

**AFRICAN JOURNAL OF  
MEDICINE  
and medical sciences**

VOLUME 33, NUMBER 2

JUNE 2004



Editor-in-Chief

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**O. D. OLALEYE**

ISSN 1116-4077

## Prevalence of coronary heart disease risk factors in Nigerians with systemic hypertension

\*OG Opadijo, \*\*AA Akande and \*\*AK Jimoh

\*Department of Medicine, \*\*Department of Chemical Pathology and Immunology, University of Ilorin Teaching Hospital, Ilorin, Kwara State, Nigeria

### Summary

This study is to determine the prevalence of coronary heart disease risk factors in Nigerians with systemic hypertension. Serum lipid profile and fasting blood glucose were determined in one hundred and thirty six newly diagnosed hypertensives selected from the Medical Outpatient Department. Basic demographic data as well as medico-social history was extracted from the records. Coronary heart disease risk was calculated from the ratios of high-density lipoprotein cholesterol to total cholesterol. High risk were defined as CHD ratio  $<0.18$ , while average and low CHD risk ratio was  $0.18$  to  $0.40$  and  $>0.40$  respectively, according to the European Atherosclerosis society guidelines. There were 76 (55.9%) males and 60 (44.1%) females aged 24-70 years (mean =  $47 \pm 8.5$ ) studied. The coronary risk ratio in the study groups was  $0.34$  as against  $0.57$  in the controls. The prevalence of high coronary heart disease risk in newly diagnosed hypertensives was 22%. The overall prevalence rate of hypercholesterolaemia was 62.5%, with high-risk group prevalence of 70%. The high-risk group was also associated with other non-lipid factors such as overweight -54% (BMI  $> 25\text{Kg/m}^2$ ), glucose intolerance-55% (FBS  $> 6.1\text{mmol/L}$ ), and alcoholism (55%). The overall prevalence of hypertriglyceridaemia was 20.4%, with higher serum values amongst females, and no risk group difference. The female patients were more affected by the metabolic risk parameters especially in the high and average risk groups. There is a need therefore, for clinicians to be encouraged to investigate lipid, lipoprotein cholesterol indices and other non-lipid risk factors to calculate the risk run by hypertensive patients of developing cardiovascular complications.

**Keywords:** *Coronary, heart disease, systemic hypertension*

### Resume

Pour déterminer le taux des facteurs à risque de la maladie coronaire du Cœur (MCC) aux Nigériens ayant l'hypertension systémique. Le profil des lipides dans le sérum et le taux de glucose à jeun étaient déterminés, à cent trente six hypertendus diagnostiqués et sélectionnés. Les données démographiques de base incluent l'histoire socio-médicale était extraite des registres individuels. Le

risque de la maladie coronaire du Cœur était calculé des proportions de densité élevées de lipoprotéine-cholestérol au cholestérol total. Les plus grands risques étaient définis comme la fraction du MCC  $<0.18$ , alors que la moyenne et le plus bas MCC était de  $0.18-0.40$  et  $>0.40$  respectivement, suivant les guides de la Société Européenne d'Atherosclérose. Ils y avaient 76 (55.9%) des mâles et 60 (44.7%) des femelles âgés de 24-70 ans avec une moyenne de  $47 \pm 8,5$  ans. La proportion de risque coronaire était de  $0.34$  contre  $0.57$  chez les contrôles. Le taux de risque de la maladie coronaire du Cœur était de 22% chez les hypertendus nouvellement diagnostiqués. La prévalence totale d'hypercholestérolémie était de 62.5% avec un maximum de 70%. Le groupe à grand risque était associé à d'autres facteurs non-lipides tels que l'accès de poids 54% (BMI  $<25\text{kg/m}^2$ ), l'intolérance du glucose-55% (FBS  $>6.1\text{mol/L}$ ) et l'alcoolisme-55%. La prévalence totale de l'hypertriglycérimie était de 20.4% avec les plus grandes valeurs de sérum chez les femelles. Les femmes étaient plus affectées par les paramètres à risque métaboliques spécialement aux groupes à risque plus élevé et moyen. Ainsi, ceci exprime le besoin aux médecins d'encourager les investigations des indices des lipides, lipoprotéines et cholestérol bien que les facteurs à risque non-lipides aux patients hypertendus de développer les complications cardiovasculaires.

### Introduction

Systemic hypertension is a common non-communicable disease with a prevalence rate of 12% in Nigeria [1]. It is associated with central obesity and cardiovascular events such as heart failure, coronary heart disease (CHD) and stroke [2-4]. Coronary heart disease is a leading cause of mortality and morbidity in the western countries [5]. However, the incidence is believed to be low in Nigeria, in view of low serum lipids in the Nigerian population [6-8]. Disease states such as hypertension, nephrotic syndrome, and diabetes mellitus are associated with hypercholesterolemia. Recent evidence suggests that hypertension may interact with other factors such as dyslipidemia, smoking, alcoholism in the development of CHD. The precise nature of that interaction however remains unclear. The apparent CHD risk associated with systemic hypertension may have a lipid mechanism involving either high-density lipoprotein-cholesterol or triglyceride [9].

This frequent connection between essential hypertension and lipid metabolism alterations had led physicians to look for possible pathogenetic links between them [10]. There is a suggestion that the relationship between

hypercholesterolemia, endothelial dysfunction and hypertension is supported by a notion that products of lipid oxidation may reduce endothelial nitrous oxide bioactivity [11]. The decrease does not necessarily result in systemic hypertension, but it may enhance the sensitivity to the hypertensive effect of dietary salt [11]. Previous reports show that most Nigerian hypertensives are not being subjected to detailed lipid profile in the course of their management compared to other risk factors, which are got through the medical history [12].

This study was thus aimed at determining the prevalence of coronary modifiable risk factors in diagnosed hypertensive by analysing the serum lipid profile, and relating this biochemical parameter to other risk factors such as smoking, alcoholism and obesity.

### Materials and methods

One hundred and thirty-six newly diagnosed adult Hypertensive that have never been on anti hypertensive therapy drawn from the General outpatient department were studied (mean age was 47.0±8.5 years). They were compared with 120 age and sex matched healthy Normotensive Nigerians drawn from the hospital workers and medical outpatients. Systemic hypertension was established with blood pressure (BP) >140/90mmHg on two clinic visits at three weeks interval. The BP was taken on the right arm in the sitting position after at least 30 minutes of rest in the clinic. Excluded from the study were patients with diabetes mellitus, renal disease, and liver disease and evidence of acute myocardial infarction. Direct questioning of the patients as regards alcohol consumption and cigarette smoking was done in the clinic. Their height and weight were recorded and their body mass index calculated using the formular  $Wt \text{ in Kg.} / Ht \text{ in m}^2$  [2,13].

A five millilitres fasting venous blood sample was collected from the antecubital vein into a plain tube and fluoride oxalate. Serum was extracted from the clotted sample for the determination of total cholesterol (TC), triglyceride (Trig), low-density lipoprotein -cholesterol (LDL-C), high-density lipoprotein -cholesterol (HDL-C) and fasting blood glucose. Low-density lipoprotein -cholesterol (LDL-C) and high-density lipoprotein -cholesterol (HDL-C) were precipitated by polyvinyl sulphate [14] (PVS) and phosphotungstic acid method respectively [15]. All serum cholesterol and triglyceride were determined by the enzymatic colorimetric method [16,17]. Fasting blood glucose was determined by the glucose oxidase method using 4-aminophenazone as the oxygen acceptor [18]. Coronary risk ratio was calculated using the formular  $HDL-C / TC$  [19].

The patients were then divided into three groups namely: High risk (A), average risk (B) and low risk (C) according to the level of coronary risk ratio. Data analysis was done using Chi square test of significance to compare proportions and the Students t-test for comparison between the means of two groups. P- value of < 0.05 was taken as being statistically significant.

### Results

136 subjects aged 24-70 years (mean = 47±8.5) were studied. There were 76 (55.9%) males and 60 (44.1%) females ( $P < 0.001$ ). The coronary risk ratio value in the patients is 0.34 as against 0.57 in the controls. Thirty (22%) patients belong to group A, 62 (45.6%) group B and 44 (32.4%) group C according to coronary risk ratio (HDL/TC).

Normal value is >37, while the high-risk value is 0.07 - 0.18. The average and low risk value is 0.18 - 0.27 and 0.25 - 0.40 respectively. The mean values for groups A, B and C patients were 0.12, 0.29 and 0.62 respectively. The sex ratio in each group was 1:1 as shown on table 1. The overall mean fasting blood sugar (FBS) in the subjects was 5.05 mmol/L as against the healthy controls with 4.0 mmol/L ( $P < 0.001$ ). The mean values of the other metabolic parameters are as shown in table 2.

There was no statistical difference ( $P > 0.05$ ) in the serum fasting blood glucose between the group A and group B. The values being 6.1 ± 0.2 mmol/L and 5.4 ± 0.2 mmol/L respectively. Also, the mean FBS for the group C was similar to the control group. The female patients were more affected by the metabolic risk parameters than their male counterparts especially in the groups A and B. It is only in the TC and LDL-C of group C patients that the females tend to bear the coronary risk brunt than the males. See table 2.

Altogether the prevalence of hypercholesterolemia in newly diagnosed patients was (85) 62.5%. Group A patients had a prevalence of (60) 70%, group B (19) 22%, while group C had (6) 8%. Overall prevalence of hyperglycaemia was (62) 46%. The prevalence was (34) 55% in group A, (20) 32% in group B and (8) 13% in group C. The mean HDL-C was significantly reduced, while LDL-C was high in group A in both sexes as compared to other groups ( $P < 0.0001$ ). There was no significant difference in both sexes as regards coronary risk ratio in-group A. ( $P > 0.05$ ). Fourteen (54%) of group A were obese (BMI >25Kg/m<sup>2</sup>), ten (38%) in group B, and two (8%) in group C. Altogether, 26 (19.1%) patients were obese in the studied population, compared to 3 (2.5%) in the control group,  $P < 0.01$ . In the group A patients, females were more affected by obesity and glucose intolerance (FBG > 6.5mmol/L). The serum cholesterol values were significantly higher ( $P < 0.0001$ ) in the females for all risk groups and the control.

The total number of smokers in the studied group was 10 (7.3%), as compared to 4 (3.3%) in the control group. There were no significant difference ( $P > 0.05$ ) in the lipid profile among the smokers and non-smokers in all risk groups. The overall prevalence of alcohol ingestion in the subjects was 55.1%. Group A patients had the highest prevalence of 67%, while groups B and C patients had 28% and 5% respectively. The prevalence of hypertriglyceridaemia was 20.4% in the subjects; however, there is no difference between the risk groups. The female subjects in the three groups had a higher ( $P < 0.001$ ) serum value than their male counterparts.

Table 1: Age and sex distribution in the three risk groups

Age years	High risk			%	Average risk			%	Low risk			%
	M	F	Total		M	F	Total		M	F	Total	
< 30	1	0	1	3.3	0	0	0	0	1	1	1	2.3
31 - 39	1	0	1	3.3	4	5	9	14.5	1	3	3	6.8
40 - 49	2	1	3	10	10	4	14	22.6	19	10	29	65.8
50 - 59	7	5	12	40	12	9	23	37.1	2	7	9	20.5
60 - 69	3	5	8	26.7	8	6	14	22.6	1	0	1	2.3
> 70	2	3	5	16.7	1	1	2	3.2	1	0	1	2.3
Total	16	14	30	100	35	27	62	100	25	19	44	100

Table 2: The mean values of fasting blood sugar, lipid profile and coronary heart disease risk ratio by sex.

Serum *Chemistry	High risk group No =30		Average risk group No = 62		Low risk group NO. = 44		Control No. = 50	
	M	F	M	F	M	F	M	F
FBS	5.70 ± 0.2	6.50 ± 0.4	5.00 ± 0.1	5.07 ± 0.2	4.02 ± 0.1	4.10 ± 0.1	4.00 ± 0.2	4.00 ± 0.5
TRG	1.00 ± 0.2	1.61 ± 0.2	1.29 ± 0.3	1.46 ± 0.2	1.36 ± 0.8	1.39 ± 0.6	1.42 ± 0.4	1.82 ± 0.6
Total								
Cholesterol	5.14 ± 0.8	5.65 ± 0.5	4.28 ± 0.5	4.77 ± 0.2	4.41 ± 0.5	4.97 ± 0.4	4.40 ± 0.5	5.1 ± 0.2
HDL-C	0.62 ± 0.8	0.57 ± 0.7	1.22 ± 0.9	1.64 ± 1.1	2.93 ± 0.7	2.21 ± 1.0	2.58 ± 0.8	2.25 ± 1.2
LDL-C	4.28 ± 1.5	3.70 ± 0.9	2.82 ± 0.9	3.01 ± 1.4	1.24 ± 0.8	1.49 ± 0.5	1.00 ± 0.5	1.24 ± 0.5
HDL-C/TC	0.13 ± 0.0	0.12 ± 0.1	0.30 ± 0.1	0.29 ± 0.2	0.66 ± 0.0	0.59 ± 0.2	0.59 ± 0.0	0.55 ± 0.1

## Discussion

This study observed that cardiovascular complications in hypertension are associated with additional risk factors such as dyslipidaemia, obesity, glucose intolerance, and alcohol. These factors have been classified in earlier studies as major factors, especially in relation to stroke and coronary heart disease complications [20,21,22]. The high (62.5%) overall prevalence of dyslipidaemia (hypercholesterolaemia) in newly diagnosed hypertensives as observed in this study is similar to the findings in Ibadan and Okada (43.4%) [4,23].

Hypertriglyceridemia prevalence rate of 22.6% in the population as previously documented [4], with higher female serum levels is similar to the findings of 20.4% with higher female values in this study. This however, is not related to the risk of CHD. Majority (63.5%) of the group A patients had a combination of hypertension, overweight, hypercholesterolemia and CHD risk ratio of 0.12, indicating high probability of atherosclerosis heart disease. However, only 25% had glucose intolerance, alcohol and smoking as additional risk factors. These findings are similar to previous reports particularly that of Opadijo as regards alcohol and obesity as risk factors [24]. The presence of multiple risk factors, which individually are risk factors for atherosclerosis [25,26] further accentuates the predisposition of hypertensives to CHD, and are most significant in the causation of disease and death in hypertensive patients [27,28,29].

The group B in this study was associated with mild hypercholesterolaemia and high LDL-C levels. These observations are lower however when compared to the Caucasian value [4]. This agrees with earlier workers in Africa that have reported lower serum total cholesterol and triglyceride levels even in the presence of concurrent disorders such as obesity, hypertension and diabetes mellitus [4,23,29].

This study thus concludes that the prevalence of dyslipidaemia was high and comparable to earlier studies [4,5,23,30]. The high-risk group as previously reported have additional risk factors such as alcohol consumption, obesity and glucose intolerance [31,32] that increase the incidence of cardiovascular complications especially coronary heart disease. Thus, the need for a more aggressive management in terms of investigation and drug treatment in this high risk group. However, hypercholesterolaemia appears to be the dominant factor than hyperglycaemia in view of the large proportion of the studied patients, 62.5% with hypercholesterolemia as against 46% with hyperglycaemia. This is not surprising since most of the other risk factors apart from blood glucose tend to have elevated serum lipids. The clinicians should be aware of the influence of drugs such as beta adrenergic receptor blockers as additional risk factor. This should be considered when selecting medication for the management of hypertension.

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Received: 7 September 2001

Accepted: 2 April 2004