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LIPID PROFILE AND ITS ASSOCIATION WITH TREATMENT MODALITIES IN CHRONIC KIDNEY DISEASE PATIENTS: A STUDY FROM A TERTIARY CARE CENTRE IN BUNDELKHAND, MADHYA PRADESH

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Abstract

Background: Progression of CKD is associated with a number of complications such as thyroid dysfunction, dyslipidaemia and cardiovascular diseases (CVD) [6]. Patients with CKD often develop cardiovascular disease as a complication, leading to an extremely high rate of cardiovascular-associated mortality. One of the important co-morbidities are lipid dysfunction in patients with CKD. Method: The patients underwent a comprehensive clinical and biochemical evaluation through well-structured face to face interviews, during their initial hospital visit. **Method:** The patients with confirmed cases of chronic kidney disease, demographic characteristics were noted. Patients were asked about the presence of family history of chronic kidney disease, whether patient were undergoing dialysis for the CKD, and the presence or absence of diabetes mellitus, hypertension, smoking habits, alcohol consumption, tobacco use, and dietary preferences. Following the overnight fasting period, approximately 5 ml of blood was drawn aseptically form each patient. The serum was separated and lipid profile tests were conducted within 4 hours on same day. Result: The table summarizes serum cholesterol, triglyceride, HDL, LDL, and VLDL levels of 250 patients.

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Cholesterol was <200 mg/dl in 86.8% of patients, triglycerides <150 mg/dl in most cases, and HDL <40 mg/dl in 50.8%, with significant variation. LDL was <100 mg/dl in 74.8% and VLDL <40 mg/dl in 78.8%, both showing significant differences ($P < 0.05$). The data highlights most patients had favorable cholesterol, LDL, and VLDL levels but low HDL levels, suggesting these parameters are critical for assessing cardiovascular risk. **Conclusion:** The study reveals that chronic kidney disease (CKD) is primarily affecting the middle-aged population, with males being 1.77 times more susceptible than females. Common lipid abnormalities include low HDL levels and hypertriglyceridemia. 33 patients had elevated cholesterol, 108 had elevated triglycerides, 127 had deranged or decreased HDL levels, and 25 CKD patients had increased LDL.

Keywords: Lipid profile. Chronic Kidney disease, Treatment modalities, Bundelkhand

INTRODUCTION

Chronic kidney disease (CKD) is a growing health burden and important cause of morbidity and mortality an estimated 350 million people in worldwide and resulting 0.5-1 million deaths annually as well as in India [1,2]. Chronic kidney disease refers to an irreversible deterioration in renal function which classically develops over a period of years. Initially, its manifest's only as a biochemical abnormality. Eventually loss of excretory, metabolic and endocrine functions of the kidneys leads to clinical symptoms and signs of renal failure, which are referred to as uraemia [3]. Chronic kidney disease includes a spectrum of distinct pathophysiological processes which is associated with abnormal kidney function [4].

Various pathological processes in CKD ultimately results in loss of renal metabolic, excretory, endocrine, and synthetic functions due to the accumulation of various protein nitrogenous substances [5].

Chronic kidney disease (CKD) is a clinical syndrome due to irreversible renal dysfunction leading to excretory, metabolic and synthetic failure resulting in accumulation of nitrogenous waste products and presents with various clinical manifestations leading to constellation of symptoms resulting from fluid retention and extravasation causing pedal edema, acute pulmonary edema and other volume overload signs and symptoms along with retention of uremic toxins with consequent signs and symptoms. Chronic kidney disease predisposes to number of systemic abnormalities [4].

The number of CKD patient is increasing day by day, probably due to increase in non-communicable diseases having, DM, hypertension, GN (glomerulonephritis), interstitial nephritis [3].

Progression of CKD is associated with a number of complications such as thyroid dysfunction, dyslipidaemia and cardiovascular diseases (CVD) [6]. Patients with CKD often develop cardiovascular disease as a complication, leading to an extremely high rate of cardiovascular-associated mortality [1].

One of the important co-morbidities are lipid dysfunction in patients with CKD. Hyperlipidaemia, an abnormally high level of lipids in the blood, is a well-known risk factor

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for early atherosclerosis causing various cardiovascular diseases, is frequently seen in patients with CKD [5].

Hyperlipidaemia, one of the important risk factors of atherosclerosis, is an abnormality commonly encountered in patients with chronic kidney disease [7]. Hyperlipidaemia, an abnormally high level of lipids in blood, is a well-known risk factor for early Atherosclerosis causing various cardiovascular diseases, is frequently seen in patients with CKD [7]. The interrelationship between chronic kidney disease and risk of cardiovascular diseases has been extensively studied. Patients with CKD should be a target for aggressive cardiovascular risk reduction given the high cardiovascular morbidity and mortality [8]. Lipid profiles vary widely in these patients, reflecting the level of kidney function and the degree of proteinuria [3].

The initial stages of CKD are mostly managed by primary care physicians and they have a pivotal role in delaying the progression of CKD to ESRD by addressing various comorbidities associated with CKD by identifying and intervening them early [5].

Patients seek medical attention when they are symptomatic, usually late in the course of disease. CKD only comes to light in earlier stages when kidney function evaluation is done for either other health conditions or, less commonly, for routine screening [9].

The study was conducted in the Bundelkhand area of India. Bundelkhand is spread over about 69,000 km^2. Of land in seven districts of Uttar Pradesh (Chitrakut, Banda, Jhansi, Jalaun, Hamirpur, Mahoba and Lalitpur) and six districts of Madhya Pradesh (Chhatarpur, Tikamgarh, Damoh, Sagar, Datia and Panna) [10].

This study is conducted to assess lipid profile with kidney function test in CKD patients to find out dyslipidaemia with conservative and dialysis management of kidney disease.

Study could prove to be a crucial step in identification of patients at risk, early diagnosis as well as treatment of complication and public health interventions and policy, and resource planning. There are limited data on treatment, outcomes, and prevention of disease in youth with these conditions to help inform clinical decision-making and define best practices.

METHODOLOGY

Study design: The study was a facility based, Cross-Sectional analytical study, single centred, to study.

Locus of the study: The department of biochemistry associated with department of general medicine at a medical college in Bundelkhand region of Madhya Pradesh.

Ethical committee approval: Present study was approved by the institutional ethical committee. Informed written consent was obtained from the patients.

Time frame: Study was conducted for a period of 1 year from August 2022 to July 2023.

Sample size: Two hundred fifty

Sampling technique: Consecutive sampling method was used to elect participants.

Selection of patients: Patients with confirmed cases of chronic kidney disease presenting to the Department of Medicine at Government Bundelkhand Medical College and Hospital, Sagar, Madhya Pradesh, India who met the following inclusion criteria and did not have any exclusion criteria were included in the study.

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Inclusion criteria: All confirmed cases of chronic kidney disease patients aged 18 years and above, of both sexes, Urea levels >50 mg/dl and creatinine levels >1.3 mg/dl were included in the study.

Exclusion criteria: Pregnant and lactating female patients, individual with acute renal failure, those admitted to the ICU for other comorbidities such as acute illness or evidence of acute infection or trauma within the last four weeks, recent surgery or burns, history of parenteral iron administration within the last 14 days or history of blood transfusion within the last month.

Study methodology: The study was conducted in accordance with Good clinical practice guidelines. The patients underwent a comprehensive clinical and biochemical evaluation through well-structured face to face interviews, during their initial hospital visit.

For the patients with confirmed cases of chronic kidney disease, demographic characteristics such as age, sex, education, occupation, and address were noted. Patients were asked about the presence of family history of chronic kidney disease, whether patient were undergoing dialysis for the CKD, and the presence or absence of diabetes mellitus, hypertension, smoking habits, alcohol consumption, tobacco use, and dietary preferences (nonvegetarian or vegetarian).

Blood samples were collected after 12 hours fast to avoid post prandial changes in serum level. Following the overnight fasting period, approximately 5 ml of blood was drawn aseptically form each patient. The blood sample was collected in a standardized plain test tube for lipid profile analysis. The serum was separated and transferred to an Eppendorf tube and the test were conducted within 4 hours on same day [11].

Table 1: Test and method used for analysis

Test	Normal value	Method
Total cholesterol	<200 mg/dl	CHOD-PAP method
Triglycerides	<150 mg/dl	GPO-method
HDL	>40 mg/dl	PVS/PEGME precipitation method
LDL	<100 mg/dl	PVS/PEGME precipitation method
VLDL	<30 mg/dl	calculated

RESULTS

Among the 250 patients in our study, 64 % patients were males and 36 % of patients were females. The mean age of the participants was 55 ± 15.75 years. The primary aetiology of CKD in the study was HTN followed by DM. In our study, 250 CKD patients, in which 118 (47.2%) patients were on conservative line management and 132 (52.8%) patients were on haemodialysis.

Table 2: Serum Cholesterol Level in participants

Parameter	Levels (mg/dl)	N (%)	Mean ± SD	95% CI	P-value
Cholesterol	<200	217 (86.8)	141±32.19	(136.69,145.30)	0.000
	200-239	18 (7.2)	223.13±12.76	(216.79, 229.48)	0.000
	>240	15 (6.0)	287.71±54.98	(257.26, 318.16)	0.000
Triglyceride	<150	142 (56.8)	110.29±23.61	(106.37, 114.20)	0.000
	150-199	55 (22)	170.30±14.75	(166.32, 174.29)	0.000
	200-499	52 (20.8)	259.94±55.15	(244.59, 275.30)	0.000

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	>500	1 (0.4)	830	—	—
HDL	<40	127 (50.8)	31.76±5.7	(30.76, 32.76)	0.000
	40-60	95 (38)	48.45±4.96	(47.44, 49.46)	0.000
	>60	28 (11.2)	70.03±1-0.12	(66.11, 73.96)	0.000
LDL	<100	187 (74.8)	62.95±20.94	(59.93, 65.97)	0.000
	100-129	38 (15.2)	111.10±7.21	(108.73, 113.47)	0.000
	130-159	12 (4.8)	137.89±7.51	(133.12, 142.66)	0.000
	160-189	9 (3.6)	169.93±8.56	(163.35, 176.51)	0.000
	>190	4 (1.6)	208.28±22.85	(171.91, 244.64)	0.000
VLDL	<40	197 (78.8)	25.45±6.86	(24.49, 26.41)	0.000
	>40	53 (21.2)	54.44±19.51	(49.06, 59.82)	0.000

The table presents a summary of the serum cholesterol, triglyceride, and HDL levels of 250 patients. Out of these, 86.8% had cholesterol below 200 mg/dl, 7.2% in the 200-239 range, and 6.0% above 240 mg/dl. The majority of patients had cholesterol levels below 200 mg/dl. The triglyceride levels were divided into four groups: (<150), (150-199), (200-499), and (>400). The majority of patients had triglyceride levels below 150 mg/dl. The HDL levels were divided into three groups: (<40), (40-60), and (>60) mg/dl. Out of these, 50.8% had HDL levels below 40 mg/dl, 38.0% in the 40-60 range, and 11.2% in the above 60 range. The majority of patients had HDL levels below 40 mg/dl, indicating a significant difference between the groups with the population mean. The data suggests that these levels are crucial for predicting cardiovascular health.

The serum LDL and VLDL levels of 250 patients. Out of these, 74.8% had LDL levels below 100 mg/dl, 15.2% in the 100-129 range, 4.8% in the 130-159 range, 3.6% in the 160-189 range, and 1.6% in the above 190 range. The majority of patients had LDL levels below 100 mg/dl, with a P-value <0.05 indicating a significant difference between the groups. The serum VLDL levels were divided into two groups: (<40) and (>40). Out of 250 patients, 78.8% had VLDL levels below 40 mg/dl, while 21.2% had VLDL levels above 40 mg/dl. The majority of patients had VLDL levels below 40 mg/dl, with a P-value <0.05 indicating a significant difference between the groups.

Table 3: Association between serum cholesterol level and serum LDL level with type of treatment/management among the participants.

	Level (mg/dl)	**Type of treatment (Management of the disease)**			**Chi-square value/ Fisher's exact test P-value**
		Haemodialysis	**Conservative treatment**	**Total**	
S. Cholesterol	<200	117 (54)	100 (46)	217 (100)	0.470
	200 – 239	7 (39)	11 (61)	18 (100)	
	>240	8 (53)	7 (47)	15 (100)	
LDL	<100	99 (53)	88 (47)	187 (100)	
	100 – 129	19 (50)	19 (50)	38 (100)	

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	130 – 159	7 (58)	5 (42)	12 (100)	0.988
	160 – 189	5 (56)	4 (44)	9 (100)	
	>190	2 (50)	2 (50)	4 (100)	

The table 3 displays the association between serum cholesterol and serum LDL levels and the type of treatment/management among participants. There are two types of treatment/ management: haemodialysis and conservative management. There are three levels for serum cholesterol (<200), levels 200-239, and levels more than 240. The chi-square test was used to examine the association, and the P-value was not significant at 0.05. There were no associations between serum cholesterol and type of treatment/ management. The association between serum LDL level and type of treatment/management was examined using the Fisher's exact test, which was <5 and had a P-value of 0.988, indicating no association between serum LDL level and type of treatment/management. The results suggest that there is no significant association between serum cholesterol and type of treatment/management among participants.

The figure 1 indicates the number of CKD patients showing following lipid disorder. Lipid disorder in which who had elevated cholesterol and elevated triglycerides are 33, 108 respectively. And 127 patients had deranged or decreased HDL level. Lastly, 25 patients of CKD had increased LDL.

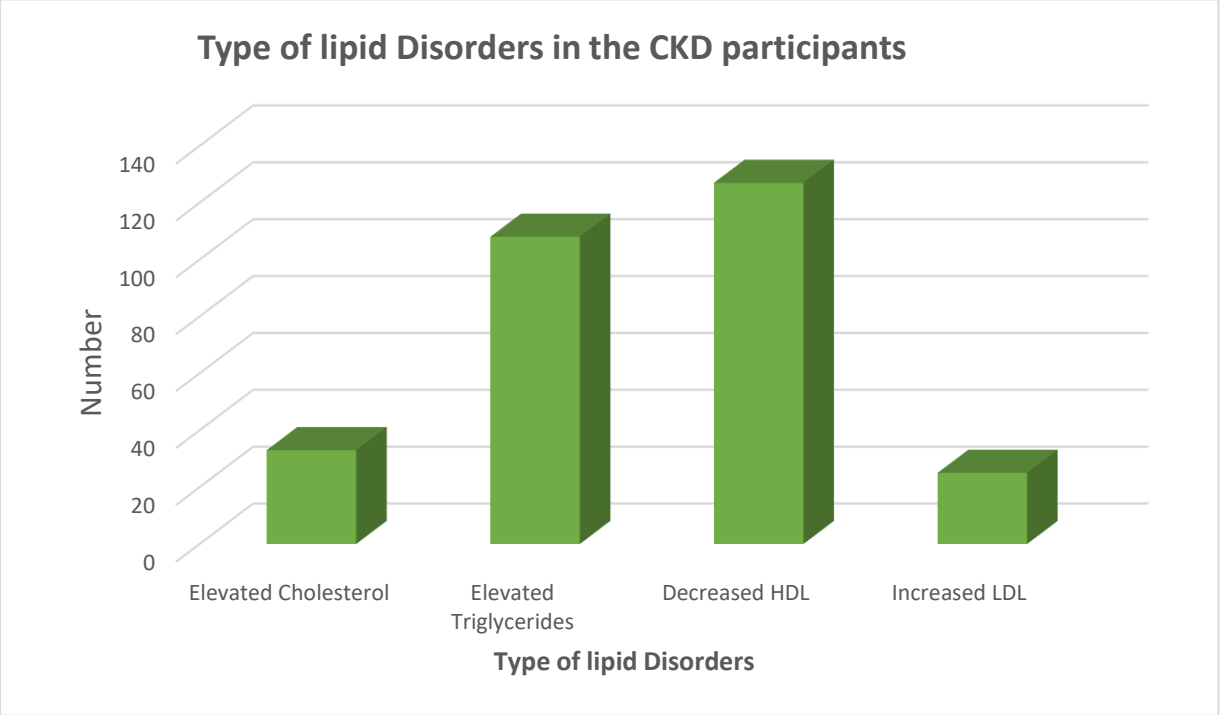

Fig 1: The dyslipidaemia among the participants

DISCUSSION

In present study, most common lipid abnormalities found were Low HDL levels and hypertriglyceridaemia. The low HDL levels in patients with chronic kidney disease in our study were consistent with Diana M Lee LG et al who studied the lipid profile in CRF patients [12]. This low HDL cholesterol levels were also an independent risk factor for the development of

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CKD in the Framingham off spring study. Several mechanisms may underlie these reductions in HDL cholesterol levels, which is usually an indication of impaired reverse cholesterol transport. Apo A, which is the activator of lecithin–cholesterol acyltransferase (LACT), is reduced in CKD due to down regulation of hepatic ApoAI genes leads to decline in the activity of LACT, which causes reduced cholesterol esterification and impairment of HDL maturation. The activity of LACT is consistently diminished in CKD, so there is decrease in HDL levels [13]. The study found significant lipid abnormalities in CKD patients, including elevated total cholesterol, LDL, triglycerides, and reduced HDL. These findings align with previous research by Attman and Alaupovic [14], who linked these abnormalities to impaired lipid metabolism due to reduced lipoprotein lipase activity and uremic toxins accumulation.

Triglyceride levels were significantly elevated in our study. Abnormal triglyceride values were found in 108 of patients in our study. The present study demonstrates that CKD is commonly accompanied by lipid abnormality in the form of hyper-triglyceridaemia. This is similar to the observations made in the study done by Meena Singh Bhagwan et al. [15] Elevated triglyceride levels are due to impaired activity lipoprotein lipase (LPL) and direct inhibitory effect of various uremic 'toxins' on the enzymes involved in lipid metabolism represent the most important pathophysiological mechanisms underlying the development of hyper-triglyceridaemia in renal failure. Trevisan, et al. [16] also found hyper-triglyceridaemia was the major abnormality in their studies. Hyper triglyceridaemia represents an early feature of renal failure.

The socio-economic and dietary context of the Bundelkhand region significantly influenced lipid profiles, with a predominantly vegetarian diet contributing to lower cholesterol levels compared to Western populations, such as the chronic renal insufficiency Cohort in the United States [17], which reported higher lipid levels due to higher dietary fat intake.

Our findings are comparable to Indian studies by Agarwal, et al. [18] and Singh, et al. [19], which reported similar dyslipidaemia patterns in CKD patients. However, variations were noted in the severity of lipid abnormalities. For instance, Agarwal, et al. observed more severe dyslipidaemia in advanced CKD stages, likely reflecting regional differences in healthcare access and dietary habits.

Limitations: Due to the absence of echocardiogram analysis for the patients, the actual prevalence of cardiovascular disease in CKD patients remains undetermined.

Clinical implication: Lipid-lowering therapies like statins and fibrates should be part of routine kidney disease care, as recommended by KDIGO guidelines, to reduce cardiovascular burden in CKD patients.

CONCLUSION

The study reveals that chronic kidney disease (CKD) is primarily affecting the middle-aged population, with males being 1.77 times more susceptible than females. Common lipid abnormalities include low HDL levels and hypertriglyceridemia. 33 patients had elevated cholesterol, 108 had elevated triglycerides, 127 had deranged or decreased HDL levels, and 25

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CKD patients had increased LDL. The study highlights the importance of understanding the lipid disorders in CKD patients.

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