

A Comparative Study Of Lipid Abnormalities In Patients Presenting With Systemic Hypertension In A Cardiac Center In Port Harcourt, South-South, Nigeria

Chibuike Eze Nwafor¹, Nicole Ogbak²

¹cardiology Unit, Department Of Medicine, University Of Port Harcourt And University Of Port Harcourt Teaching Hospital

²goodheart Medical Consultants

Abstract

Background High blood pressure has been associated with abnormal blood lipid levels (dyslipidaemia), nevertheless many hypertensive individuals in Nigeria tend to overlook their blood lipid levels, primarily due to a lack of understanding regarding the relationship between hypertension and dyslipidaemia. This study aims to assess the pattern of dyslipidaemia in normotensive, pre-hypertensive and hypertensive populations in a private cardiac centre in Port Harcourt, Nigeria.

Methods The study was a retrospective and comparative hospital-based investigation carried out in GoodHeart Medical Consultants Hospital, Port Harcourt, Nigeria. Hospital records of patients 18 years and above were obtained and lipid profiles were examined.

Results A total of 387 subjects were evaluated, 125 normotensives, 16 prehypertensives and 246 hypertensives with a mean age of 56.08 ± 14.2 years. There were 201 (51.9%) males and 186 (48.1%) females. Low HDL (40.3%) was more prevalent, followed by elevated LDL (23.2%), elevated TC (18.1%) and elevated TG (6.2%). Prehypertensives had a higher prevalence of dyslipidaemia (100%), followed by hypertensive (97%), lastly normotensives (68%).

Conclusion Dyslipidemia is widespread, especially among individuals with pre-hypertension and hypertension. Low HDL and high LDL levels are prevalent, indicating the need for dietary adjustments and lifestyle changes to improve the HDL/LDL ratio. Obesity and elevated fasting blood glucose also contribute to dyslipidemia. Surprisingly, normotensive individuals exhibit a high dyslipidemia prevalence, underscoring the urgency of raising awareness about this emerging public health threat.

Keywords: Hypertension, prehypertension, lipid profile, dyslipidaemia, South-South, GoodHeart, Port Harcourt

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I. Introduction

Hypertension poses a significant global public health challenge and stands as a primary contributor to the worldwide burden of disease and mortality.(1) It ranks among the top ten reported causes of death, with approximately 4% of these fatalities attributed to hypertensive complications. While the prevalence of hypertension is notably elevated in the black population compared to whites(2), its occurrence increases with age across both racial groups. Notably, hypertension-related mortality is more pronounced among black individuals, particularly among Nigerians (3). It has been found that men have a higher prevalence of hypertension compared to women(4) though this trend changes later in life, with a substantial increase in hypertensive females around menopause.(5)

Elevated blood pressure levels are frequently associated with several risk factors for cardiovascular disease (CVD), such as dyslipidemia, dysglycemia, obesity, diabetes mellitus, sedentary habits, diets rich in saturated fats, and genetic predisposition.(6) However, dyslipidemia (hyperlipidemia) has been recognized as a distinct risk factor for cardiovascular diseases.(7)

Elevated blood pressure often coexists with dyslipidemia (irrespective of gender and age), as confirmed by findings from the NATPOL 2011 registry.(8) The well-established connection between hypertension and dyslipidemia can collectively contribute to increase susceptibility to the development of coronary heart disease in patients (9). Plasma lipid levels show significant variation among different population groups due to differences in geographical, cultural, economic, and social conditions, as well as dietary habits and genetic makeup. Age and gender differences also have a considerable impact on serum lipid levels.(10)

Many hypertensive individuals in Nigeria tend to overlook their blood lipid levels, primarily due to a lack of understanding regarding the relationship between hypertension and dyslipidaemia. Consequently, they

seldom undergo lipid panel tests due to their limited knowledge on the subject.(11) This study aims to compare the differences in lipid profile of normotensives, pre-hypertensive and hypertensives, in a private cardiac centre in Port Harcourt Nigeria.

II. Materials And Methodology

The study was a retrospective and comparative hospital-based investigation carried out in Good Heart Medical Consultant Hospital, a private medical facility in Port Harcourt Nigeria.

Patient selection: The study population comprised of September 2022 to October 2023 hospital records of patients at least 18 years and above, registered with the Cardiology unit of the Hospital. There were 3 patient groups examined.

Group 1 – Normotensive (optimal BP) subjects.

Group 2– Pre- hypertensive (High- normal BP) subjects.

Group 3 – Hypertensive (High BP) subjects.

Patients information were retrieved from the hospital’s electronic records and evaluated in each group.

Data generation

Optimal blood pressure was defined as systolic blood pressure (SBP) of < 120 mmHg and diastolic blood pressure (DBP) of < 80 mmHg; high- normal blood pressure as SBP of 130 – 139 mmHg and DBP of 85 – 89 mmHg; while hypertension was defined as SBP of \geq 140 mmHg and DBP of \geq 90 mmHg, using 2017 American College of Cardiology/American Heart Association (ACC/AHA) guideline. (12)

Dyslipidemia was characterized as elevated levels of total cholesterol (TC) exceeding 200mg/dl (>5.2 mmol/L), elevated low-density lipoprotein cholesterol (LDL-C) exceeding 129mg/dl (>3.38 mmol/L), low levels of high-density lipoprotein cholesterol (HDL-C) below 40mg/dl (<1.0 mmol/L), and triglycerides (TG) equal to or greater than 150mg/dl (\geq 1.7 mmol/L) based on the Adult Treatment Panel III (ATP III) guidelines [9].

BMI was considered to be increased when \geq 25 Kg/m² (overweight; BMI of 25.0 – 29.9 Kg/m²) and obesity; BMI \geq 30 Kg/m²) according to WHO guidelines.(13)

Statistical analysis:

Data entry and analysis was done using EXCEL version 16 and STATA version 15.0. Quantitative variables were expressed as means and standard deviations. Qualitative variables were expressed as percentages. The chi-square test where applicable was used in comparing proportions, while Student’s t-test was used to compare means. Analysis of Variance (ANOVA) was used to compare the means and proportions respectively between normotensives, pre-hypertensives and hypertensives . A p-value of \leq 0.05 was considered significant.

III. Result:

A total of 387 subjects were evaluated. There were 125 subjects in group 1, 16 subjects in group 2, 246 subjects in group 3 with a mean age of 56.08 \pm 14.2 years. Among the entire study population, 201 (51.9%) were males, while 186(48.1%) were females. The most prevalent age group was middle age (41-60 years) 195 (50.4%), followed by elderly (>61 years) 146 (36.9%), lastly young adults (18-40years) 49 (12.7%). The mean age of the subjects in group 1 was 54.10 \pm 15.09 years, for group 2, (61.73 \pm 17.49) and (56.74 \pm 13.42) for group 3. The mean age of the subjects fell within the middle age and elderly age group. There was a significant difference in the mean Systolic and diastolic blood pressure across the groups (p-value = 0.000). There was an increase in BMI and FBG as age advanced across the group. The other baseline characteristics are shown in table 1 and 2.

Table 3 shows the prevalence of dyslipidaemia among the three groups. The most frequent dyslipidaemia among the 387 patients studied was Low HDL 156(40.3%) and elevated LDL 90(23.2%), followed by elevated TC 70(18.1%) and elevated TG 24(6.2%) respectively. Comparing the proportion of increased TC, high LDL, low HDL and high TG, there were statistically significant differences across the groups (p=0.048, p=0.048, p=0.027) except for HDL (P=0.926). Prehypertensives had a higher prevalent of dyslipidaemia (100%), followed by hypertensives (97%), lastly normotensives (68%).

Table 1: Baseline characteristics of the study population

Variables	Frequency N=387	Percentage%	
Gender:			
Male	201	51.9	
Female	186	48.1	
Mean age (SD)	56.08 \pm14.2		

Age range: 18-40(Young adults) 41-60 (Middle age) >61 (Elderly)	49 195 143	12.7 50.4 36.9	
Blood pressure: Normotensive Pre-hypertensive Hypertensive	125 16 246	32.30 4.13 63.57	
Mean BMI (SD)	30.8 ± 5.7		

Key: SD; Standard deviation. All values are expressed as percentages and Mean ± Standard deviation

Table 2: Comparison of mean baseline characteristics of study population

Characteristics	Group 1 Normotensives	Group 2 Pre-hypertensives	Group 3 Hypertensives	P-value
Age(years)	53.73 ±14.55	63.3±19.09	56.22± 14.49	0.0692
SBP (mmHg)	109.06±12.73	124.75±2.29	144.95±18.79	0.000*
DBP (mmHg)	69.53±7.88	71.25±4.78	85.36±14.42	0.000*
BMI(Kg/m ²)	30.10±5.87	31.65±4.03	31.18±5.67	0.1945
FBG (mmol/L)	5.56±1.47	7.02±3.76	6.45±4.01	0.3300

Key: *P-value <0.05; statistically significant; SBP, systolic blood pressure; DBP, diastolic blood pressure; BMI, body mass index; FBG, fasting blood glucose; All values are expressed as Mean ± Standard deviation.

Table 3: Prevalence of dyslipidaemia among normotensive, pre-hypertensive and hypertensive population.

Parameters	Normotensive N=125	Pre-hypertensive N=16	Hypertensive N=246	Total N=387	P-value
TC >5.2mmol/L N (%)	14(11.2)	4(25)	52(21.1)	70(18.1)	0.026
HDL <1mmol/L N (%)	49(39.2)	7(43.8)	100(40.7)	156(40.3)	0.926
LDL >3.3mmol/L N (%)	20(16)	3(18.8)	67(27.2)	90(23.2)	0.048
TG >1.7mmol/L N (%)	2(1.6)	2(12.5)	20(8.1)	24(6.2)	0.027*
TOTAL	85(68%)	16(100%)	239(97.1%)	340(87.8%)	

Key: *p-value <0.05; statistically significant; TC; total cholesterol, HDL; high density lipoprotein, LDL; low density lipoprotein and TG; triglycerides, N; number of subjects .

IV. Discussion:

The current study revealed abnormal plasma lipid levels across normotensive, prehypertensive, and hypertensive subjects. Prehypertensives had significantly higher TC and TG levels when compared to normotensive and hypertensive individuals, this could be attributed to elevated BMI and FBG in this sub-group. This clustering of cardiovascular disease risk factors among persons with prehypertension suggests that they are at increased risk of cardiovascular events and should be screened for other cardiovascular disease risk factors, irrespective of age and gender. (14,15) Another explanation could be the wrong notion that not being hypertensive exonerates them from implementing lifestyle changes including their diet, which could otherwise assist in reducing their lipid levels. Individuals with prehypertension are at a higher risk of advancing to hypertension compared to those with normal blood pressure. Therefore, early detection of these abnormalities and prompt interventions may halt the progression from prehypertension to hypertension, thus preventing complications in these individuals.

Among the study population, the prevalence of dyslipidemia is high (87.8%), with low HDL (40.3%) being the most frequently observed form, followed by elevated LDL (23.2%), elevated TC (18.3%), and elevated TG (6.2%) as the least common forms of dyslipidemia. This trend is similar to findings reported in Abuja, Northern Nigeria, Asaba, Southern Nigeria (60%), Owerri, Southern Nigeria (60.5%), Port Harcourt, Southern Nigeria (65.4%), as well as other regions in Nigeria and elsewhere. (16–19). Previous research conducted in Nigeria also found a high prevalence of dyslipidemia across all geopolitical zones, characterized by a consistent pattern of low HDL and high LDL. The overall prevalence of dyslipidemia in Nigeria varied, ranging from 60% to 89%. (20) Our findings show that the current state of dyslipidemia in Port Harcourt Nigeria supports earlier

findings that dyslipidemia is highly prevalent in Nigeria. This may be closely linked to rapid urbanization and western diet with most urban cities saturated with fast food outlets and increasing sedentary lifestyle which contrasts with our previous highly active agrarian-based lifestyle.

The generally low HDL among Nigerian subjects has been attributed to low intake of fresh fruits and vegetables.(5) The same reason might apply in this study. The pattern of distribution of low LDL among the groups was however similar to what was reported by previous authors in which hypertensives had significantly higher mean LDL than other subjects. (1,21)

In all dyslipidemic subjects, Prehypertensives had the highest forms of dyslipidaemia put together (100%) followed by hypertensives (97.1%) and normotensives (68%), this report agrees with previous authors (22) and reveals a progressive increase in the prevalence of elevated LDL as blood pressure increases.

Prevalence of dyslipidaemia among normotensives in this study significantly differs from a study among Indians 68% versus 24%. (23) This could be due to a high BMI (obese) ($30.10 \pm 5.87 \text{ kg/m}^2$) and borderline high fasting glucose (5.56 ± 1.47) observed in the study population. Overall, dyslipidemia in normotensives can result from a combination of genetic, lifestyle, metabolic factors and dietary habits; Even though normotensives have normal blood pressure, they might still consume diets high in fats, and cholesterol which would result in dyslipidaemia.

The present study also revealed an increase in plasma cholesterol, FBG, and BMI levels as the blood pressure increased, demonstrating the central role that blood pressure plays in these metabolic disorders in Nigerians. (5)

V. Conclusions

In this study, dyslipidaemia was highly prevalent regardless of blood pressure, but more common in prehypertensives than the other groups. Normotensives had a high prevalence of dyslipidaemia (68%). There was a rise in plasma lipids as blood pressure and age increased with a similar trend for FBG and BMI. A remarkable disparity in the HDL/LDL ratio of Nigerians was observed. The above findings, call for more action on sensitization programs to promote healthy body mass, lifestyle and diet modification, to reduce the cardiovascular disease burden among Nigerians.

Limitations of the study

The number of subjects in this study will limit the extent of generalization of our findings in this study. This is a retrospective descriptive study which will not be as accurate as a randomized control trial.

Recommendation

We recommend more intensive public health campaigns and sensitization to increase awareness on the dangers of dyslipidaemia. Also, routine screening for abnormal blood lipids irrespective of blood pressure would necessitate appropriate intervention. Prehypertensive individuals should be screened for other cardiovascular risk factors to prevent progression to frank hypertension and associated complications. Fruits and vegetables and less trans fats should be incorporated as part of regular meals.

References

- [1]. Chen S, Cheng W. Relationship Between Lipid Profiles And Hypertension: A Cross-Sectional Study Of 62,957 Chinese Adult Males. *Front Public Health*. 2022 May 18;10:895499.
- [2]. Ordúñez P, Kaufman Js, Benet M, Morejon A, Silva Lc, Shoham Da, Et Al. Blacks And Whites In Cuba Have Equal Prevalence Of Hypertension: Confirmation From A New Population Survey. *Bmc Public Health*. 2013 Feb 24;13(1):169.
- [3]. Akinlua Jt, Meakin R, Umar Am, Freemantle N. Current Prevalence Pattern Of Hypertension In Nigeria: A Systematic Review. *Plos One*. 2015 Oct 13;10(10):E0140021.
- [4]. Connelly Pj, Currie G, Delles C. Sex Differences In The Prevalence, Outcomes And Management Of Hypertension. *Curr Hypertens Rep*. 2022;24(6):185–92.
- [5]. Saidu H, Karaye Km, Okeahialam Bn. Plasma Lipid Profile In Nigerians With High - Normal Blood Pressure. *Bmc Research Notes*. 2014 Dec 18;7(1):930.
- [6]. Sharifi-Rad J, Rodrigues Cf, Sharopov F, Docea Ao, Can Karaca A, Sharifi-Rad M, Et Al. Diet, Lifestyle And Cardiovascular Diseases: Linking Pathophysiology To Cardioprotective Effects Of Natural Bioactive Compounds. *Int J Environ Res Public Health*. 2020 Apr;17(7):2326.
- [7]. Dyslipidemia And Cardiovascular Disease Risk Among The Mashad Study Population | Lipids In Health And Disease [Internet]. [Cited 2024 Feb 6]. Available From: <https://link.springer.com/article/10.1186/S12944-020-01204-Y>
- [8]. Chruściel P, Stemplewska P, Stemplewski A, Wattad M, Bielecka-Dąbrowa A, Maciejewski M, Et Al. Associations Between The Lipid Profile And The Development Of Hypertension In Young Individuals – The Preliminary Study. *Arch Med Sci*. 2022 Jan 17;18(1):25–35.
- [9]. Ariyanti R, Besral B. Dyslipidemia Associated With Hypertension Increases The Risks For Coronary Heart Disease: A Case-Control Study In Harapan Kita Hospital, National Cardiovascular Center, Jakarta. *J Lipids*. 2019 Apr 30; 2019:2517013.
- [10]. Idemudia Jo, Emmanuel Ike Ugwuja. Plasma Lipid Profiles In Hypertensive Nigerians. *The Internet Journal Of Cardiovascular Research*. 2009;6(2).

- [11]. Okeke C, Uzochukwu B, Nawfal E, Abada E, Uzochukwu B. Prevalence Of Hypertension And Awareness Of The Causes And Effects Of Hypertension In Rural And Urban Communities Of Enugu State Nigeria. 2017;6(12).
- [12]. Flack Jm, Adekola B. Blood Pressure And The New Acc/Aha Hypertension Guidelines. Trends In Cardiovascular Medicine. 2020 Apr 1;30(3):160–4.
- [13]. Obesity [Internet]. [Cited 2024 Jan 26]. Available From: <https://www.who.int/health-topics/obesity>
- [14]. Bharath T, Manjula P. Lipid Profile But Not Highly Sensitive C-Reactive Protein Helps Distinguish Prehypertensives From Normal Subjects. J Nat Sci Biol Med. 2015;6(2):347–50.
- [15]. Grotto I, Grossman E, Huerta M, Sharabi Y. Prevalence Of Prehypertension And Associated Cardiovascular Risk Profiles Among Young Israeli Adults. Hypertension. 2006 Aug;48(2):254–9.
- [16]. Onyegbutulem Hc, Dogo D, Alu F, Dankyau M, Olorunfemi Ds, Abdullahi Fm, Et Al. Patterns Of Dyslipidemia Amongst Hypertensive Patients In Abuja, North Central Nigeria. The Pan African Medical Journal [Internet]. 2021 [Cited 2024 Feb 7];39. Available From: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8348252/>
- [17]. Odenigbo Cu, Oguejiofor Oc, Odenigbo Um, Ibeh Cc, Ajaero Cn, Odike Ma. Prevalence Of Dyslipidaemia In Apparently Healthy Professionals In Asaba, South South Nigeria. Nigerian Journal Of Clinical Practice. 2008 Dec;11(4):330.
- [18]. Osuji Cu, Nzerem Ba, Meludu S, Dioka Ce, Nwobodo E, Amilo Gi. The Prevalence Of Overweight/Obesity And Dyslipidemia Amongst A Group Of Women Attending “August” Meeting. Nigerian Medical Journal. 2010 Oct 1;51(4):155.
- [19]. Daka Ir, Amaewhule Mn, Wekhe C. The Prevalence Of Dyslipidemia In The Niger Delta Region Of Southern Nigeria. Greener Journal Of Medical Sciences.
- [20]. Oguejiofor O, Onwukwe C, Odenigbo C. Dyslipidemia In Nigeria: Prevalence And Pattern. Annals Of African Medicine. 2012 Oct 1;11(4):197–197.
- [21]. Choudhury Kn, Mainuddin A, Wahiduzzaman M, Islam Sms. Serum Lipid Profile And Its Association With Hypertension In Bangladesh. Vasc Health Risk Manag. 2014 Jun 30;10:327–32.
- [22]. Karasek D, Vaverkova H, Halenka M, Jackuliakova D, Frysak Z, Orsag J, Et Al. Prehypertension In Dyslipidemic Individuals; Relationship To Metabolic Parameters And Intima-Media Thickness. Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub. 2013 Mar 1;157(1):41–9.
- [23]. Gupta P, Chaurasia A, Mishra A, Prakash G. Study Of Prevalence Of Dyslipidemia In Newly Diagnosed Essential Hypertension. International Journal Of Contemporary Medicine, Surgery And Radiology. 2018 Dec 1;3.