, hypertension, diabetes mellitus, pregnancy, history of any cardiovascular event, thyroid disorder, chronic liver disease, any malignancy was taken. Drug history regarding lipid-lowering drugs was noted. Then participants were examined for height, weight, blood pressure. The study parameter was serum lipid profile. Estimation of study parameter was done in the Department of Biochemistry, Dhaka Medical College. After 12-hours fasting, blood samples were drawn from the arterio-venous fistula before starting dialysis. Serum total cholesterol (TC), triglyceride (TG) and high density lipoprotein-cholesterol (HDL-C) were assayed on semi automated biochemical analyzer. Low density lipoprotein-cholesterol (LDL-C) was calculated by Friedwald equation.[10] LDL-C= Total Cholesterol - (HDL-C + *TG*5).

Results

Table 1 shows the distribution of baseline characteristics of study subjects. The mean age of CKD with MHD was 39.64 ±11.90. BMI was lower in CKD patients with MHD than that of the control (20.9 ± 3.1 vs 21.7 ± 2.9). Both the systolic (184 ± 26) and diastolic (101 ± 16) blood pressure in patients were significantly higher when compared to that of the controls (117 ± 9 and 77 ± 8 respectively), $p<0.05$.

Table II shows the distribution of study subjects according to lipid profile in the CKD patients with MHD and the controls. The mean of triglyceride (172.22 ± 32.83) was significantly higher and HDL-C (33.60 ± 5.45) was significantly lower in CKD patients with MHD when compared with that of control (140.44 ± 37.99 and 39.94 ± 9.26) respectively, $p<0.05$. Total cholesterol (159.40 ± 20.39) was lower and LDL-C (115.10 ± 16.37) was higher in CKD patients with MHD than the controls but non-significant.

Table III shows lipid profile status at different

duration of MHD. The mean (±SD) of serum total cholesterol, HDL-C, LDL-C and triglyceride level at ?1 year of duration of dialysis were157.25 ± 18.81, 31.81 ± 3.60, 117.25 ± 22.89 and 186.18 ± 42.99, respectively; at 1-3 year of duration of dialysis were 159.70 ± 19.39, 35.15 ± 6.56, 110.54 ± 7.63 and 162.25 ± 22.77, respectively; at >3 year of duration of dialysis were 161.42 ± 24.49, 33.42 ± 5.16, 119.17 ± 16.29 and 170.50 ± 27.88 respectively. All of these differences were statistically non-significant.

Table I: Distribution of baseline characteristics of study subjects (n=100)

Baseline characteristics	Groups	
	Group I (CKD with MHD) (n=50)	Group II (Healthy) (n=50)
Age (Years) (mean ±SD)	39.64±11.90	37.94±12.26
Gender		
Male n(%)	34 (68.0)	26 (52.0)
Female n(%)	16 (32.0)	24 (48.0)
BMI (kg/m²) (mean ± SD)	20.9±3.1	21.7±2.9
Blood pressure(mm of Hg) (mean ± SD)		
Systolic BP	184±26	117±9
Diastolic BP	101±16	77±8

n = Number of subjects. Results are expressed as mean±SD.

Table II: Distribution of study subjects according to lipid profile in group I and group II

Lipid profile	Group		P value
	Group I (CKD with MHD) (n=50)	Group II (Healthy) (n=50)	
TC (mg/dL)	159.40 ± 20.39	166.80 ± 35.89	0.208
HDL-C (mg/dL)	33.60 ± 5.45	39.94 ± 9.26	0.001
LDL-C (mg/dL)	115.10 ± 16.37	107.17 ± 28.30	0.089
TG (mg/dL)	172.22 ± 32.83	140.44 ± 37.99	0.001

p value determined by Unpaired Student 't' test. Pvalue <0.05 was taken as level of significant. Results are expressed as mean±SD.

Table III: Lipid profile status at different duration of MHD

Lipid profile	Duration H/D			P value
	1 year (n=16)	1-3 year (n=20)	>3 years (n=14)	
TC (mg/dL)	157.25 ± 18.81	159.70 ± 19.39	161.42 ± 24.49	0.857
HDL-C (mg/dL)	31.81 ± 3.60	35.15 ± 6.56	33.42 ± 5.16	0.190
LDL-C (mg/dL)	117.25 ± 22.89	110.54 ± 7.63	119.17 ± 16.29	0.266
TG (mg/dL)	186.18 ± 42.99	162.25 ± 22.77	170.50 ± 27.88	0.090

p value was determined by ANOVA test. P value <0.05 was taken as level of significant. Results are expressed as mean ± SD. n = Number of subjects.

Discussion

In this study, the pattern of dyslipidemia in CKD patients on MHD shows hypertriglyceridemia and reduced HDL-C.

In our study, the serum triglyceride levels were found to be significantly higher in MHD patients as compared to control group. Similar hypertriglyceridemia was also observed in other study.[11] The accumulation of triglycerides leading to hypertriglyceridemia in CKD is the consequence of both a high production and a low catabolism of triglycerides.

But the predominant mechanism which is attributed for hypertriglyceridemia in CKD is decreased catabolism of triglycerides.[12] Various factors contribute to this metabolic aberration in CKD, which includes:

- Diminished lipoprotein lipase (LPL) activity as a consequence of the down regulation of the enzyme with Basha et al.[13]
- A disproportionate increase in plasma apolipoprotein C-III which is a possible cause of lipoprotein lipase inactivation in uremia.[14]
- The presence of inhibitors of lipase in CKD patients.[15]

All these factors which lead to a qualitative or quantitative decrease in LPL activity in plasma

result in a decreased catabolism of triglycerides in chylomicrons and VLDL.

The second most common lipid abnormality in our study was low HDL-C level as compared to healthy control. This observation is in agreement with other study.[11,16]

The significant decrease of HDL-C in CKD can be attributed to

- Decreased levels of apolipoproteins AI and AII; the main protein constituents of HDL.[17]
- Diminished activity of LCAT; the enzyme responsible for the esterification of free cholesterol in HDL particles.[18]
- Increased activity of cholesteryl ester transfer protein (CETP) that facilitates the transfer of cholesterol esters from HDL to triglyceride-rich lipoproteins.[19]

All these factors combinedly act to reduce the serum concentration of HDL-C. Total cholesterol and LDL-C were not significantly different between the patients and control groups.

In this study, the mean (±SD) of total cholesterol, LDL-C, TG and HDL-C level were changed with the duration of dialysis but non-significant. This finding was inconsistent with studies of Nelva et al.[20]

Conclusion

Patients undergoing MHD show important abnormalities of lipid metabolism such as hypertriglyceridemia and low HDL-C, which could contribute to atherosclerosis and cardiovascular disease and may increase the morbidity and mortality in this group.

References

1. Eknoyan G, Lameire N, Barsoum R, Eckardt KU, Levin A, et al. The burden of kidney disease: improving global outcome. Kidney Int. 2004; 66:1310-1314.
2. Levey AS, Coresh J, Balk E, Kausz AT, Levin A, Steffes MW, et al. National kidney foundation practice guidelines for chronic kidney disease: evaluation, classification, and stratification. Ann Intern Med. 2003; 139(2): 137-47.
3. Attman PO, Samuelsson O, Alaupovic P. Lipoprotein metabolism and renal failure. Am J Kidney Dis. 1993; 21: 573-592.
4. El Nahas AM, Bello AK. Chronic Kidney disease: The global challenge. Lancet 2005; 365:331-340.
5. Foley RN, Parfrey PS, Sarnak MJ. Clinical epidemiology of cardiovascular disease in chronic renal disease. Am J Kidney Dis. 1998; 32: 112-9.
6. National Kidney Foundation. K/DOQI clinical practice guidelines for managing dyslipidemias in chronic kidney disease. Am J Kidney Dis. 2003;41(suppl 3):1-92.
7. Deighan CJ, Caslake MJ, McConnell M, BoultonJones JM, Packard CJ. Atherogenic lipoprotein phenotype in end-stage renal failure: origin and extent of small dense low density lipoprotein formation. Am J Kidney Dis. 2000;35:852-62.
8. Iseki K, Yamazato M, Tozawa M, Takishita S. Hypocholesterolemia is a significant predictor of death in a cohort of chronic hemodialysis patients. Kidney Int. 2002; 61:1887-93.
9. Liu Y, Coresh J, Eustace JA, et al. Association between cholesterol level and mortality in dialysis patients: Role of inflammation and malnutrition. JAMA. 2004; 291:451-9.

10. Friedwald WT, Levy RI, Fredrickson DS. Estimation of the concentration of low-density lipoprotein cholesterol in plasma without use of preparative ultracentrifuge. Clin Chem. 1972; 18:499-502.

11. Maheshwari N, Ansari MR, Laghari MS, Darshana, Lal K, Ahmed K. Pattern of lipid profile in patients on maintenance hemodialysis. Saudi J Kidney Dis Transpl. 2010 Sep 22; 21: 565-70.

12. Prinsen BH, Sain-van der Velden MG, Koning EJ, Koomans HA, Berger R, et al. Hypertriglyceridemia in patients with chronic renal failure: possible mechanisms. Kidney Int Suppl. 2003; May 84: 121-4.

13. Vaziri ND, Liang K. Down-regulation of tissue lipoprotein lipase expression in experimental chronic renal failure. Kidney Int. 1996; 50: 1928-35.

14. Moberly JB, Attman PO, Samuelsson O, Johansson AC, Knight-Gibson C, et al. Apolipoprotein C-III, hypertriglyceridemia and triglyceride-rich lipoproteins in uremia. Miner Electrolyte Metab. 1996;25: 258-262.

15. Cheung AK, Parker CJ, Ren K, Iverius PH. Increased lipase inhibition in uremia: identification of pre-beta-HDL as a major inhibitor in normal and uremic plasma. Kidney Int. 1996; 49: 1360-71.

16. Pennell P, Leclercq B, Delahunty MI, Walters BA. The utility of non-HDL in managing dyslipidemia of stage 5 chronic kidney diseases. Clin Nephrol. 2006; 66(5): 336-47.

17. Vaziri ND, Deng G, Liang K. Hepatic HDL receptor, SR-B1 and Apo A-I expression in chronic renal failure. Nephrol Dial Transplant. 1999; 14: 1462-6.

18. Guarnieri GF, Moracchiello M, Campanacci L, Ursini F, Ferri L, et al. Lecithin-cholesterol acyltransferase (LCAT) activity in chronic uremia. Kidney Int. 1978; 26-30.

19. Kimura H, Miyazaki R, Imura T, Masunaga S, Suzuki S, et al. Hepatic lipase mutation may reduce vascular disease prevalence in hemodialysis patients with high CETP levels. Kidney Int. 2003; 64: 1829-1837.

20. Nelva T, Gomez D, Ana D, Giammona M, Luis A,Touceda. 'Lipid abnormalities in Chronic Renal Failure patients undergoing hemodialysis.'Medicina, 2001;61(2): 142-6.