Risk Factors of Hypertension among Type 2 Diabetic Patients in Imo state, South East of Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Author UWD conceived the study, designed the study and drafted the manuscript. Author NVO data collection and data analysis, Author SMO designed the study and revisited the manuscript writing. Authors OBN, CJN and INSD revisited the manuscript and critically evaluated the intellectual contents. All authors read and approved the final manuscript.

Article Information

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ABSTRACT

Background: Hypertension is among the important causes of non-communicable disease burden worldwide. It has raised public health concerns in both developed and developing nations. It mostly occurs in patients with diabetes and the prevalence depends on duration, type and age of the patient. The study aimed at determining the risk factors of hypertension among type 2 diabetic patients in Imo State, Nigeria.
Methods: A hospital-based descriptive survey design involving 50 patients attending hospital was used. Structured questionnaire complemented with interview schedule was used to collect data from the respondents. Data were analyzed using frequency and mean score. Hypotheses were tested using Chi-square at 5% significance level.
Results: The result showed that the majority (70.0%) of the patients was hypertensive, 54.0% of the patients used dietary control and drugs in the treatment of the diseases. Furthermore, it was found that 54.0% ate salty foods always, 58.0% of the patients added extra table salt in their meals,

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54.0% ate canned foods and 82.0% took sugary drinks always. It was also found that 66.0% ate always from restaurants and 58.0% ate more of starchy foods. The result further showed that 74.0% of the patients avoided physical exercise and 70.0% indicated that doing stress works made them get anxious. Eighty percent of the patients had hypertension in their family history and the 74.0% indicated it was their brother/sister. The X^2 result showed a significantly association between family history of hypertension and type 2 diabetes $X^2(121, N = 50) = 187$, $p = 0.000$. It was also found that dietary pattern was significantly associated with risk of type 2 diabetes $X^2(121, N = 50) = 187$, $p = 0.000$.

Conclusion: Dietary pattern and family history of hypertension were significantly associated with type 2 diabetes. It was recommended that sensitization campaigns be organized to educate women on the effect of diets on diabetes. Also, family history of hypertension should be ascertained from patients to ensure early detection and treatment of diabetes.

1. INTRODUCTION

Hypertension also called high blood pressure (HBP) is a major cause of cardiovascular disease (CVD) in the world [1]. About 26% of the world's population (972 million people) is suffering from hypertension and the prevalence is expected to rise to 29% by 2025, cause mainly by increases in economically developing countries. The high prevalence of hypertension poses a serious public health challenge [2]. The World Health Organization (WHO) reported that CVDs account for nearly 17 million deaths a year, almost one-third of the total [3]. Of these, complications resulting from hypertension account for 9.4 million mortalities worldwide yearly [4]. Hypertension causes at least 45% of the deaths due to heart disease and 51% of deaths due to stroke [5].

Hypertension was formerly more associated with wealthy regions of the world. However, the disease is rapidly increasing in low and middle-income countries (LMICs) [6,7] in recent times due to limited health resources, high incidence of infectious diseases, low awareness and treatment levels of hypertension are still very low [7]. Currently, LMICs are leading in the incidence of hypertension globally, where it affects about 1 in every 5 of the adult population and this is projected to increase [8]. By 2025, nearly 3 out of 4 people with hypertension will be living in LMICs [9]. In some places in Africa, it is estimated that over 40% of adults have hypertension and the number is projected to spike from 80 million people in 2000 to 150 million in 2025. This makes the prevalence of hypertension highest in Africa [5].

Diabetes and hypertension tend to occur together because they share certain physiological traits [10]. Also, [11] observed that the two conditions share the same risk factors It has been shown that hypertension is the leading cause of death among diabetic patients and it is the largest contributor to direct and indirect cost of diabetes [12]. Olack et al. [13] identified risk factors of hypertension as smoking, alcohol consumption, overweight, waist circumference, insufficient intake of vegetables and fruits and lack of physical activities. According to [14] hypertension in diabetic individuals significantly increases the risk of peripheral vascular disease, stroke, retinopathy and accelerates cardiac disease. According to [15] insulin resistance is essential in the development of CVD and type 2 diabetes. A study in the US reported that 50 - 80% of people with type 2 diabetes have high blood pressure [11]. This is in line with the view that these two chronic diseases coexist [16].

Research has identified a number of risk factors for type 2 diabetes and cardiovascular diseases [17,18]. The presence of these risk factors in adult diabetic patients is important in screening intervention for hypertension. Screening high risk adult diabetic patients specifically for hypertension and its risk factors is a primary care clinic imperative as individuals suffering from diabetes are at increased risk of developing cardiovascular diseases independent of progression to diabetes mellitus [19]

The study aimed at investigating the risk factors of hypertension among type 2 diabetic patients in Imo State, Nigeria. Among other specific objectives, it investigated association between dietary pattern and hypertension.

2. MATERIALS AND METHODS

The study was conducted at Imo State Specialist Hospital, Umuguma in Owerri West local

government area of Imo State. It is a tertiary health institution which serves as a centre for preventive and curative health services as well as a research centre. It covers Imo State as well as other neighbouring states like Anambra, Rivers and Abia States. Its health facilities serve as referrals for hospitals and health centres.

The study adopted the descriptive survey research design which permitted the study of the respondents in their natural settings and collection of original data. Patients attending the hospital served as the population for the study. All the 50 type 2 diabetic patients attending the hospital constituted the sample for the study. Data were collected using structured questionnaire complemented with an interview schedule. Face and content validity methods were used in validating the instrument while the Cronbach alpha reliability method which produced a coefficient of 0.71 was used in establishing the reliability of the instrument. Data were analyzed using mean score and percentages. The hypotheses were tested using Chi-Square statistics at 5% significance level.

3. RESULTS

Table 1 shows that the majority (72.0%) was female and the remaining 28.0% men, a greater proportion (48.0%) of the patients was within 29 – 30 years respectively, 38.0% within 40 – 59 years and 14.0% less than 19 years. The mean age of the patient was found to be 38.5 years. This implies that the patients were in young. It was also revealed that the majority (60.0%) of the patients had no formal education whereas the remaining 40.0% received different forms of formal education. The result further shows that farming was the dominant occupation of the patients (66.0%) while only 6.0% were civil servants. All the patients were Christians and most (70.0%) were married.

3.1 Medical History

Table 2 shows that the majority (70.0%) was suffering from hypertension. It also shows that the patients used several treatments for diabetes however the commonest among them were the use of oral anti-diabetic drug and diabetic control (54.0%). Some other patients used insulin (16.0%) and a combination of insulin and dietary control (30.0%). For the treatment of hypertension, most of the patients used oral anti-hypertensive and dietary control (58.0%) while

others used diuretics (22.0%) and diuretics and dietary control (20.0%).

Table 1. Distribution of patients according to socioeconomic characteristics

Characteristics	F	%	$\bar{X}$
Sex			
Male	14	28.0	
Female	36	72.0	
Age (Years)			
< 19	7	14.0	
20 – 39	24	48.0	38.5
40 – 59	19	38.0	
Education			
No formal education	30	60.0	
Primary	10	20.0	
Secondary	5	10.0	
OND/NCE	3	6.0	
HND/Degree	2	4.0	
Occupation			
Farming	33	66.0	
Trading	10	20.0	
Civil servant	3	6.0	
Student/unemployed	4	8.0	
Religion			
Christianity	50	100	
Marital status			
Married	35	70.0	
Single	15	30.0	

Table 2. Medical history of patients

Statements	F	%
Are you suffering from hypertension?		
Yes	35	70.0
No	15	30.0
What type of treatment do you use for your diabetes?		
Oral anti-diabetic drug and dietary control	27	54.0
Insulin	8	16.0
Insulin and dietary control	15	30.0
What type of treatment do you use for hypertension?		
Oral anti-hypertensive and dietary control	29	58.0
Diuretics	11	22.0
Diuretics and dietary control	10	20.0

3.2 Respondents' Diet Composition

Table 3 reveals that the majority (58.0%) of the patients agreed that they put additional Table salt to their meals, the majority (54.0%) always ate

canned foods and 66% always ate from restaurants. Furthermore, 58.0% fed more on starchy foods, 22.0% ate more of protein while 20.0% ate more of fatty foods. The result also shows that most (74.0%) of the patients did not put additional sugar to their meals while a large proportion (82.0%) took sugary drinks at varying degrees.

Table 3. Distribution of patients according to diet composition

Statement	F	%
Do you add additional table salt to your food?	29	58.0
Yes	21	42.0
No		
How often do you eat salty food such as canned food (tomatoes, corn beef, sadin) sausage, sea food etc?		
Always	27	54.0
Most times	8	16.0
Sometimes	15	30.0
Never	0	0.0
How often do you eat from food restaurants?		
Always	33	66.0
Most times	10	20.0
Sometimes	3	6.0
Never	4	8.0
What constitutes your diet?		
More starch	29	58.0
More protein	11	22.0
More fat	10	20.0
Do you add additional sugar to your food such as tea, pap etc?		
Yes	13	26.0
No	37	74.0
How often do you take sugary drink?		
Always	6	12.0
Most times	19	38.0
Sometimes	16	32.0
Never	9	18.0

Table 4. Distribution of patients according to lifestyle

Statement	F	%
Do you engage in physical exercises that make you sweat and raise your heath for 30 minutes?		
Yes	13	26.0
No	37	74.0
If yes, how often?		
Everyday	33	66.0
Weekly	10	20.0
Monthly	3	6.0
Whenever I want	4	8.0
Do you engage in a stressful work that makes you feel anxious?		
Yes	35	70.0
No	15	30.0
If yes, how often?		
Always	15	30.0
Most times	10	20.0
Sometimes	18	36.0
Occasionally	7	14.0
Do you smoke?		
Yes	0	0.0
No	50	100.0

3.3 Respondents' Lifestyle

Table 4 shows that the majority (74.0%) did not engage in physical exercise. It is further revealed that the majority (70.0%) of the majority (70.0%) did not engage in stressful work that makes them anxious; 36.0% of these patients engaged in the work sometimes. All (100.0%) of the patients did not smoke.

3.4 Family History of Patients

Table 5 shows that a large proportion (46.0%) of the patients indicated a history of diabetes in their family, 68.0% indicated that the parents were the ones that suffered it. However, 20.0% of the patients agreed they had hypertension while 74.0% indicated it were their brothers/sister that suffered it.

3.5 Association between Family History of Hypertension and Type 2 Diabetes

The result in Table 6 shows that family history is significantly associated with type II diabetes, $X^2(121, N = 50) = 187$, p = 0.000.

3.6 Association between Dietary Pattern and Type II Diabetes

The result in Table 7 reveals that there was a significant association between dietary patterns and risk of type diabetes $X2(289, N = 50) = 408$.

Table 5. Family history of patients

Statement	F	%
Had any person in your family suffered diabetes?		
Yes	23	46.0
No	27	54.0
If yes, who is the person?		
Grandparents	0	0.0
Parents	34	68.0
Brother/sister	7	14.0
Cousin	6	12.0
Nephew/Niece	3	6.0
Had any person in your family suffered hypertension?		
Yes	10	20.0
No	40	80.0
If yes, who is the person?		
Grandparents	0	0.0
Parents	5	10.0
Brother/sister	37	74.0
Cousin	5	10.0
Nephew	3	6.0

Table 6. Chi-square result of association between

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	187.000[a]	121	.000
Likelihood Ratio	81.420	121	.998
Linear-by-Linear Association	16.000	1	.000
N of Valid Cases	17		

a: 324 cells (100.0%) have expected count less than 5. The minimum expected count is .04

Table 7. Association between family history of hypertension and type II diabetes

	Value	df	Asymp. Sig (2-sided)
Pearson Chi-Square	408.000[a]	289	.000
Likelihood ratio	130.907	289	1.000
Linear-by-linear association	23.000	1	.000
N of Valid Cases	24		

4. DISCUSSION

Diabetes and hypertension are major health concerns in developing countries. They pose serious health challenges in Nigeria. The study found a high prevalence of hypertension among the patients. Many studies have reported a high prevalence of hypertension among diabetic than non-diabetic patients, however it tends to be higher among individuals with type 2 diabetes [20]. The prevalence of hypertension among diabetic individuals is variable worldwide [20]. According to [21] the frequency of hypertension in type 2 diabetes is related to the degree of obesity, advancement of age and extreme atherosclerosis. [20] Reported a high prevalence (54.0%) of hypertension among diabetic individuals in Nigeria.

The high prevalence of the patients could be attributed to their dietary pattern. They consumed more of fatty foods, canned foods and always ate from restaurants. They were also found to consume more of carbohydrates. Though they did not put additional sugar to their foods, many of them took sugary drinks always. According to heartuk.org (n.d.) three-quarters of the salt we eat is hidden in manufactured foods, ready meals and takeaways. Other studies [22] have shown that foods high in red and processed meats, fast food, fatty foods and sweet deserts can lead to high blood pressure. Furthermore, the use of dietary control in the treatment of both diseases implies the importance of diets in both conditions.

The non-engagement in physical exercise by many of the respondents predisposes them to hypertension and diabetes. This might be linked to the poor sensitization on the role of physical activities in diabetes and hypertension reduction. Physical activities according to [23] help control weight and reduce risk factors such as high blood pressure, high blood sugar levels and high blood cholesterol and lead to prevention of complications such as atherosclerosis, angina, myocardial infarction and stroke. It maintained that physical activities reduce systolic blood pressure by an average of 7.4mmHg and diastolic blood pressure by 5.8mmHg. The risk of stroke is reduced by 35 – 40%and cardiovascular disease by 20–25% when diastolic blood pressure is decreased by 5 – 6 mmHg.

Family history of the respondents is also a risk factor for diabetes and hypertension [24]. Stated that family history is an important non-modifiable risk factor for hypertension. The inheritable nature of hypertension has been found by many family studies [25] showing associations of blood pressure among siblings and between parents and children [26]. [27] found that about 30% of the blood pressure variance can be attributed to genetic factors and was found to vary from 25% in pedigree studies to 65% in twin studies [28]. [24] Reported that a higher prevalence of hypertension in those with a family history of hypertension at all levels than those without it. On the association between hypertension and the risk of diabetes, [24] also reported that individuals with history of hypertension had a higher body mass index, LDL cholesterol, triglycerides and diastolic blood pressure. They also found that in patients with hypertension, the BMI and diastolic blood pressure increased significantly with an increasing number of generations.

Identifying family history of hypertension offers the opportunity of low-cost, greater acceptability and reflecting shared genetic and lifestyle factors. It is also important for screening purposes to identify the high risk population before diagnosis of hypertension is made [29] and to target intervention and disease prevention [30]. Knowledge of risk is a factor that promotes better and earlier health-related behavior [31] and lifestyle modification are proven effectual in primary prevention of hypertension [32].

5. CONCLUSION

Family history is associated with type 2 diabetes. Dietary pattern is also associated with the risk of hypertension in type 2 diabetic patients. It was observed that many of the patients avoided physical activities. Drugs and dietary controls were used in the treatment of the two conditions. It was recommended that sensitization campaigns be increased so as to educate people on the effect of diets on hypertension and diabetes. Family history of patients should be also determined to encourage early detection and treatment of hypertension and diabetes.

CONSENT

As per international standard or university standard, participant's written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, Abraham J, Adair T, Aggarwal R, Ahn SY, Almazroa MA, Alvarado M, Anderson RH, Anderson LM, Andrews KG, Atkinson C, Baddour LM, Barker-Collor S, Murray CJL. Global and regional mortality from 235 causes of death for age groups in 1990 and 2010: a systematic analysis for the global burden of disease study 2010. Lancet. 2012;380(9859):2095–2128.
2. Alexander MR. What is the global prevalence of hypertension (high blood pressure)? Medscape, June 21; 2019.
3. World Health Organization, WHO. Physical activity for patients with hypertension. A non-communicable disease education manual for primary healthcare professionals and patients. World Health Organization, Western Pacific Region; 2017.
4. Lim SS, Vos T, Flaxman AD, Danaei G. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors clusters in 21 regions, 1990 – 2010: A systematic analysis for the Global Burden of Disease Study 2010. Lancet. 2012;380(9859):2224–2260.
5. World Health Organization, WHO. Causes of death 2008 (online database); 2013. Available:https://www.who.int/healthinfo/global_burden_disease/cod_2008_sources_methods.pdf
6. Fuentes R, Ilmaniemi N, Laurikainen E, Tuomilehto J, Nissinen A. (). Hypertension in developing economies: A review of population-based studies carried out from 1980 – 1998. Journal of Hypertension. 2000;18:521-529.
   DOI: http://dx.doi.org/10.1097/00004872-2000018050 - 00003PMID: 10826553
7. Ibrahim MM, Damasceno A. Hypertension in developing countries. Lancet. 2012;380: 611–619.
8. Seedat YK. Hypertension in developing nations in sub-Saharan Africa. Journal of Human Hypertension. 2000;14(9):3–11.
9. Van de Vijver S, Akinyi h, Oti S, Olajide A, Agyemang C, Aboderin I, Kyobutungi C. Status report on hypertension in Africa – consultative review for the 6th Session of the African Union Conference of Ministers of Health on NCDs. Pan African Medical Journal. 2013;16:38.
   DOI: 10.11604/pamj.2013.16.38.3100
10. Anwer Z, Sharma PK, Garg VK, Kumar N, Kumari A. (). European Review for Medical and Pharmacological Science. 2011;15:1256–1263.
11. Bakris GL, Barnhill BW, Sadler R. Treatment of arterial hypertension in diabetic humans: importance of therapeutic selection. Kidney International. 2012;41:912–919.
12. De Boer IH, Bangalore S, Benetos A, Davis AM, Michos ED, Muntner P, Rossing P, Zoungas S, Bakris G. Diabetes and hypertension: A position statement by the American Diabetes Association, Diabetes care. 2017;40(supply.1):S2.
    Available:https://doi.org/10.2337/dc17.S001
13. Olack B, Wabire-Mangen F, Smeeth L, Montgomery JM, Kiwanuka N, Breiman RF. Risk factors of hypertension among adults aged 35 – 64 years living in urban slum Nairobi, Kenya. Public Health. 2015;15:1251.
    DOI: 10.1186/s12889-015-2610-8
14. Standley PR, Ali S, Bapna C, Sowers JR. Increased platelet cytosolic calcium responses to low density and without hypertension. American Journal of Hypertension, 2003;6:938–943.
15. Stern MP. Do non-insulin-dependent diabetes mellitus and cardiovascular disease share common antecedents? Annals of Internal Medicine. 1996;124:110–116.
16. Sowers JR, Zemel M. clinical implications of hypertension in the diabetic patient. American Journal of Hypertension. 2010;3:415–424.
17. Keamy PM, Whelton M, Raynolds K. Global burden of hypertension analysis of worldwide data. Lancet. 2015;265:217–223.
18. Mawaw PM, Yav T, Mukuku O, Lukanka O, Kazadi PM, Tambwe D, Omba J, Kakoma J, Bangs MJ, Luboya OS. Prevalence of obesity, diabetes mellitus, hypertension and associated risk factors in a minning workforce, democratic Republic of Congo. Pan African Medical Journal. 2017;28:282.
    DOI: 10.11604/pmj.2017.28.282.14361
19. Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hamalanen H, PIlannne-Parikka

P, Kinanen-Kiukaanniemi S, Laakso M, Louheranta A, Rastas M, Salminen, V., Aunola, S. Prevention of Type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. The New England Journal of Medicine. 2001;344:1343–1350.

20. Unadike BC, Ereggie A, Ohwovoriole AE. Prevalence of hypertension amongst persons with diabetes mellitus in Benin City, Nigeria. Nigerian Journal of Clinical Practice. 2011;14(3):300–302.

21. Hashemizadeh H, Dorari S, Sarvelayati DS. Hypertension and type 2 diabetes: A cross-sectional study in hospitalized patients in Quchan, Iran. Iranian Journal of Diabetes and Obesity. 2013;5(1):21–26.

22. Kotchen T. Obesity-related hypertension: epidemiology, pathophysiology and clinical management. American Journal of Hypertension. 2010;23(11):1170–1178. Available:https://doi.org/10.1038/ajh.2010. 172

23. World Health Organization, WHO. Non-communicable disease education manual for primary health care professionals and patients. WHO; 2017.

24. Ranasinghe P, Cooray DN, Jawawardena R, Katulanda P. The influence history of hypertension on disease prevalence and associated metabolic risk factors among Sri Lankan adults. BMC Public Health. 2015;15:576.DOI: 10.1186/s12889-015-1927 – 7

25. Barlassina C, Lanzani C, Manunta P, Bianachi G. Genetics of essential hypertension: Rom family to genes. Journal of American Society of Nephrology. 2002;13(Suppl. 3):S155–S164.

26. Carretero OA, Oparil S. Essential hypertension. Part I: definition and etiology. Circulation. 2000;101(3):329–335.

DOI: 10.1161/01.CIR.101.3.329

27. Corvol P, Juenemaitre X, Charru A, Soubrier F. Can the genetic factors help in the treatment of systemic hypertension? The case of the renin-hypertension in adolescents. American Journal of Cardiology, 1992;70(12):14D–20D.
DOI: 10.1016/0002-9149(92)90267 – 3

28. Simsolo RB, Pomo NM, Rabinovich L, Bananno M, Grunfeld B. (). Family history of essential hypertension versus obesity as risk factors for hypertension in adolescents. American Journal of Hypertension. 1999;12(3):260–263.

29. Goldstein I, Shapiro D, Weiss R. How family history and risk factors for hypertension relate to ambulatory blood pressure in healthy adults. Journal of Hypertension. 2008;26(2):276–283.
DOI: 10.1097/HJH.0b013e3282fi5c27

30. Khanna N, Sharma RS, Sidhu RS. A study of the basic and derived anthropometric indices among healthy adults (20 – 30 years of age) of Amristar city (Punjab) having family history of hypertension. International Journal of Biology and Medical Resource. 2011;2(3):743–746.

31. Zafar SN, Gowani SA, Irani FA, Isahq M. Awareness of risk factors presenting features and complications of hypertension amongst hypertensives and normotensives. Journal of Paskistani Medical Association, 2008;288(15):1882–1888.

32. Whelton PK, He J, Appel LJ, Cutler JA, Havas S, Kotchen TA, Rocella EJ, Stout R, Vallbona Winston MC, Karimbakas J. Primary prevention of hypertension: Clinical and public health advisory from the National High Blood Pressure Education Program. Journal of American Medical Association. 2002;288(15):1882–1888.