



Hypertension among Type 2 Diabetic Patients in Uyo, South East Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Objective: The prevalence of non-communicable diseases especially diabetes is increasing in Nigeria. In addition to the other tropical diseases they present an increased load on the healthcare resources of the nation. Diabetic patients with comorbid hypertension are at an increased risk for cardiovascular disease morbidity and mortality. This study was conducted to determine the pattern of hypertension among diabetic patients.

Methods: Patients in the diabetes and metabolic diseases clinic of the University of Uyo Teaching Hospital (UUTH) were recruited for this study. They filled a questionnaire and had their BP measurements taken. Hypertension was defined as having a previous physician's diagnosis of hypertension or persistent elevation of BP $\geq 140/90$ mm Hg.

Results: Three hundred and twenty patients were recruited for the study. There were 177 (54.1%) females and 150 (45.9%) males. The average age of the patients was 56.2 ± 9.3 years while the average duration of diabetes was 8.3 ± 5.3 years. Two hundred and forty (73.4%) of the patients were previously known hypertensive patients with only 48 (20%) having adequate BP control.

Conclusion: The prevalence of hypertension among diabetics is quite high and the control of BP is poor. This puts them at an increased risk for cardiovascular diseases morbidity and mortality.

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1. INTRODUCTION

Diabetes is an endocrine and metabolic condition primarily defined by the level of hyperglycaemia. Current estimates indicate there were 171 million people in the world with diabetes in the year 2000 and this is projected to increase to over 360 million by 2030 [1]. Hypertension is the persistent elevation of the systemic blood pressure $\geq 140/90$ mmHg. The World Health Statistics 2012 report that one in three adults worldwide, has a raised blood pressure; a condition that causes around half of all deaths from stroke and heart disease while one in ten adults has diabetes [2]. Hypertension is a common co-morbid condition amongst persons with diabetes mellitus (DM) [3]. Diabetes and hypertension share several pathophysiologic mechanisms including: inappropriate activation of the renin angiotensin aldosterone system (RAAS) [4], oxidative stress secondary to excessive production of reactive oxygen species (ROS) [5], inflammation, impaired insulin mediated vasodilatation, increased sympathetic nervous system (SNS) activation, dysfunctional innate and adaptive immune responses and abnormal renal handling of sodium [6]. It has also been shown that hypertension in diabetic persons is associated with accelerated progression of both microvascular (retinopathy, nephropathy and neuropathy) and macrovascular (atherosclerotic) complications [7]. Studies conducted in the Framingham population with diabetes indicated that the presence of hypertension in these participants was a resulting risk factor for the presence of cardiovascular disease. This data and other studies suggest a two-fold increased risk of cardiovascular events and deaths in diabetic persons with hypertension compared to those with normal blood pressures [8]. Conversely proper management of blood pressure (BP) in diabetics has been shown to reduce CVD outcome among patients [9].

Nigeria has a high prevalence of diabetes mellitus [10] as well as of systemic hypertension. The combined burden of these conditions places a lot of strain on the healthcare resources of the Nation [11]. This study was undertaken to determine the prevalence and pattern of hypertension among type 2 diabetes patients as an initial step in addressing the problems posed by hypertension in diabetes.

2. METHODS

2.1 Study Location

This study was conducted in the diabetes and metabolic diseases clinic of the University of Uyo Teaching Hospital (UUTH). This is a public hospital located in the capital of Akwa Ibom state, South Eastern Nigeria. This hospital provides secondary and tertiary health care services to the people of Akwa-Ibom and the neighboring states. The diabetes and metabolic diseases clinic receives referrals from the Hospital's general outpatient clinics, the general medical out-patient clinic and from other primary and secondary health care facilities within and around the state. The clinic attends to between 60 and 80 patients every week with about 1000 active patients on the register.

2.2 Study Population

Patients with a physician's diagnosis of type 2 diabetes were recruited for this survey. The minimum number of patients required for this study was calculated to be 303 using the formula $nf = n/1+(n/N)$. Where nf = The desired sample size when population is less than 10,000. n = the desired sample size when the population is more than 10,000. n is derived with the formula; $n = z^2Pq/d^2$. From results of a previous study in Benin, Nigeria [5] P is estimated to be 0.54.

BP was measured using Accuson mercury sphygmomanometer with the patient in a sitting position. Both arms were used for the measurements. Each arm was measured twice with an interval of 3-5 minutes apart and the highest value was recorded as the BP. Weight and height were measured without shoes and the subjects wearing light clothing. Hypertension was defined as having a previous physician's diagnosis of hypertension or persistent elevation of BP $\geq 140/90$ mmHg. BP was considered to be poorly controlled if the BP was $\geq 140/90$ mmHg (systolic/diastolic) at the time enrolment.

Data was analyzed using SPSS statistical software package (SPSS) version 20. Continuous variables were presented as means and the relationship between them was evaluated using Student's t test. Categorical variables were presented on frequency tables and the relationship between the variables and level of control was examined using a contingency table. P values less than 0.05 were considered statistically significant.

3. RESULTS

Three hundred and twenty-seven type 2 diabetic patients were recruited for this survey. There were 177 (54.1%) females and 150 (45.9%) males. The average age of the patients was 56.2 ± 9.3 years while the average duration of diabetes was 8.3 ± 5.3 years. Most of the patients were married (83.5%). Only 21 (6.4%) of them had no education with a majority (47.7%) having a tertiary education. The most common occupational category was that of civil servant while the least was the business category. The commonest medications used were oral hypoglycemic agents (OHA) alone (72.5%) followed by insulin alone (22.0%). Only 3 (0.9%) of the patients relied on just dietary measures to control their blood sugar. Eighteen percent (18%) of patients report using alcohol regularly. Two hundred and forty (73.4%) of the patients were previously known hypertensive patients and were currently on anti-hypertensive medications. The average body mass index (BMI) was 27.7 ± 4.1 kg/m² with just 87 (26.6%) of the patients with normal weight and 129 (39.4%) being overweight (Table 1).

One hundred and eighty-nine patients had uncontrolled systolic blood pressure with a mean BP of 158.0 ± 21.2 mmHg. 120 patients had uncontrolled diastolic BP with a mean of 96.3 ± 12.0 mmHg. In all 192(58.7%) patients had an elevation in BP (Table 2). A contingency table was constructed to determine the level of BP control among diabetic patients who were previously known hypertensive (Table 3). Of the 240 diabetics with a previous diagnosis of hypertension, only 48(20.0%) had good control of their BP (X^2 168.6, $p < 0.001$).

4. DISCUSSION

This study was a hospital-based survey to determine the pattern of hypertension among patients attending the diabetic clinic of in a Tertiary health facility. Women were in majority in this survey (54.1%). This female preponderance is in keeping with observations from previous studies conducted among patients in health facilities in Nigeria where females make between 52%-63% of the study population [12-14]. The preponderance of female diabetics has also been

reported from previous community based studies in Nigeria [15-17]. This presentation is different from observations in Europe where diabetes is more prevalent among men [18-20].

Table 1. Patient characteristics

Parameter	Frequency N (%)
Gender	
Males	150(45.9)
Female	177(54.1)
Marital status	
Married	273(83.5)
Widowed	51(15.6)
Divorced	3(0.9)
Education	
None	21(6.4)
Primary	99(30.3)
Secondary	51(15.6)
Tertiary	156(47.7)
Occupation	
Unemployed	39(11.9)
Retired	78(23.9)
Unskilled	66(20.2)
Semi-skilled	18(5.5)
Civil servants	111(33.9)
Business men	15(4.6)
Diabetes treatment	
Diet alone	3(0.9)
OHA* alone	237(72.5)
Insulin	72(22.0)
Insulin and OHA combined	15(4.6)
BMI	
Normal	87(26.6)
Overweight	129(39.4)
Mild obesity	93(28.4)
Moderate obesity	12(3.7)
Morbid obesity	3(0.9)
Alcohol use	60(18.3)
Previously Hypertensive	240(73.4)

*Oral Hypoglycaemic Agent

Table 2. Frequency of elevated blood pressure

Parameter	Frequency (%)
Systolic hypertension	189(57.8)
Diastolic hypertension	120 (36.7)
Hypertension*	192(58.7)

*elevated BP $\geq 140/90$ mmHg

Table 3. Blood pressure control among known hypertensive patients

Adequate BP control	Normotensive N=87	Hypertensive N = 240	X ²	Df	P
Yes	87(100)	48(20.0)	168.6	1	<0.001
No	0(0.0)	192(80.0)			

The average age of the diabetic patients in this survey was 56.2 years. This is similar to previous studies from Nigeria where the average age of diabetics ranges between 57.1 years and 59.8 years [13-15]. This is lower than what is reported from European populations where majority of the diabetics are above 65 years [18,19].

In this study the frequency of hypertension was 73.4% this is similar to observations from previous studies in Europe where hypertension is more common in individuals with diabetes than the general population, with estimates of the prevalence of hypertension in diabetic populations ranging from 58% in Framingham [8] to 73% in Spain [21]. There is an obvious change in the prevalence of hypertension among diabetics over time in Nigeria. Earlier studies from Nigeria had reported lower prevalence for hypertension among diabetic patients. Osuntokun et al. in 1972, reported a prevalence rate of hypertension in DM of 25% in Ibadan [22], while Okesina et al. in the early 1990s reported a prevalence rate of 30% in Ilorin [23].

More recent studies from Nigeria report a varied prevalence for hypertension in diabetes but generally the reported prevalence is above 50%. Unadike et al. in a survey to determine the prevalence of hypertension among diabetics in Benin reported a prevalence of 54.2% [5]. Ogundele et al. reported a prevalence of 79% in Lagos [14]. While Udenze et al. [24] reported a prevalence of 69% in Lagos. Chineye et al. in a multicenter survey involving diabetics from 6 different parts of Nigeria reported a prevalence of 60.9% for hypertension among DM patients [13].

An elevated BP is a strong independent risk factor for CVD and chronic kidney disease (CKD), and when hypertension is associated with DM, the risk is increased even further [25]. Several landmark studies have demonstrated that strict BP control is beneficial in hypertensive patients with diabetes [6]. In this survey the control of blood pressure among diabetics was poor with only 20% of them achieving recommended BP control. Similar poor BP control among diabetics with hypertension have been reported from other local studies; Chinenye et al. observed that between 14.2% and 17% of the diabetics in their study achieved adequate BP control [13]. Mutua et al. in central Kenya reported adequate BP control in only 36% of the diabetic patients [26]. Studies from Europe and America generally report adequate BP control among diabetics in a higher percentage of the

study population; Ruckert et al. reported that 48.8% of their patients with diabetes and hypertension achieved adequate BP control in the DIAB-CARE study carried out in Germany [27]. Choma et al. in a review of data from Veterans healthcare records in America reported that 59.5% of the hypertensive patients with newly diagnosed diabetes had adequate BP control [28]. This differences in rate of BP control observed between studies involving African subjects and studies from the Western world may be attributable to racial differences among other factors [28,29].

5. CONCLUSION

In conclusion hypertension is very common among patients with diabetes in our environment and the recommended BP targets are not achieved in a vast majority of them putting them at a higher risk for CVD. Further studies may be required to evaluate factors associated with poor BP control among our patients. As well as a follow up study to determine CVD and all cause morbidity and mortality among diabetic patients in Uyo.

6. STUDY LIMITATIONS

There limitations of this study include the fact that this was a single center study and the measured parameters were recorded in a single visit and the study location is a tertiary health facility as such the patients may have more advanced / complicated disease.

CONSENT

As per international standard or university standard written patient consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: Estimates for the year 2000 and

- projections for 2030. *Diabetes Care*. 2004;27:1047-1053.
2. World Health Organization. Geneva: WHO; 2012. World Health Statistics 2012 Report. (Accessed on 16/11/2015)
Available:http://apps.who.int/iris/bitstream/10665/44844/1/9789241564441_eng.pdf?ua=1
 3. Unadike BC, Eregie A, Ohwovoriole AE. Prevalence of hypertension amongst persons with diabetes mellitus in Benin City, Nigeria. *Niger J Clin Pract*. 2011;14:300-2.
 4. Cooper SA, Whaley-Connell A, Habibi J, Wei Y, Lastra G, Manrique C, et al. Renin-angiotensin-aldosterone system and oxidative stress in cardiovascular insulin resistance. *Am J Physiol Heart Circ Physiol*. 2007;293:H2009–H2023.
 5. Sowers JR. Diabetes mellitus and vascular disease. *Hypertension*. 2013;61(5):943–7.
 6. Lastra G, Syed S, Kurukulasuriya R, Manrique C, Sowers JR. Type 2 diabetes mellitus and hypertension: An update. *Endocrinol Metab Clin North Am*. 2014;43(1):103–122.
 7. Mathews DR, Stratton JM, Aldington SJ, Holman RR, Kohner EM. For the UK prospective diabetes study group. Risks of progression of retinopathy and vision loss related to tight blood pressure control in type 2 diabetes mellitus: UKPDS 69. *Arch Ophthalmol*. 2004;122(11):1631-1640.
 8. Chen G, McAlister FA, Walker RL, Hemmelgarn BR, Campbell NR. Cardiovascular outcomes in Framingham participants with diabetes: The importance of blood pressure. *Hypertension*. 2011;57:891–897.
 9. Mehler PS, Coll JR, Estacio R, Esler A, Schrier RW, Hiatt WR. Intensive blood pressure control reduces the risk of cardiovascular events in patients with peripheral arterial disease and type 2 diabetes. *Circulation*. 2003;107:753-756.
 10. Ogbera AO, Ekpebegh C. Diabetes mellitus in Nigeria: The past, present and future. *World Journal of Diabetes*. 2014;5(6):905-911.
 11. Akinlua JT, Meakin R, Umar AM, Freemantle N. Current prevalence pattern of hypertension in Nigeria: A systematic review. Reboldi G, Ed. *PLoS ONE*. 2015;10(10):e0140021.
DOI: 10.1371/journal.pone.0140021
 12. Chukwuani U, Digban KA, Yowwin GD, Chukwuebuni NJ. Prevalence of chronic complications of type 2 diabetes mellitus in a secondary health centre in Niger Delta, Nigeria. *Int J Res Med Sci*. 2016;4:1080-5.
 13. Chinenye S, Uloko AE, Ogbera AO, Ofoegbu EN, Fasanmade OA, Fasanmade AA, et al. Profile of Nigerians with diabetes mellitus - Diabcare Nigeria study group (2008): Results of a multicenter study. *Indian J Endocr Metab* 2012;16:558-64.
 14. Ogundele SO, Dada AO, Mosuro OR. Clinical profile, knowledge, and beliefs about diabetes among patients attending a Tertiary Health Centre in Lagos: A cross-sectional survey. *Niger J Clin Pract*. 2016;19(4):508-12
 15. Isara AR, Okundia PO. The burden of hypertension and diabetes mellitus in rural communities in southern Nigeria. *The Pan African Medical Journal*. 2015;20:103.
DOI: [10.11604/PAMJ.2015.20.103.5619](https://doi.org/10.11604/PAMJ.2015.20.103.5619)
(Accessed on 21/06/2017)
Available:<http://www.panafrican-med-journal.com/content/article/20/103/full/#WUvAqYwCfMs>
 16. Ogunmola OJ, Olaifa AO, Oladapo OO, Babatunde OA. Prevalence of cardiovascular risk factors among adults without obvious cardiovascular disease in a rural community in Ekiti State, Southwest Nigeria. *BMC Cardiovascular Disorders*. 2013;13:89.
(Accessed on 20/06/2017)
Available:<http://www.biomedcentral.com/1471-2261/13/89>
 17. Sabir A, Ohwovoriole A, Isezuo S, Fasanmade O, Abubakar S, Iwuala S. Type 2 diabetes mellitus and its risk factors among the rural Fulanis of Northern Nigeria. *Ann Afr Med*. 2013;12(4):217-22.
 18. Andersson T, Ahlbom A, Magnusson C, Carlsson S. Prevalence and incidence of diabetes in Stockholm County 1990-2010. Manzoli L, Ed. *PLoS ONE*. 2014;9(8):e104033.
DOI: 10.1371/journal.pone.0104033
(Accessed on 22/11/2016)
Available:<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0104033>
 19. Soriguer F, Goday A, Bosch-Comas A, Bordiu E, Calle-Pascual A, Carmena R, et al. Prevalence of diabetes mellitus and impaired glucose regulation in Spain: The diabetes study. *Diabetologia*. 2012;55(1):88-93.
 20. Espelt A, Borrell C, Palencia L, Goday A, Spadea T, Gnavi R, et al. Socioeconomic inequalities in the incidence and

- prevalence of type 2 diabetes mellitus in Europe. *Gac Sanit.* 2013;27(6):494-501.
21. de Burgos-Lunar C, Jimenez-García R, Salinero-Fort MA, Gómez-Campelo P, GilA, Abanades-Herranz JC, et al. Trends in hypertension prevalence, awareness, treatment and control in an adult type 2 diabetes Spanish population between 2003 and 2009. *PLoS ONE.* 2014;9(1):e86713. DOI: 10.1371/journal.pone.0086713 (Accessed on 22/08/2016) Available:<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0086713>
22. Osuntokun BO. Hypertension in Nigerian diabetics: A study of 832 patients. *Afr J Med Sci.* 1972;3:257-65.
23. Okesina AB, Omotoso AB, Gadzama AA, Ogunrinola EO. Frequency of hypertension in diabetic patients: Relationship with metabolic control, body mass index, age and sex. *Int Diab Dig.* 1995;7:39-40.
24. Udenze IC, Azinge EC, Arikwe AP, Egbuagha EU, Onyenekwu C, Ayodele O, et al. The prevalence of metabolic syndrome in persons with type 2 diabetes at the Lagos University Teaching Hospital, Lagos, Nigeria. *West Afr J Med.* 2013;32(2):126-32.
25. Garcia-Touza M, Sowers JR. Evidence-based hypertension treatment in patients with diabetes. *J Clin Hypertens (Greenwich).* 2012;14:97-102.
26. Mutua EM, Gitonga MM, Mbuthia B, Muiruri N, Cheptum JJ, Maingi T. Level of blood pressure control among hypertensive patients on follow-up in a regional referral hospital in Central Kenya. *Pan Afr Med J.* 2014;18:278. DOI: 10.11604/pamj.2014.18.278.4308 eCollection 2014. (Accessed on 21/06/2017) Available:<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4258197/pdf/PAMJ-18-278.pdf>
27. Ruckert IM, Baumert J, Schunk M, Holle R, Schipf S, Volzke H, et al. Blood pressure control has improved in people with and without type 2 diabetes but remains suboptimal: A longitudinal study based on the German DIAB-CORE Consortium. *Plos One.* 2015;10(7):e0133493. DOI: 10.1371/journal.pone.0133493 eCollection 2015. (Accessed on 23/06/17) Available:<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4519307/pdf/pone.0133493.pdf>
28. Choma NN, Griffin MR, Kaltenbach LA, Greevy RA, Roumie CL. Blood pressure control among patients with hypertension and newly diagnosed diabetes. *Diabet Med.* 2012;29(9):1126-33.
29. Axon RN, Gebregzibher M, Echols C, Msph GG, Egede LE. Racial and ethnic differences in longitudinal blood pressure control in veterans with type 2 diabetes mellitus. *J Gen Intern Med.* 2011;26(11):1278-83.

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