

Serum lipid profile of Nigerian diabetics with end stage renal disease

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Summary

Background: End stage renal disease (ESRD) and diabetes mellitus may have lipid abnormalities that act synergistically to place diabetics with ESRD at an augmented risk for cardiovascular morbidity and mortality. We studied serum lipid profile and risk ratio in Nigerian diabetics with ESRD as there is no data in this regard.

Materials and method: Serum lipid profile was determined in the fasting state for consecutive diabetic patients with ESRD seen in the Nephrology Unit of the Jos University Teaching Hospital over a 2- year period. A similar group of non- diabetic patients with ESRD and healthy individuals served as controls.

Results: A total of 21 diabetics and 30 non- diabetics both with ESRD and 36 controls were studied. High-density lipoprotein (HDL) cholesterol levels were lower in diabetics compared to controls (1.55 ± 1.14 mmol/L vs. 2.38 ± 0.57 mmol/L, $p < 0.05$) but similar to that of the non- diabetic group. On the contrary, low-density lipoprotein (LDL) cholesterol levels were higher in diabetics compared to controls (2.87 ± 2.07 mmol/L vs. 1.44 ± 0.52 mmol/L, $p < 0.05$). Serum Triglyceride and total Cholesterol levels were similar in all study groups. The LDL/HDL cholesterol ratio was higher in diabetics compared to non- diabetics and controls (3.65 ± 3.97 , 2.08 ± 1.72 , 0.61 ± 0.30 respectively, $p < 0.0001$; multiple comparison $p < 0.05$).

Conclusion: Cardiovascular risk as imposed by lipid abnormalities is elevated in Nigerian diabetic persons with ESRD compared to their non- diabetic counterparts as reported elsewhere.

Key-words: Atherogenic index, Diabetes, Dyslipidemia, End stage renal disease, Nigerians.

Résumé

Introduction: Maladie rénale étape finale (MREF) et diabète mellitus pouvaient avoir anomalie lipidique qui agit synergistiquement pour placer diabétiques avec (mref) au niveau augmenté du risque pour la morbidité et mortalité cardiovasculaire. Il s'agit d'une étude du profil sérum lipidique et proportion du risque chez diabétiques nigériens atteints du MREF parce qu'il n'y a aucune donnée à cet égard.

Méthode et matériel: Profil du sérum lipidique était décidé dans un état d'être à la diète pour des patients diabétiques consécutif atteints du MREF vus dans le service néphrologie du centre hospitalier universitaire du Jos au cours d'une durée de 2 ans. Un groupe pareil du patients non-diabétiques avec MREF et individu en bonne santé ont servi comme groupe témoin.

Résultats: un nombre total de 21 diabétiques et 30 non diabétiques les deux avec MREF et 36 groupe témoins ont été étudiés. Lipoprotéine densité élevée (LDE) taux de cholestérol étaient en baisse chez des diabétiques par rapport

au groupe témoin ($1,55 \pm 1,14$ mmol/L vs. $2,38 \pm 0,57$ mmol/L, $P < 0,05$) mais la même chose par rapport du groupe non-diabétique. Au contraire, lipoprotéine sensité basse (LDB) taux de cholestérol étaient élevées chez des diabétiques par rapport au groupe témoin ($2,87 \pm 2,07$ mmol/L vs $1,44 \pm 0,52$ mmol, $P < 0,05$). Sérum Triglyceride et taux de cholestérol total étaient pareil dans tous les groupes étudiés. La proportion LDB/LDE cholestérol était élevée chez des diabétiques par rapport au non diabétiques et groupe témoin ($3,65 \pm 3,97$, $2,08 \pm 1,72$, $0,61 \pm 0,30$ respectivement, $P < 0,0001$ comparaison multiple $P < 0,05$).

Conclusion: Risque cardiovasculaire comme imposé par anomalie lipidique est élevé chez des individus diabétique nigériens atteints du MREF par rapport aux leurs homologues comme on l'avait rapporté ailleurs.

Introduction

Type 2 diabetes mellitus (DM); a disease commonly complicated by lipid abnormalities is a leading cause of end stage renal disease worldwide.¹⁻³ Patients with end stage renal disease (ESRD) have lipid abnormalities that place them at an augmented risk for cardiovascular morbidity and mortality.⁴⁻⁶ While inconclusive, available data suggests that DM and ESRD contribute synergistically to the dyslipidemia of diabetics with ESRD and the development of atherosclerosis as a consequence⁷⁻⁹.

Although the vast majority of available literature on lipid abnormalities is in Caucasians, the interaction of race on lipids in chronic renal failure patients has been described¹⁰. In Nigeria, data on lipid profiles of patients with renal failure is scanty. Given the increasing contribution of diabetes, especially type 2 to the ESRD population world wide¹¹, we were interested in the lipid profile and risk ratio of Nigerian diabetics presenting with ESRD.

Materials and methods

Study design and setting

This is a case- control study of diabetic and non-diabetic patients with ESRD seen in the Nephrology Division of the Jos University Teaching Hospital, a referral center for the States in North Central Nigeria. The study was carried out over a 2- year period.

Data collection

Consecutive diabetic patients with ESRD seen in the unit within the study period and a similar group of non-diabetic patients with ESRD were recruited for the study. A similar group of healthy individuals served as controls. Participants were interviewed and physically examined. Weight and height were measured for each and body mass index (BMI) calculated. Serum lipid profile was determined for each participant in the fasting state in the routine chemical

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laboratory of the hospital. Risk ratio was calculated as the ratio of LDL cholesterol to HDL cholesterol. The following investigations were also carried out on all the participants: urea, electrolytes and serum creatinine. Glomerular filtration rate was estimated by the 24-hour urinary creatinine clearance.

Laboratory methods

Total cholesterol (TC) and triglyceride were assayed using Lieberman Burchard reaction, while high-density lipoprotein (HDL) cholesterol by enzymatic reaction and low-density lipoprotein (LDL) cholesterol by the Friedwald formula¹². Serum and urinary creatinine were determined by the Jaffe reaction.

Statistics

Statistical analysis was performed using NCSS statistical software for windows. Results are expressed in means (SD). Analysis of variance (ANOVA) was used to compare means and Bonferroni correction for multiple comparisons. The Chi-Square was used to compare proportions where appropriate. Correlation was performed by the Spearman method. Probability values <0.05 were considered significant.

Results

Patient characteristics

A total of 21 diabetics and 30 non-diabetics with ESRD and 36 controls were studied. The mean ages of the study

Table 1 Clinical and laboratory parameters of diabetics with end stage renal disease at the Jos University Teaching Hospital

Parameter	Diabetic group	Non-diabetic group	Controls	P value
Number (M/F)	16/5	22/8	24/12	-
Mean age (years)	55.52 ± 9.84	51.86 ± 8.96	49.28 ± 9.82	0.1
^b BMI (Kg/M ²)	24.51 ± 4.07	21.87 ± 3.72	24.89 ± 2.78	0.002
^c SBP (mmHg)	165.7 ± 30.8	158.6 ± 37.9	128.9 ± 12.2	<0.0001
^d DBP (mmHg)*	102.1 ± 21.5	113.2 ± 26.3	83.8 ± 7.6	<0.0001
Serum creatinine (umol/L)*	938.24 ± 404.09	1291.53 ± 632.72	84.36 ± 19.85	<0.0001
^e GFR (ml/min)*	6.08 ± 3.61	3.76 ± 1.56	92.64 ± 26.16	<0.0001
^f TC (mmo/L)	6.60 ± 2.57	4.22 ± 1.50	4.40 ± 0.89	0.06
^g TG (mmol/L)	1.86 ± 1.02	1.60 ± 1.56	1.27 ± 0.53	0.1
^h HDL (mmol/L)*	1.55 ± 1.14	1.43 ± 0.75	2.38 ± 0.57	<0.0001
ⁱ LDL (mmol/L)*	2.87 ± 2.07	2.19 ± 1.26	1.44 ± 0.52	0.0005

^amales/females, ^bbody mass index, ^csystolic blood pressure, ^ddiastolic blood pressure, ^eglomerular filtration rate, ^ftotal cholesterol, ^gtriglyceride, ^hhigh-density lipoprotein cholesterol, ⁱlow-density lipoprotein cholesterol.

*No statistically significant difference existed in these variables (i.e. SBP, DBP, GFR, HDL and LDL levels) in diabetic and non-diabetic groups.

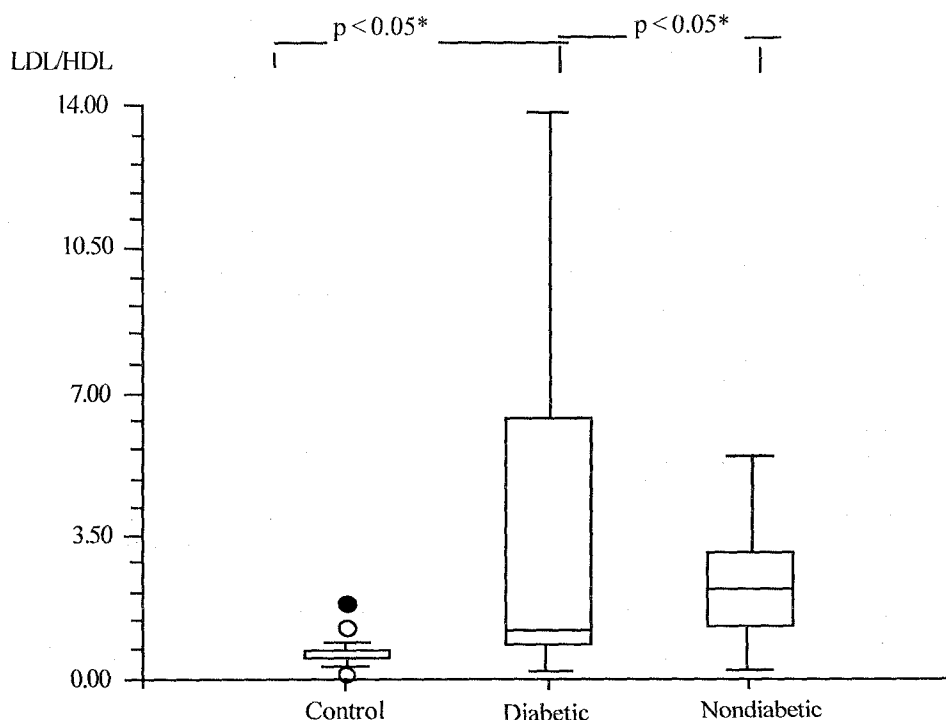


Fig. 1 LDL/HDL ratio in patients with end stage renal disease in Jos University Teaching Hospital

subjects were similar (Table 1). The mean GFR was similar in both diabetics and non- diabetics ($p = 0.1$)

Lipid profile and risk ratio

Serum TG and TC levels were similar in all study groups as shown in the table. HDL levels were lower in diabetics compared to controls (1.55 ± 1.14 mmol/L vs. 2.38 ± 0.57 mmol/L, $p < 0.05$) but similar to that of the non- diabetic group. On the contrary, LDL levels were higher in diabetics compared to controls (2.87 ± 2.07 mmol/L vs. 1.44 ± 0.52 mmol/L, $p < 0.05$).

LDL cholesterol correlated significantly with TC in diabetics ($r = 0.89$). A similar relationship also existed between LDL and TG ($r = 0.73$). A linear regression model that included TC and TG explained 77% of the variance (r^2) in LDL, whereas a model that included only TC explained the same amount of variance.

The risk ratio as measured by the LDL/ HDL cholesterol ratio was higher in diabetics compared to non- diabetics and controls as indicated in figure 1.

Discussion

Coronary heart disease is related to serum cholesterol in an exponential fashion, with the LDL cholesterol being largely responsible for this¹³. The HDL cholesterol however, is thought to be protective as the higher the levels the less the likelihood of developing coronary heart disease. The results of this study show that the pattern of increased LDL and reduced HDL exists in Nigerian diabetics with ESRD.

An increased concentration of LDL is associated with increased cholesterol deposition in the vessel wall. This is worsened in the face of HDL deficiency, as there is a decrease in reverse cholesterol transport from tissues to the liver¹³. Though considered to be highly atherogenic, this combination was found to occur in similar proportions in both the diabetic and non- diabetic groups in our study. This is in keeping with previous reports from other parts of the world^{14,15,9}. Taken in isolation, this would suggest that lipid profiles in diabetics with ESRD corresponded with their non- diabetic counterparts, indicating that the diabetic state does not confer additional atherogenic burden. However, this is not true, as the LDL/ HDL cholesterol ratio has been shown to be a better index of the risk of atherogenicity and its attendant complications than absolute levels of LDL and HDL cholesterol¹⁶. The LDL/ HDL cholesterol ratio was higher in diabetics with ESRD compared to the non- diabetic group in this study. This suggests that cardiovascular risk due to lipid abnormalities is higher in diabetic patients with ESRD compared to their non- diabetic counterparts despite seemingly similar LDL and HDL levels.

Diabetic patients in this study had a significantly higher BMI compared to their non-diabetic counterparts. It is possible that this could have contributed to the difference in the lipid profile of the two groups. However, our study was not designed to find out the cause of this difference. Further studies may be needed to determine factors that influence this risk as they would form possible points of targeted therapy.

Though racial differences in lipid and cardiovascular risk abnormalities have been noted in the general population and in the ESRD population¹⁰, this study has demonstrated that

cardiovascular risk as indicated by the atherogenic index is elevated in Nigerian diabetic persons with ESRD as have been reported in other parts of the world. In conclusion, the study shows that the diabetic and ESRD states contribute synergistically to the increased atherogenic burden of diabetics with ESRD as have been reported in other parts of the world.

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