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A study of lipid profile and its correlation between magnesium in non-diabetic chronic kidney disease patients on hemodialysis

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Abstract
Background: Patients with CKD have an increased risk for cardiovascular disease. Since dyslipidemia, a major risk factor for coronary heart disease, an early detection and intervention for any alterations in the lipid profile of these patients will possibly help to prevent cardiovascular complications and rapid progression of renal failure.
Objectives
- To determine the pattern of dyslipidemia in non-diabetic CKD patients on hemodialysis.
- Correlation between lipid profile and magnesium in non-diabetic chronic kidney disease patients on hemodialysis.

Methods: It is an observational cross sectional study in 100 subjects in which 50 are apparently healthy, remaining are non-diabetic CKD patients on hemodialysis. An estimation of total cholesterol, triglycerides, serum HDL, VLDL and serum magnesium will be done by enzymatic method by using an autoanalyser in S.R.G hospital Jhalawar**.** Cardiovascular risk indices (TC/HDL-C and LDL/HDL-C) were also determined.
Results: CKD was seen in all age groups with a mean age of 41.5 years and predominantly in males (68%).The mean triglyceride level (P<0.0001) higher than the control while HDL-C was significantly lower (P<0.0001). Cardiovascular risk indices TC/HDL-C, LDL-C/HDL-C were higher than the control. Serum magnesium level was significantly negatively correlated with serum triglycerides.
Conclusion: The abnormalities of lipid metabolism, such as hyper-triglyceridemia and low HDL-C, were associated with a low level of magnesium, could contribute to accelerated atherosclerosis and cardiovascular disease in hemodialysis patients.

Keywords: CKD - Chronic Kidney Disease, Dyslipidemia, HD - Hemodialysis, lipid ratios, Serum Magnesium, TG- Triglyceride, TC - Total cholesterol, HDL cholesterol, LDL- cholesterol, VLDL, MHD- maintenance hemodialysis

Introduction

Chronic Kidney Disease (CKD) is a worldwide health problem. Over the last decade, CKD is associated with a very high mortality, morbidity rate and accelerated cardio-vascular (CV) disease[1]. In patients, who later advanced to CKD stage 5 and especially on dialysis, the prevalence of clinical coronary heart disease is 40% and CVD mortality is 10 to 30 times higher than in the general population of the same gender, age and race [1, 2].

Dyslipidemia among HD patients negatively impacts cardiovascular profiles, which in turn influence the frequency and/or duration of hospitalizations [3]. A study by Kurella *et al.* [4] indicated that each component of metabolic syndrome including hypertriglyceridemia and low high density lipoprotein cholesterol (HDL-C) is an independent risk factor of developing CKD.

Previous studies based on Korean populations indicated that triglyceride (TG)/HDL-C ratio is independently associated with CKD [5, 6]. Since dyslipidemia, a major modifiable risk factor for coronary heart disease, an early detection and intervention for any alterations in the lipid profile of these patients will possibly help to prevent cardiovascular complications and rapid progression of renal failure.

Objectives

- To determine the pattern of dyslipidemia in non-diabetic CKD patients on hemodialysis.
- Correlation of lipid profile with magnesium in non-diabetic chronic kidney disease patients on hemodialysis.

Materials and Methods

It is an observational cross sectional study conducted in 100 subjects in which 50 subjects are apparently healthy, remaining are non-diabetic CKD patients on hemodialysis.

Exclusion Criteria

- Age below 18 years
- Patients on lipid lowering agents
- Acute or chronic infection
- Patients with already diagnosed diabetes mellitus/ hypertension/ischemic heart disease/hypothyroidism.
- Patients with acute medical conditions requiring ICU admissions
- Body mass index (BMI) more than24.9 kg/m2

Inclusion Criteria

- Age above 18 years
- CKD patients on hemodialysis for more than 6 months.

Ethics Statement

All the patients had to sign an informed written consent before being included into the study. The study was conducted after due approval by the Ethical Committee of Jhalawar Medical College, and during the course of study the conditions of Ethical Committee were followed.

A thorough clinical examination was done with special reference to signs of CKD like pallor, puffiness of face etc. Blood pressure was measured with standard mercury sphygmomanometer in all four limbs. Hypertension was defined as blood pressure >140/90 mm Hg or if patient is already on antihypertensive drug. The morning urine sample and blood samples were collected after 8 hours of overnight fasting for complete hemogram, blood urea levels, serum creatinine levels, serum electrolytes and lipid profile

The clinical diagnosis of CKD was done based on elevation of serum creatinine for more than 3 months. Estimated Glomerular Filtration Rate (eGFR) was calculated by the Cockcroft-Gault equation i.e., 140 – age x body wt(kg) 72 x S.Creatinine(mg/dl).

Biochemical Examination

An estimation of total cholesterol, triglycerides, serum HDL, VLDL and serum magnesium will be done by enzymatic method by using autoanalyser in S.R.G hospital Jhalawar**.** Cardiovascular risk indices (TC/HDL-C and LDL/HDL-C) were also determined.

The total cholesterol, triglyceride (TG) or low density lipoprotein (LDL) levels more than 95th percentile for age and gender or high density lipoprotein (HDL) less than 35 mg/dl was defined as dyslipidemia.

Data Analysis

Data was analysed by using SPSS 20.0 (trial version) software and appropriate statistical test were used to analyse the data. Results were expressed as mean ± standard deviation and were analyzed by unpaired Student's t-test. The value of $P<0.01$ was considered significantly.

Results

In 100 subjects, 50 patients in the maintenance hemodialysis (MHD) group and 50 subjects in the control group were studied. There were 34 males (68%) and 16 females (32%) in the MHD group. Also 30 males (60%) and 20 females (40%) in the control group.

Age among MHD and control groups were 41.5±13.88 years and 42.5±9.4 years respectively. Among MHD patients, the mean urea was 175.16±72.83 mg/dl and creatinine was 11.04±3.4 mg/dl. The mean triglyceride level ($P<0.0001$) higher than the control while HDL-C was significantly lower ($P<0.0001$).

Cardiovascular risk indices TC/HDL-C, LDL-C/HDL-C were higher than the control.

Serum magnesium in CKD patients significantly correlated with Age ($P<0.01$), systolic blood pressure ($p<0.001$), serum Triglyceride levels (P=0.029), FBS (p= 0.04).

Tables and Figures

Table 1: Baseline Characteristics of Study Population

	Control(n=50)	Cases(n=50)
Age (years) Mean ±SD	42.5±9.4	41.5±13.88
Gender(M/F)	30/20	34/16
Height(cm)	162.56±8.62	158.86 ± 8.25
Weight(kg)	64.72±11.41	46.35 ± 5.07
BMI	24.29±2.44	18.27 ± 1.82
Systolic Blood Pressure	100 ± 9.8	168.56 ± 10.59
Diastolic Blood Pressure	76.09 ± 5.8	104.04 ± 11.28
Urea(mg/dl)	44.36±14.83	175.16±72.83
Creatinine (mg/dl)	.94±.27	11.04±3.4
GFR	95.6 ± 2.44	6.9 ± 15.58
Number of Hemodialysis	-	18.09 ± 15.86
F B S(mg/dl)	105.62±8.61	105.52±15.65
Serum Albumin	4.5 ± 0.54	2.8 ± 0.35
S. Magnesium	2.3 ± 0.01	2.12 ± 0.3

Table: 2: Correlation between serum magnesium with the clinical and biochemical characteristics in non- diabetic CKD patients in haemodialysis.

	P value	R value
Age (years) Mean ±SD	0.01	-0641
Gender(M/F)	0.623	-0.00
Height	0.25	-0.11
Weight	0.32	-0.152
BMI	0.75	-0.046
Systolic Blood Pressure	0.003	-0.325
Diastolic Blood Pressure	0.145	-0.185
Urea(mg/dl)	0.366	0.121
Creatinine (mg/dl)	0.856	-0.046
GFR	0.904	
Number of Haemodialysis	0.333	-0.155
F B S(mg/dl)	0.04	-0.38
Serum Albumin	0.908	0.017
Triglycerides	0.021	-0.310
Serum cholesterol	0.075	-0.270
HDL	0.0285	0.01

Table 3: Lipid Profile among Control and CKD Patients

	Group	N	Mean	Std. Deviation	T value	P value
Total Cholesterol	CKD Cases	50	185.22	86.50547	0.703	0.484
	Control	50	175.4	47.73823		
Triglycerides	CKD Cases	50	153.44	89.51186	3.665	<0.0001*
	Control	50	102.04	42.67627		
LDL Cholestrol	CKD Cases	50	109.78	41.96417	1.481	0.142
	Control	50	120.9	32.5164		

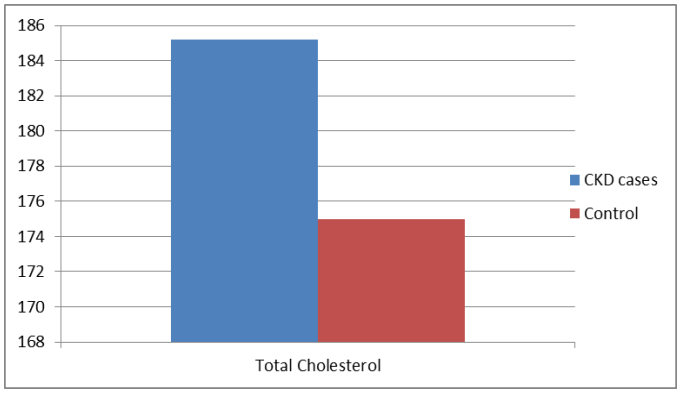

Fig 1: Distribution of total cholesterol in control and CKD subject group.

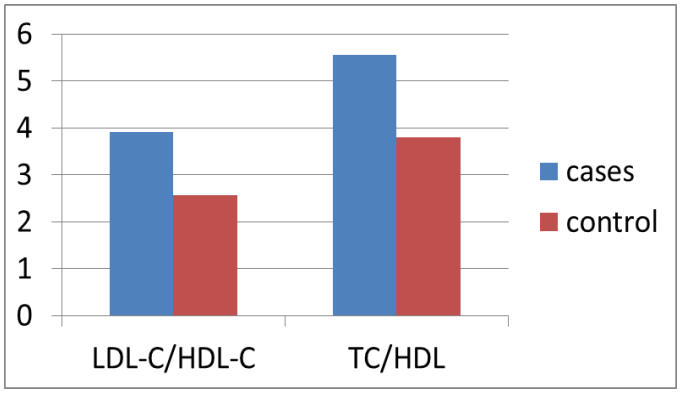

Fig 2: Lipid Ratios

Data are represented as mean ± S.D. and analysed using unpaired t-test. $p<0.05$ considered as significance level.

Discussion

We investigated the serum lipid profile in non – diabetic HD patients and compared them with healthy control in the present study. In the analysis of the serum lipid profile, serum TG, total cholesterol, LDL- cholesterol and VLDL were significantly higher in CKD non – diabetic patients on haemodialysis group than healthy controls. But HDL-cholesterol was lower in CKD patients. Also lipid ratio which is a good marker of cardiovascular disease was higher in haemodialysis group.

There is growing evidence that abnormalities in lipid metabolism contribute to renal disease progression [7, 8]. The pathophysiological basis for dyslipidemia in CKD is not only acceleration of atherosclerosis in the renal microcirculation, but also accumulation of lipoprotein in glomerular apparatus and stimulates inflammation mediators and contribute for fibrogenesis [9, 10].

Muntner *et al.* [11] studied the association of plasma lipids to a rise in serum creatinine of 0.4 mg/dl or greater in 12728 participants with baseline serum creatinine that was less than 2.0 mg/dl in men and less than 1.8 mg/dl in women. Subjects with higher baseline triglyceride and lower HDL-cholesterol levels were at increased risk for a rise in creatinine.

Samuelsson *et al* [12] studied, 73 non-diabetic patients with CKD were followed for an average of 3.2 years. In the study, it is indicated that TC, LDL-C, and triglyceride-rich apoB-containing lipoproteins contributed to a more rapid decline in renal function. After 9 years' follow-up in the Atherosclerosis Risk in Communities study, it was shown that hypertriglyceridemia and low HDL-C were associated with the incident of CKD.

Small density LDL-C phenotype is a risk factor of coronary heart disease. The series of metabolic disorders might predict endothelial dysfunction that might lead to an increased susceptibility to thrombosis [13]. An alternation is using TG/LDL-C ratio which might be a surrogate for small density LDL-C [14].

When using TG/HDL-C ratio to predict the existence of a small LDL-C particle size pattern, the sensitivity was 75.9% and the specificity 85.4% in a previous study [15]. TG/HDL-C ratio can be used as a surrogate of insulin resistance and can be used to predict coronary heart disease independently. Kim *et al* [6]. used lipid ratios to predict CKD in Korean populations. It showed TG/HDL-C ratio is the only lipid ratio associated with CKD in both men and women [5, 6].

The present study showed deranged lipid profile in relation to serum magnesium. Magnesium showed positive correlation with HDL. i.e. (p= 0.02) which was significant. The magnesium was significantly negatively correlated with serum triglycerides, with p value ($p<0.001$). Magnesium was negatively correlated with total cholesterol levels p value (p = 0.07) which is not significant. Thus the lower serum magnesium level may be associated with dyslipidemia in patients on haemodialysis.

No statistically significant effect of magnesium concentration on the content of lipids analysed in blood serum was found by J. Elementol *et. al.* [16]. Magnesium content in blood serum was also positively correlated with HDL cholesterol in men of both groups. A positive effect on LDL-cholesterol was found in the group of older women and that of younger men. Also, small negative correlation between Mg and LDL-cholesterol contents was obtained in older men..

Feng Liu *et al* [17], recruited 98 chronic HD patients. High-density lipoprotein cholesterol (HDL-c) levels, carotid artery plaque (CAP), and carotid intima-media thickness (CIMT) (all $p<0.05$, respectively) were higher in patients with low serum magnesium There was no significant correlation between Mg and low-density lipoprotein cholesterol (LDL-c), lipoprotein-a (LP-a), cholesterol (TC), serum triglycerides (TG) ($p>0.05$, respectively).

In Robles NR *et al* [18], twenty-five haemodialysis patients reported a positive significant correlation between serum magnesium levels and serum total cholesterol, and serum triglycerides.

Conclusion

- The present study showed, patients on MHD had abnormalities of lipid metabolism such as hypertriglyceridemia, low HDL-C and low serum magnesium which is a potential contributor to atherosclerosis and cardiovascular disease and may increase the morbidity and mortality in this group.
- A strict monitoring of lipid profile can reduce the morbidity and mortality rate and will improve the quality of life of CKD patients.

References

1. Foley RN, Parfrey PS, Sarnak MJ. Clinical epidemiology of cardiovascular disease in chronic renal disease. Am J Kidney Dis. 1998; 32(3):S112-9.
2. Parfrey PS, Foley RN, Harnett JD. Outcome and risk factors of ischemic heart disease in chronic uremia. Kidney Int. 1996; 49(5):1428-34.
3. Baugh ME, Stoltz ML, Vanbeber AD, Gorman MA. Are lipid values and BMI related to hospitalizations in the hemodialysis population. J Ren Nutr. 2001; 11(1):37-45.
4. Kurella M, Lo JC, Chertow GM. Metabolic syndrome and the risk for chronic kidney disease among nondiabetic adults. J. Am. Soc. Nephrol. 2005; 16:2134-2140.
5. Kang HT, Shim JY, Lee YJ, Lee JE, Linton JA, Kim JK *et al*. Association between the ratio of triglycerides to high-density lipoprotein cholesterol and chronic kidney diseasein Korean adults: The 2005 Korean national hHealth and nutrition examination survey. Kidney Blood Press. Res. 2011, 34:173-179.
6. Kim JY, Kang HT, Lee HR, Lee YJ, Shim JY. Comparison of lipid-related ratios for prediction of chronic kidney disease stage 3 or more in Korean adults. J. Korean Med. Sci. 2012; 27:1524-1594.
7. Schaeffner ES, Kurth T, Curhan GC, Glynn RJ, Rexrode KM *et al*. Cholesterol and the risk of renal dysfunction in apparently healthy men. J Am Soc Nephrol. 2003; 14:2084-2091.
8. Hovind P, Rossing P, Tarnow L, Smidt UM, Parving HH. Remission and regression in the nephropathy of type 1 diabetes when blood pressure is controlled aggressively. Kidney Int. 2001; 60:277–283.
9. Rovin BH, Tan LC. Ldl stimulates mesangial fibronectin production and chemoattractant expression. Kidney Int. 1993; 43:218-225.
10. Abrass CK. Cellular lipid metabolism and the role of lipids in progressive renal disease. Am J Nephrol. 2004; 24:46-53.
11. Muntner P, Coresh J, Smith JC, Eckfeldt J, Klag MJ. Plasma lipids and risk of developing renal dysfunction: The atherosclerosis risk in communities study. Kidney Int. 2000; 58:293-301.
12. Samuelsson O, Attman PO, Knight-Gibson C, Larsson R, Mulec H, Weiss L *et al*. Complex apolipoprotein B-containing lipoprotein particles are associated with a higher rate of progression of human chronic renal insufficiency. J. Am. Soc. Nephrol. 1998; 9:1482-1488.
13. Lamarche B, Lemieux I, Després JP. The small, dense LDL phenotype and the risk of coronary heart disease: epidemiology, patho-physiology and therapeutic aspects. Diabetes Metab. 1999; 25:199-211.
14. Bhalodkar NC, Blum S, Enas EA. Accuracy of the ratio of triglycerides to high-density lipoprotein cholesterol for predicting low-density lipoprotein cholesterol particle sizes, phenotype B, and particle concentrations among Asian Indians. Am. J Cardiol. 2006, 97:1007–1009.
15. Fan X, Liu EY, Hoffman VP, Potts AJ, Sharma B, Henderson DC. Triglyceride/high-density lipoprotein cholesterol ratio: A surrogate to predict insulin resistance and low-density lipoprotein cholesterol particle size in nondiabetic patients with schizophrenia. J Clin. Psychiatry. 2011; 72:806-812.
16. Elementol J *et al*. Evaluation of the correlations between magnesium concentration and selected serum lipid components in women and men of different age with chronic kidney failure. 2010; 15(2):321-329.
17. Feng Liu, Xintian Zhanng *et al*. Corelataion of serum magnesium with cardiovascular risk factors in maintenance hemodialysis patients. A cross sectional study. Magnes res. 2013; 26(3):100-8
18. Robles NR, Escola JM, Albarran L, Espada R, Cruz A. Correlation of serum magnesium and serum lipid levels in hemodialysis patients. Dialysis & Transplantation 1998; 27(10):644.648.