

# Serum Lipids In Pre- Dialysis Chronic Renal Failure Patients In Jos University Teaching Hospital, Nigeria

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## SUMMARY

A prospective study of serum lipids in pre-dialysis chronic renal failure (CRF) patients in the Jos university teaching hospital over a twelve-month period undertaken to determine the pattern of lipid abnormalities associated with this disease.

Lipids were measured in the fasting state using standard methods in 67 patients with CRF and 50 healthy controls. The means of total cholesterol and triglyceride were similar in both groups. The mean HDL cholesterol was significantly lower in the study group compared to controls; being  $1.72 \pm 1.34$  mmol/L and  $4.21 \pm 1.89$  mmol/L respectively ( $df=1$ ,  $F=83.78$ ,  $p < 0.001$ ), while LDL cholesterol was significantly higher in the study group compared to controls ( $2.90 \pm 1.56$  mmol/L vs.  $1.87 \pm 1.00$  mmol/L;  $df=1$ ,  $F=16.99$ ,  $p < 0.001$ ). Similarly, the mean LDL/HDL cholesterol, an index of atherogenicity, was significantly higher in the study group compared to controls ( $3.12 \pm 3.18$  vs.  $1.61 \pm 1.92$ ;  $df=1$ ,  $F=8.85$ ,  $p < 0.001$ ).

Serum lipid abnormalities are common in patients with CRF hence increasing the risk for the development of coronary heart disease in them. The

management of such patients should also include treatments aimed at correcting lipid abnormalities.

**KEY WORDS:** Hyperlipidaemia, Dyslipidaemia, Chronic Renal Failure

## INTRODUCTION

Lipid abnormalities are one of the common metabolic derangements of chronic renal failure<sup>1-4</sup>, a condition that accounts for 2-12.8% of medical admissions in Nigeria<sup>5,6</sup>. They have been implicated in the pathogenesis of cardiovascular morbidity and mortality in chronic renal failure<sup>7</sup>. Furthermore, they are important determinants of renal function loss both in diabetic and non-diabetic nephropathies<sup>8,9</sup>. This underscores the need for their detection as treatment reduces the risk of cardiovascular morbidity and mortality and also retards the progression of chronic renal failure<sup>10</sup>.

Several patterns of lipid abnormalities have been described in patients with chronic renal failure in the Western world<sup>2-4,11-13</sup>. Till date, there is no study on serum lipid profile in Nigerians with chronic

renal failure hence the magnitude of this problem is unknown. We thus studied serum lipids in pre-dialysis Nigerians with chronic renal failure with a view of determining the pattern of abnormality and assessing the risk for coronary heart disease.

## MATERIALS AND METHODS

This is a case-control study of patients with chronic renal failure (CRF) seen in the renal unit of the Jos University Teaching Hospital, a referral center for the states in North Central Nigeria. The study was carried out between March 2001 and September 2001.

The ethical committee of the hospital approved the study and informed consent was obtained from the participants.

Each consecutive patient seen within the study period in the renal unit with a glomerular filtration rate (GFR) of  $< 50$  ml/minute and a similar group of randomly selected healthy controls comprising largely medical students and nurses were recruited for the study. The following investigations were carried out on all the participants: urinalysis, urine microscopy, urea and electrolytes, serum creatinine and fasting serum lipids in the routine laboratories of the hospital. Total cholesterol (TC) and high-density lipoprotein (HDL) cholesterol were assayed using Lieberman Burchard and enzymatic reactions respectively while low-density lipoprotein (LDL) cholesterol was estimated using the Friedwald formula<sup>14</sup>. GFR was estimated by 24-hour urinary creatinine clearance by the Jaffe reaction<sup>15</sup>. Hyperlipidaemia was diagnosed based on the Lipid Research Clinic tables (i.e. total cholesterol  $> 6.5$  mmol/L and/ or triglyceride level  $> 2.2$  mmol/L respectively)<sup>16</sup>.

Data obtained was analyzed using the statistical software EPI info version 6.04c. Chi-Square was used to test significance of association while student "t" test to compare means of variables where appropriate. Correlation statistics was also done. Results are expressed as means (SD). P values  $< 0.05$  were considered significant.

## RESULTS

A total of 67 patients with CRF (58.2% males and 41.8% females) and 50 healthy controls (58% males and 42% females) were studied with mean ages of  $42.17 \pm 17.0$  and  $45.44 \pm 11.21$  respectively (table 1). Chronic glomerulonephritis and systemic hypertension accounted for 65.5% of the causes of CRF.

Hypercholesterolemia was present in 19 (28.3%) of the study group and 5 (10%) of controls while hypertriglyceridemia in 22 (34%) and 9 (18%) respectively (figure 1). The mean values of total cholesterol and triglyceride were however similar in both groups (table 2). HDL levels were decreased to below normal levels in 31 (46%) of the study group compared to 5 (10%) of controls. The mean HDL cholesterol was significantly higher in the control group compared to the study group ( $4.21 \pm 1.89$  mmol/L vs.  $1.72 \pm 1.34$  mmol/L;  $df=1$ ,  $F=83.78$ ,  $p < 0.0001$ ). In contrast, the mean values of LDL cholesterol were  $2.90 \pm 1.56$  mmol/L in the study group and  $1.87 \pm 1.00$  mmol/L in the control group, the difference being statistically significant ( $df=1$ ,  $F=16.99$ ,  $p=0.0006$ ). Similarly, the mean values of LDL/HDL cholesterol ratio were significantly higher in the study group compared to the control group ( $3.12 \pm 3.18$  vs.  $1.61 \pm 1.92$ ;  $df=1$ ,  $F=8.85$ ,  $p=0.001$ ).

There exists a significant inverse relationship between serum creatinine and LDL cholesterol ( $r = -0.789$  respectively,  $df=1$ ,  $p$  value  $< 0.05$ ). A similar relationship also exists between LDL/HDL cholesterol ratio and GFR in the study group ( $r = -0.32$ ;  $df=1$ ,  $p$  value =  $0.05$ ). HDL cholesterol and total cholesterol however, do not correlate significantly with GFR in the study group ( $r = -0.08$  and  $-0.04$  respectively,  $df=1$ ,  $p$  values  $> 0.05$ ). Age, duration of disease, and serum urea do not correlate with any of the lipid fragments in the study group.

Table 1. Clinical parameters of study participants

Characteristic	Chronic renal failure	Controls	F statistic***	p Value
Mean age (years)	42.17± 17.0	45.44± 11.21	1.4	0.2
Sex (M/F*)	39/28	29/21	-----	—
Mean weight (KG)	64.43± 12.83	73.81± 14.64	13.56	<0.001**
Mean BMI (KG/M2)	23.21 ± 4.80	27.23 ± 4.01	23.05	<0.001**

\* M= Males;

F = Females

\*\* = p Values < 0.05 are statistically significant

+ = Standard Deviation of means

\*\*\*= Degree of freedom for F statistic= 1

Figure 1. Frequency of lipid abnormalities in chronic renal failure in JUTH

Table 2. Serum lipid profile of study participants

Lipid fragment	Chronic renal failure	Controls	F statistic**	p Value
Mean TC (mmol/L)	5.01 ± 1.69	4.83 ± 1.49	0.36	0.5
Mean TG (mmol/L)	1.77 ± 1.35	1.49 ± 0.97	1.55	0.2
Mean HDL (mmol/L)	1.72 ± 1.34	4.21 ± 1.89	83.78	<0.001*
Mean LDL (mmol/L)	2.90 ± 1.56	1.87 ± 1.00	16.99	<0.001*
Mean LDL/HDL	3.12 ± 3.18	1.61 ± 1.92	8.85	<0.001*

\*= p Value <0.05 are considered significant

+ = Standard Deviation of means

\*\* degree of freedom for F statistic =1

## DISCUSSION

Our study has shown that the pattern of hypertriglyceridaemia and decreased serum HDL-cholesterol is the most prevalent dyslipidaemia in pre-dialysis chronic renal failure patients as reported in the Western world<sup>11-13, 17-21</sup>. This duo exists in our patients and thus increases their risk for coronary heart disease. The mecha-

nisms of these lipid abnormalities in chronic renal failure are not completely understood, although reduced lipoprotein lipase activity and decreased synthesis of the HDL-2 sub-fraction have been proposed as likely causes<sup>(19,22.)</sup>

In conditions of hypertriglyceridaemia, very low-density lipoproteins are taken up by macrophages to form foam cells with resultant formation of atheromatous plaques on vascular endothelium. While hypertriglyceridaemia commonly occur in association with elevated levels of LDL, its occurrence alone is not sufficient to significantly increase coronary risk in chronic renal failure<sup>22</sup>. In this series, hypertriglyceridaemia appears quite common, not only in the study group, but also among the controls. This may be as a result of the smaller number of controls used.

In the normal population, there is an exponential relationship between serum cholesterol and coronary heart disease. This largely depends on LDL cholesterol, although the HDL cholesterol concentration is inversely related to the likelihood of developing coronary heart disease. There is strong epidemiological and clinical evidence that increased plasma LDL and decreased HDL levels are associated with increased atherosclerotic complications<sup>23</sup>. While increased concentrations of LDL are believed to be associated with increased deposition in vessel wall, low HDL may decrease the reverse cholesterol transport from tissues to liver leading to their accumulations in the tissues thereby losing the protection it confers. Taken together, the reduction in serum HDL-cholesterol coupled with an increase in the LDL-cholesterol is highly atherogenic<sup>7</sup>.

The LDL/HDL-cholesterol ratio has been shown to be a better index of coronary artery disease risk than LDL and HDL levels alone<sup>24</sup>. This ratio is also increased in our patients thus indicating the atherogenic burden the disease imposes on its sufferers. This pattern is common in patients

with chronic renal failure<sup>11,17</sup>.

Our study also demonstrates that an inverse relationship exists between serum creatinine, a marker of renal function and the major atherogenic lipid fragments especially the LDL cholesterol. This is in keeping with previous reports of lipid abnormalities in renal disease<sup>17-21</sup>. The apparent lack of association between the major atherogenic lipid fragment and GFR is possibly due to the relatively small sample size.

This study has established dyslipidaemia in pre-dialysis Nigerians with chronic renal failure. It also demonstrates the increased atherogenic burden associated with this disease. We recommend that the management of such patients should also include treatments aimed at correcting lipid abnormalities. Further studies are also recommended to fully determine the magnitude of this problem.

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