Prevalence, patterns and predictors of dyslipidaemia in Nigeria: a report from the REMAH study

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Abstract

Aim: The aim of this study was to determine the prevalence and predictors of dyslipidaemia in adults in Nigeria.

Methods: Using the WHO criteria, we determined dyslipidaemia using serum lipid levels of 3 211 adult Nigerians, aged at least 18 years, obtained between March 2017 and February 2018 from two communities (rural and urban) in a state from each of the six geopolitical zones of Nigeria.

Results: The overall prevalence of low high-density lipoprotein cholesterol (l-HDL), elevated low-density lipoprotein cholesterol (e-LDL), hypertriglyceridaemia (h-TG) and hypercholesterolaemia (h-CHL) were 72.5, 13.6, 21.4 and 7.5%, respectively. The adjusted odds of h-CHL [odds ratio (95% confidence interval) 1.47 (1.10–1.95)], h-TG [1.89 (1.48–2.41)] and e-LDL [1.51 (1.03–2.15)] increased with obesity. Being a rural dweller increased the odds of h-TG [1.55 (1.29–1.85)], e-LDL [1.38 (1.10–1.73)] and l-HDL [1.34 (1.14–1.58)]. The odds of h-CHL [2.16 (1.59–2.95)], h-TG [1.21 (1.01–1.47)], e-LDL [1.42 (1.13–1.80)] and l-HDL [0.78 (0.65–0.93)] increased with hypertension. Diabetes mellitus doubled only the odds of h-TG [2.04 (1.36–3.03)].

Conclusion: The prevalence of dyslipidaemia, particularly low HDL-C, is high among adult Nigerians.

Keywords: dyslipidaemia, elevated LDL cholesterol, low HDL cholesterol, hypercholesterolaemia, hypertriglyceridaemia, Sub-Saharan Africa

Africa is currently faced with a double burden of communicable and non-communicable diseases (NCDs). The latter, which was less common in past decades, is predicted to take the lead in the next decade.1 The sudden rise in the burden of NCDs, which is fuelled partially by the adoption of urbanised and unhealthy lifestyles, is understood to be the repercussion of increasing prevalence of cardiovascular diseases (CVD) risk factors, including high blood pressure, obesity, dyslipidaemia and diabetes mellitus.

Dyslipidaemia is a major driver of atherosclerosis,2 from which various CVD are known to originate.1,3 Dyslipidaemia, together with smoking, obesity, hypertension and diabetes mellitus, account for over 80% of the CVD burden across the globe.4,5 Lack of reliable data remains a major challenge to...
assessing the burden of dyslipidaemia in Africa and this is responsible for the misconception that dyslipidaemia rarely occurs. A recent review of dyslipidaemia among Africans living in Africa indicates that countrywide, data are scarce and the burden of dyslipidaemia is high.

Nigeria possesses a fast-growing economy and population, which is expected to contribute hugely to the burden of dyslipidaemia in Africa. As in many other African nations, the countrywide prevalence of dyslipidaemia in Nigeria is unknown. Emerging evidence from various sub-national surveys suggests a high prevalence of dyslipidaemia, in contrast to earlier notions. However, the reliability of such findings remains contentious, given the small sizes of the populations surveyed.

Worse still, the Nigerian population is large and culturally diverse, so much so that only a carefully selected random and representative sample would be suitable to estimate the nationwide prevalence of dyslipidaemia. Efforts to estimate the nationwide prevalence from sub-national data have proven abortive due to heterogeneity in the methods employed, populations studied and dyslipidaemia criteria considered. The main objective of this study was to define the prevalence of dyslipidaemia in Nigeria using a representative, nationwide sample.

Methods

The study population consisted of Nigerians aged 18 years and above who participated in the REMoving the MAsk on Hypertension (REMAH) survey. REMAH was a nationwide survey of NCD risk factors in Nigeria that took place between March 2017 and February 2018. The study design of REMAH has been described in detail elsewhere.

Using a multi-staged sampling technique, subjects were randomly selected from two communities (rural and urban) of a state from each of the six geopolitical zones of Nigeria as follows: Anambra (south-east), Akwa-Ibom (south-south), Oyo (south-west), Federal Capital Territory (north-central), Gombe (north-east) and Zamfara (north-west). The selected communities were mobilised, following which homes were visited and invitations were issued to persons aged 18 years and above.

Consenting subjects were invited to a mobile health facility where various physical and clinical examinations were conducted. A total of 4,665 adults were invited, of whom 4,196 subjects consented to participate. However, blood samples were collected from 4,187 subjects, out of which only 3,211 had complete records and also met the criteria for calculating low-density lipoprotein cholesterol (LDL-C) using the Friedewald formula. These subjects were considered for analysis (Fig. 1).

Before commencement of the study, in each locality, the investigators had a series of meetings with members of the community. During the meetings, the investigators addressed participants’ questions on various aspects of dyslipidaemia and other NCD risk factors.

After laboratory analysis of the samples obtained during the field work, the results of the lipid profiles were transmitted to all participants and those who had one form of dyslipidaemia or another were given counselling on lifestyle changes. Those who were judged to need further intervention were referred to the tertiary health institution within the geo-political zone where the local principal investigator representing the zone was a practicing physician.

The study complied strictly with the guidelines for research on human subjects as contained in the Helsinki declaration. Approval for the study was obtained from the University of Abuja Teaching Hospital Health Ethics Committee (FCT/UATH/HREC/PR/041).

Non-fasting blood samples were collected and centrifuged within 45 minutes of collection, following which the resulting sera were stored at –20°C for later analysis. Serum lipids, including total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C) and triglycerides (TG) were analysed on a Landwind c100 auto chemistry analyser, using direct, endpoint and multilayer element methods, respectively, with the aid of test kits procured from Beijing Strong Biotechnologies Incorporations. LDL-C levels of samples with TG < 4.5 mmol/l were calculated using the Friedewald formula.

Dyslipidaemia was defined according to the criteria of the World Health Organisation (WHO). A subject was considered to have elevated TC, otherwise referred to as hypercholesterolaemia (h-CHL), if TC was > 5.1 mmol/l; elevated TG, otherwise referred to as hypertriglyceridaemia (h-TG), if TG was > 1.7 mmol/l; elevated LDL-C (e-LDL) if LDL-C was > 3.5 mmol/l; or low HDL-C (l-HDL) if HDL-C was < 1 mmol/l for women or < 0.9 mmol/l for men.

Trained field workers administered a modified WHO-STEPS questionnaire to obtain information on subjects’ demographics, lifestyle characteristics, and history of hypertension and diabetes mellitus.

In accordance with the guidelines of the European Society of Hypertension, five consecutive blood pressure measurements were obtained from subjects in a sitting position using a mercury sphygmomanometer. The mean of the five readings was calculated as systolic and diastolic blood pressures.

Height and weight were measured using a stadiometer to the nearest 0.1 cm and 0.1 kg, respectively. Measurements...
were taken while subjects were lightly clothed, barefoot and without head gear. Body mass index (BMI) was calculated as the weight (kg) per unit height squared (m²). Waist circumference was measured using a non-stretchable measuring tape, as the minimum horizontal distance midway between the iliac crest and the lower costal margin. Hip circumference was measured as the maximum horizontal distance around the buttocks.

Statistical analysis

All database management and statistical analyses were done using SAS software version 9.4 (SAS Institute, Cary, NC). We used mean and standard deviation to measure the central tendency and spread of all continuous characteristics, while categorical characteristics were expressed as proportions. Differences between means and proportions of binary independent groups were tested using the student’s t-test and chi-squared test, respectively. We used the Cochran–Armitage test to analyse the p-value less than 0.05 was considered statistically significant in all two-tailed tests.

Results

The socio-demographic characteristics of the subjects according to place of residence are summarised in Table 1. A total of 3 211 subjects with an average age of 43.8 ± 5.2 kg/m² were investigated for dyslipidaemia. Overall, 1 796 (55.9%) were women, 1 081 (34.2%) drank alcohol, 112 (3.4%) smoked cigarettes and 369 (11.5%) were obese. Nearly three out of 10 were hypertensive and two out of 50 were diabetic.

The overall mean systolic and diastolic blood pressures were 125.0 ± 22.9 and 77.0 ± 13.0 mmHg, respectively. Cigarette smoking, alcohol consumption, physical inactivity, diabetes mellitus and hypertension were comparable (p > 0.05) between rural and urban dwellers. The mean levels of LDL-C (2.1 ± 0.6 mmol/l, p < 0.0001), TG (1.4 ± 0.6 mmol/l, p < 0.0001), TC (3.4 ± 0.7 mmol/l, p < 0.0001) and HDL-C (0.7 ± 0.8 mmol/l, p < 0.0001) were significantly higher in the rural compared to the urban dwellers.

As shown in Table 2, the prevalence of l-HDL was 72.5% in the overall group, 72.3% in the diabetic group, 69.0% in the hypertensives and 73.2% in obese subjects. LDL-C was elevated in 13.6% of the overall group, 18.8% among the diabetics, 19.1% of the hypertensives and 20.3% of obese subjects. The prevalence of h-TG was 21.4, 39.3, 27.8 and 32.8% in overall, diabetic, hypertensive and obese subjects, respectively. High TC was prevalent in 7.5% of the overall group, 10.7% of diabetics, 12.6% of hypertensives and 11.9% of obese subjects. In comparison to urban residents, the prevalence of l-HDL (75.3 vs 69.2%), e-LDL (15.8 vs 10.9%) and h-TG (25.1 vs 17.0%) was significantly (p < 0.05) higher in subjects who resided in rural areas. With the exception of h-TG, all lipid abnormalities occurred significantly (p < 0.05) more often in women (l-HDL 74.6%, e-LDL 17.2%, h-CHL 9.3%) compared to men (l-HDL 69.9%, e-LDL 9.1%, h-CHL 5.2%).

Fig. 2 shows the prevalence of dyslipidaemia in different age groups. The prevalence of all forms of dyslipidaemia, excluding l-HDL, steadily increased with age (p < 0.0001 for trend), with a peak occurring in subjects aged 41–50 or 51–60 years.

### Table 1. Socio-demographic characteristics of participants by place of residence

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Overall n (%)</th>
<th>Rural n (%)</th>
<th>Urban n (%)</th>
<th>Place of residence, n (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of participants</td>
<td>3211 (55.9)</td>
<td>1796 (54.4)</td>
<td>1415 (72.5)</td>
<td>Place of residence, n (%)</td>
<td>0.0039</td>
</tr>
<tr>
<td>Women</td>
<td>1796 (55.9)</td>
<td>1085 (62.1)</td>
<td>711 (48.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cigarette smoking, n (%)</td>
<td>112 (3.4)</td>
<td>49 (2.8)</td>
<td>63 (4.4)</td>
<td>Rural 1748 1316 (75.3) 276 (15.8) 249 (14.9) 69.0%</td>
<td>0.0001</td>
</tr>
<tr>
<td>Alcohol intake, n (%)</td>
<td>1081 (34.2)</td>
<td>575 (33.1)</td>
<td>506 (35.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension, n (%)</td>
<td>968 (30.2)</td>
<td>527 (30.2)</td>
<td>441 (30.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes mellitus, n (%)</td>
<td>112 (3.5)</td>
<td>52 (3.0)</td>
<td>60 (4.1)</td>
<td>Urban 1463 1012 (69.2) 160 (10.9) 249 (14.9) 72.3%</td>
<td>0.0001</td>
</tr>
<tr>
<td>Physical inactivity, n (%)</td>
<td>1170 (36.4)</td>
<td>641 (36.7)</td>
<td>529 (36.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obesity, n (%)</td>
<td>369 (11.5)</td>
<td>137 (7.8)</td>
<td>232 (15.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, years, mean ± SD</td>
<td>43.5 ± 16.4</td>
<td>45.6 ± 17.2</td>
<td>40.7 ± 14.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBP, mmHg, mean ± SD</td>
<td>125.0 ± 22.9</td>
<td>124.5 ± 22.4</td>
<td>125.8 ± 21.0</td>
<td></td>
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<tr>
<td>DBP, mmHg, mean ± SD</td>
<td>77.7 ± 13.0</td>
<td>77.2 ± 12.9</td>
<td>78.3 ± 13.2</td>
<td></td>
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<tr>
<td>RBC, mmol/l, mean ± SD</td>
<td>24.1 ± 4.9</td>
<td>23.3 ± 4.4</td>
<td>25.0 ± 5.4</td>
<td></td>
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</tr>
<tr>
<td>HDL-C, mmol/l, mean ± SD</td>
<td>0.7 ± 0.4</td>
<td>0.7 ± 0.4</td>
<td>0.8 ± 0.4</td>
<td></td>
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</tr>
<tr>
<td>LDL-C, mmol/l, mean ± SD</td>
<td>2.0 ± 1.2</td>
<td>2.1 ± 1.1</td>
<td>1.8 ± 1.1</td>
<td></td>
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<tr>
<td>TG, mmol/l, mean ± SD</td>
<td>1.3 ± 0.6</td>
<td>1.4 ± 0.7</td>
<td>1.2 ± 0.6</td>
<td></td>
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<tr>
<td>TC, mmol/l, mean ± SD</td>
<td>3.3 ± 1.3</td>
<td>3.4 ± 1.3</td>
<td>3.1 ± 1.3</td>
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<tr>
<td>SBP, systolic blood pressure, and DBP, diastolic blood pressure were derived from the average of five consecutive auscultatory readings. Hypertension was systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg. BMI, body mass index; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; TG, triglycerides; TC, total cholesterol; RBC, random blood glucose.</td>
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</table>
The results in Table 3 show the odds of various factors associated with the different components of dyslipidaemia after adjusting for age, gender, cigarette smoking and alcohol intake. The adjusted odds ratio of e-LDL (AOR 1.42; 95% CI 1.13–1.80), h-TG (AOR 1.21; 95% CI 1.01–1.47), h-CHL (AOR 2.16; 95% CI 1.59–2.95) and l-HDL (AOR 0.78; 95% CI 0.65–0.93) significantly increased with subjects being hypertensive. Additionally, the adjusted odds of h-TG increased with subjects being diabetic (AOR 2.04; 95% CI 1.36–3.03), obese (AOR 1.89; 95% CI 1.48–2.41) and residing in rural areas (AOR 1.55; 95% CI 1.29–1.85). Also, being a resident of rural areas and being obese increased the odds of l-HDL (AOR 1.34; 95% CI 1.14–1.58) and h-CHL (AOR 1.51; 95% CI 1.03–2.15), respectively.

### Discussion

This study shows for the first time, the nationwide prevalence of low HDL-C, elevated LDL-C, hypertriglyceridaemia and hypercholesterolaemia, which were 72.5, 13.6, 21.4 and 7.51%, respectively, with a higher burden observed in women compared to men and rural compared to urban dwellers. All but low HDL-C steadily increased with age, peaking in subjects aged 41–50 years or 51–60 years. The adjusted risks of all lipid abnormalities except low HDL-C were higher in hypertensive and obese subjects in comparison to their normotensive and lean counterparts. In addition, residing in rural areas associated positively with increased risk of all but hypercholesterolaemia, while being diabetic doubled the risk of only hypertriglyceridaemia.

Until this study, the burden of dyslipidaemia has never been characterised in any nationally representative population of adult Nigerians. A previous attempt by the Federal Ministry of Health was part of a NCD survey involving 16 019 subjects from the then three geographical regions of Nigeria, which dates back more than 20 years. The NCD survey of plasma lipids was inadequate for two major reasons; the investigators neither estimated the prevalence of dyslipidaemia nor assessed all lipid fractions.

Nevertheless, comparing the mean TC (3.17 ± 1.1 mmol/l) and HDL-C (1.04 ± 0.5 mmol/l) with those of our study shows that the status of average blood levels of TC and HDL-C may have deteriorated by 3.2 and 32.7%, respectively. In line with this and recent evidence from Nigeria and other black African populations, it is apparent that the burden of this disease remains a public health challenge in Nigeria.
dyslipidaemia in Nigeria, particularly low HDL-C, has increased over time. According to various small pockets of community-based surveys, the prevalence of low HDL-C, high LDL-C, high TG and high TC in adult Nigerians ranges from 13.0–96.5, 0.8–45.9, 1.8–24.5 to 3.1–35.9%, respectively.

In a meta-analysis report involving 294 063 native Africans drawn from 177 studies, the pooled prevalence of low HDL-C, high LDL-C, hypertriglyceridaemia and hypercholesterolaemia was 37.4, 28.6, 17.0 and 25.5%, respectively. It is worth noting that over 60% of the pooled studies were hospital based and barely 9% had a nationwide coverage, which may explain the subtle difference in the prevalence of low HDL-C, high LDL-C and high TC of the current study.

In comparison with the report of Gebreyes and colleagues, estimates of low HDL-C (68.5%), high LDL-C (14.1%), hypertriglyceridaemia (21.0%) and hypercholesterolaemia (5.2%) indicate a close conformity with our findings. The survey by Gebreyes and colleagues was nationwide in coverage, involving 10 260 residents of Ethiopia aged 15–69 years, and was conducted using similar WHO-STEMS instruments.

The increased burden of dyslipidaemia in Nigeria and other parts of Africa is unsurprising, given the rapid rate of urbanisation of rural areas. Population growth and industrialisation, including construction of roads, houses and industries, all reduce access to land for farming activities. Worse still, the little available land is cultivated using mechanised methods, which encourage sedentariness, thus fueling the burden of dyslipidaemia and various other CVD risk factors in Africa. In the last decade, Nigeria has witnessed a 20.2% increase in the rate of urbanisation, from 42.6% in 2009 to 51.2% in 2019.

Consistent with other recent evidence but contrary to the NCD survey, we observed a higher risk of almost all forms of dyslipidaemia among rural compared to urban dwellers. In a cross-sectional survey of 136 945 Chinese adults aged 40 years and above, the burden of elevated TC and LDL-C was significantly higher in rural compared to urban dwellers, whereas HDL-C and elevated TG were similar between the two groups.

The change in the pattern of rural–urban disparity of dyslipidaemia may be a reflection of ongoing epidemiological shift in CVD risk factors widely observed in many developing countries, especially in Africa. This event is not surprising as over the years, rural areas have continued to experience urbanisation at an alarming rate. Therefore, the pattern of exposure to social, environmental and behavioural risk factors of CVD among rural residents has increasingly become similar, with the unhealthy risk profile noted among their urban counterparts. The risk of CVD may therefore be aggravated among people residing in rural areas due to malnutrition and poor access to healthcare in such areas.

In a meta-analysis assessment of rural–urban differences in CVD risk factors among middle-income countries, unfavourable risk profiles of cigarette smoking, alcohol intake, leisure time and active travel, physical activity among rural dwellers was a major highlight of that report. Similar to this report, the current study shows that the behavioural risk factors of dyslipidaemia, including physical inactivity, alcohol intake and cigarette smoking are comparable between rural and urban participants.

Fruit and vegetable intake are surrogate measures of nutritional status inversely related to dyslipidaemia. Although rural–urban difference in nutritional status was not assessed in the current study, evidence from large-scale observational studies across the globe, including the Prospective Urban–Rural Epidemiology study (PURE), indicates a lower intake of fruit and vegetables among rural residents, who tend to prioritise energy-rich foods over fruit and vegetables, as the former is a cheaper source of energy and better satisfies hunger.

According to a WHO survey of 10 sub-Saharan countries, intake of fruit and vegetables increased with per capita gross domestic product (GDP), with lower intake in rural compared to urban areas in all countries except Mozambique. In addition to low income, the quest to improve socio-economic status, lack of storage facilities, low level of education, and cultural norms and practices are many other factors potentially responsible for lower consumption of fruit and vegetables in rural dwellers.

The change in rural–urban disparity of dyslipidaemia is also evident with other risk factors of CVD. For instance, our main findings from the REMAH survey indicate that the rural–urban gap in the prevalence of hypertension has narrowed, two decades after a wide difference of urban compared to rural dwellers was reported.

Worthy of discussing in this report is the variation of almost all forms of dyslipidaemia with gender, a finding which agrees with the NCD survey and many other surveys within Nigeria and across the globe. Evidence from experimental and observational studies indicates that hormonal changes typical of post-menopausal women may be the underlying mechanism responsible for increased risk of dyslipidaemia in women. Sex hormones, especially oestrogens and progestogens, are antiatherogenic factors, well-established in the regulation of lipid and lipoprotein metabolism. In the current study, increased risk of almost all lipid abnormalities observed in women could be the consequence of a substantial participation of post-menopausal women, who accounted for nearly 40% of the women, with an average age of 62.1 ± 9.3 years.

Increase in the prevalence of all but low HDL-C with age, dramatically peaking in subjects aged 41–50 years or 51–60 years, is an occurrence that has been widely reported in many studies. In a sample of 11 956 rural-dwelling Chinese adults of Liaoning province, Sun and colleagues observed an increase in the prevalence of all lipid abnormalities with age, which peaked in subjects aged 55–64 years for TG. Ahaneku and colleagues observed a similar trend in a group of apparently healthy adults from a homogenous rural community of Enugu State, south-east of Nigeria. There was an increase in mean levels of all lipid fractions, which peaked in subjects aged 45–64 years.

Advancement in age is associated with several metabolic changes, including increased lipolysis in adipocytes, reduced mass of metabolically active tissues, reduced oxidative capacity of tissues and reduced hepatic or extrahepatic LDL receptors, resulting in insulin resistance, hyperinsulinaemia and altered lipid metabolism, which all promote atherogenicity.

An interesting finding from our study, which partially conforms with many other studies, indicated that hypertension and obesity were associated with increased risk of all lipid abnormalities except low HDL-C, which had a contrasting picture. Additionally, increased risk of high TG was associated with diabetes, compared to their non-diabetic counterparts. Compelling evidence has previously shown that lipid abnormalities, including elevated LDL-C, TG and TC and low HDL-C are well-established in the pathogenesis of atherosclerosis.
and obesity, to which hypertension and diabetes mellitus are secondary conditions. However, it remains obscure why a lower risk of low HDL-C was observed in hypertensive individuals despite the anti-atherogenic benefits that HDL-C confers via reverse cholesterol efflux.

In recent times, HDL-C has become an object of intense scrutiny and research following evidence emanating from genetic, epidemiological and large-scale clinical trial studies, which have all questioned the benefit of increasing levels of HDL-C. Opoku and colleagues reported a lower risk of low HDL-C in hypertensive (OR 0.95; 95% CI 0.92–0.97) compared to normotensive subjects. Findings from the Illuminata study, a clinical trial of torcetrapib (a cholesteryl ester transfer protein inhibitor), showed a 75% increase in plasma HDL-C levels with a concomitant increase in CVD risk (HR: 1.58; 95% CI 1.14–2.19) and mortality. Furthermore, genetic evidence shows that low concentrations of HDL-C, attributable to Mendelian disorders, such as mutations in modulatory proteins [apolipoprotein A-I (apoA-I), ATP-binding cassette transporter (ABC1) and lecithin cholesteryl acyl transporter (LCAT)], do not translate to premature coronary heart disease.

Speculations abound that alterations in key components of HDL-C metabolism, including apoA-I, LCAT or ABC1, may be the underlying mechanisms responsible for these paradoxical associations. In vitro studies have shown that oxidative modifications of apoA-I catalysed by myeloperoxidase results in impaired cholesterol efflux of apoA-I, independent of HDL-C concentration. Taken together, one may deduce that HDL-C functionality rather than quantity may be the inherent property directly responsible for its atheroprotective properties, including anti-inflammatory, anti-oxidant and nitrous oxide-promoting effects.

Strengths and limitations

Our study investigated for the first time the burden and predictors of dyslipidaemia in a nationally representative population of Nigeria. In addition to this, our subjects were drawn from rural and urban communities to evaluate the changing patterns of rural–urban differences in dyslipidaemia, which are widely reported with other CVD risk factors in many developing populations. We achieved all these by deploying standardised WHO-STEPs protocols. In a bid to ease comparison with past and future studies, we carefully selected the WHO criteria over other criteria for diagnosing dyslipidaemia, as it is perceived to be one of the most frequently used criteria in African studies.

Our findings should be interpreted within the context of the following limitations. Our study may have underestimated the burden of dyslipidaemia as our estimations were obtained without recourse to the level of awareness, treatment and control of dyslipidaemia in the population. The causal nature of associations between risk factors and the different forms of dyslipidaemia were not investigated. The associations reported in this study were entirely observed and based on a mere co-existence of the predictors and supposed outcomes.

Conclusion

The prevalence of dyslipidaemia, particularly low HDL-C, is high among adult Nigerians, and factors that are majorly associated with it include hypertension, diabetes mellitus, obesity and residing in rural areas. The high prevalence of dyslipidaemia in Nigeria suggests that dyslipidaemia may contribute substantially to the large burden of CVD and its risk factors in this region. There is a need to intensify inexpensive measures such as increasing awareness, training experts in dyslipidaemia management, and educating against sedentary lifestyle and unhealthy dietary habits, especially in rural areas where poverty is high and access to health services is a major challenge. Using dyslipidaemia as a prime target of obesity, diabetes mellitus and hypertension could prove to be central in the fight against CVDs in Nigeria. Therefore, screening of high-risk individuals for dyslipidaemia should be encouraged.

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