

Hypertension Prevalence and Body Mass Index Correlates among Patients with Diabetes Mellitus in Oghara, Nigeria

Anizor Chinedu, Azinge Nicholas

Department of Internal Medicine, Endocrine Unit, Delta State University Teaching Hospital, Oghara, Delta State, Nigeria

Abstract

Background: Hypertension and abnormal body mass index (BMI) are a cause of increased morbidity and mortality in patients with diabetes mellitus (DM). The aim of this study is to determine the prevalence of hypertension with correlates to BMI among patients with DM seen in a tertiary hospital in Oghara, Delta State. **Materials and Methods:** Two hundred and forty-four diabetic subjects were retrospectively evaluated at the Endocrinology Clinic of the Delta State University Teaching Hospital, Oghara, Nigeria. Data obtained from medical records included presence of hypertension confirmed by presence of elevated blood pressure >140/90 mmHg on two consecutive clinic visits or known hypertensive on medications, age, sex, type of diabetes, weight and height with computation of BMI. **Results:** The prevalence of hypertension among the diabetic patients was 57.4%. Eighty-two males (58.5%) were hypertensive compared with 58 (41.5%) in female subjects. The prevalence of hypertension was higher in overweight and obese diabetic subjects than in normal weight subjects and also higher in type 2 diabetic patients compared to type 1, which were both statistically significant ($P < 0.05$). **Conclusion:** Hypertension is a common co-morbidity arising in diabetic patients in this study. The focus must be on health education, lifestyle modification and adherence to anti-hypertensive therapy to control hypertension in diabetic patients.

Key words: Body mass index, diabetes mellitus, hypertension, prevalence

INTRODUCTION

There has been an increase in the prevalence of diabetes mellitus (DM) world-wide. The worldwide prevalence of diabetes in 2000 was approximately 2.8% and is estimated to grow to 4.4% by 2030. This translates to a projected rise of diabetes from 171 million in 2000 to well over 350 million in 2030.^[1] There is considerable evidence of an increased prevalence of hypertension in diabetic persons.^[2,3] In a large prospective cohort study that included 12,550 adults, the development of type 2 diabetes was almost 2.5 times as likely in persons with hypertension that in their normotensive counterparts.^[3,4] Similarly, evidence points to increased prevalence of hypertension in diabetic persons as each pathophysiological disease entity serves to exacerbate the other.^[5,6]

The presence of hypertension in diabetic patients substantially increases the risks of coronary heart disease, stroke, nephropathy, and retinopathy.^[7,8] Indeed, when hypertension coexists with diabetes, the risk of cardiovascular disease is

increased by 75%, which further contributes to the overall morbidity and mortality of an already high-risk population.^[9]

Epidemiologic studies provide evidence for co-existence of hypertension and diabetes and possibly point toward a common genetic and environmental factor promoting both diabetes and hypertension.^[10] Insulin resistance increased renin-angiotensin-aldosterone system and increased sympathetic nervous system activity have all been implicated in this complex pathophysiology of hypertension and diabetes.^[11,12]

In this study, we aim to assess the prevalence of hypertension among persons with DM attending the Endocrinology Clinic in Oghara, Delta State. Findings from this study will contribute to the existing knowledge of the complex interplay of hypertension, abnormal body mass index (BMI) and diabetes. It will also form a basis for future prospective and interventional studies in these areas.

MATERIALS AND METHODS

This was a cross-sectional descriptive study of 244 persons with DM who consented and were recruited from the endocrine clinic of the Delta State University Teaching Hospital, Oghara, Delta State. The study period was from January 2010 to June 2012.

Access this article online

Quick Response Code:



Website:
www.njgp.org

DOI:
10.4103/1118-4647.158707

Address for correspondence: Dr. Anizor Chinedu, Department of Internal Medicine, Delsuth, P.M.B. 07, Oghara, Delta State, Nigeria.
E-Mail: dranizor@gmail.com

Data obtained from medical records include socio-demographic variables (age, gender) history of hypertension use of anti-hypertensive medications and duration of diabetes. Anthropometric measurements, including weight and height were obtained from records. BMI was calculated by dividing the weight in kilograms by the square of the height in meters. BMI was categorized as normal of 18.5–24.9 kg/m², overweight of 25–29.0 kg/m² and obese if ≥ 30 kg/m².^[13]

Blood pressure which was measured using standardized sphygmomanometers was also obtained from medical records on first and second clinical visit. Hypertension was diagnosed if systolic blood pressure ≥ 140 mmHg or a diastolic blood pressure ≥ 90 mmHg was gotten on at least two occasions or if the patient was on antihypertensive drugs.^[14]

Data analysis was performed using SPSS for Windows, Version 16.0. Chicago, SPSS Inc (2007).

Results were expressed as means $\pm$ standard deviation comparison of proportions and test of association was done using the Chi-square test. The level of statistical significance was taken as $P < 0.05$.

RESULTS

The socio-demographic characteristics of the study group are shown in Table 1. There were 129 females and 115 males representing 52.9% and 47.1% of the study population, respectively.

The mean age of the study subjects was 55.6 ± 9.2 years. The mean BMI was 28.62 ± 4.2 kg/m².

The prevalence rate of hypertension was 57.4%. Eighty-two males (58.5%) and 58 females (41.5%) had hypertension, but there was no significant difference between the proportions in both sexes [Table 2].

Eleven (24%) of the 46 subjects with type 1 DM had hypertension, whereas 129 (65.1%) out of 198 subjects with type 2 DM had hypertension, this difference was statistically significant ($P = 0.032$) [Table 3].

In this study, over weight and obese subjects had significantly higher rate of hypertension than normal weight subjects (74.4% vs. 41.7%, $P = 0.0004$) [Table 4]. Also, the prevalence of overweight and obesity among the hypertensive subjects was 62.1%. Out of the 140 hypertensive patients, 16.4% were not aware of having hypertension at the time of study. In addition, 55.7% of patients who were aware of having hypertension and were on medications still had uncontrolled blood pressure.

DISCUSSION

Patients of both type 1 and type 2 DM are prone to develop hypertension which accelerates cardiac, renal and cerebral dysfunctions, which are leading causes of deaths.^[15] Hypertension may precede the onset of DM and in about 95% cases, it is essential hypertension and the rest may be

Table 1: Socio-demographic characteristics of study population

	<i>n</i> (%)
Gender	
Female	129 (52.9)
Male	115 (47.1)
Age	
<50	73 (30)
50-60	64 (26.2)
≥ 60	107 (43.8)
BMI	
Normal	127 (52)
Over weight	81 (33.2)
Obese	36 (14.8)

BMI: Body mass index

Table 2: Association between hypertension and gender of study subjects

	Hypertension (%)	No hypertension (%)	Total (%)
Male	82 (71.3)	33 (28.7)	115 (100)
Female	58 (45)	71 (55)	129 (100)
Total	140	104	244

$\chi^2=8.72$, $P=0.108$

Table 3: Association between hypertension and type of DM

	Hypertension (%)	No hypertension (%)	Total (%)
Type 1	11 (24)	35 (76)	46 (100)
Type 2	129 (65.1)	69 (34.9)	198 (100)
Total	140	104	244

$\chi^2=9.73$, $P=0.032$. DM: Diabetes mellitus

Table 4: Association between hypertension and BMI of study subjects

	Hypertension (%)	No hypertension (%)	Total (%)
Normal	53 (41.7)	74 (58.3)	127 (100)
Overweight	62 (76.5)	19 (23.5)	81 (100)
Obese	25 (69.4)	11 (30.6)	36 (100)
Total	140	104	244

BMI: Body mass index

secondary type. In some cases, both hypertension and DM may be present at the initial diagnoses. Hypertension may develop later in a diabetic subject as a feature of diabetic nephropathy.

The frequency of hypertension in the diabetic population is almost twice when compared to the nondiabetic general population.^[16] The prevalence rate of hypertension among diabetic subjects in this study was 57.4%. This is comparable to the 54.2% rate reported in Benin City, Nigeria and 53% among Saudi diabetics.^[17,18] Compared with other populations, the rate of hypertension among diabetics in our study is lower than the 74%, 74.4%, 73% and 82% rates of hypertension reported in UK Caucasians, Italian Spanish and UK Afro-Caribbean

subjects respectively.^[19-22] Our rate is also much higher than the 32% and 39% rates reported among diabetics in the Turkish and Taiwanese populations, respectively.^[23,24] The explanation for differences in frequency by each country could be due to different methods of surveillance, differences in definitions of hypertension, population characteristics, and ethnic variations.^[22]

Our study also showed that the prevalence of hypertension was higher in overweight and obese diabetics than those with normal BMI. This association is in agreement with research literature and with the findings of other studies.^[25] The high prevalence of overweight and obesity amongst hypertensive and diabetic adult patients might be explained by the fact that hypertension has been found to be more prevalent in the older obese population than in normal weight control.^[24] Also, there is a direct positive relationship between body weight or BMI and blood pressure,^[27] and over 75% of newly diagnosed type 2 diabetic patients are obese.^[28] The coexistence of diabetes, hypertension and obesity or overweight increases the risk of cardiovascular complications and other morbidities.^[29] Studies in the United Kingdom also showed similar findings where obese patients had worse glycemic control and lipid profiles and higher blood pressures compared to nonobese patients.^[30] It is known that weight loss in overweight patients with type 2 diabetes rapidly reverses the state of insulin resistance and can restore normal glucose cancelations.^[31] A variety of intervention studies show that patients with type 2 diabetes who succeed in losing weight often enjoy modest improvements in glycemic control and cardiovascular risk profiles as long as the weight loss is maintained. Obesity is known to increase the risk of dyslipidemia and hypertension.^[32] Thomas *et al.* showed that the prevalence of hypertension and uncontrolled blood sugar progressively increased with BMI in respective of the gender of their subjects.^[21] Therefore, it is plausible, not only that obesity is a risk factor for diabetes, but that obesity is also a continuing risk factor for complications in those with established diabetes.

Our study also revealed that 16.4% of the hypertensive diabetic patients were not aware of having hypertension. A study in Morocco had a prevalence of unawareness of 38.8%.^[33] This certainly emphasizes the need for monitoring and control of blood pressure in diabetics and the importance of continuous education for a diabetic patient. However, the majority of patients in our study with previously diagnosed hypertension still had uncontrolled hypertension. This finding is also consistent with reports from other studies.^[33,34] This may be attributed to the patient's ignorance of the potential complications of hypertension, ineffective health education from physicians and other health-care providers, low level of education and/or low socio-economic status. Anti-hypertensive treatments are somewhat expensive especially in the developing countries and some of these patients may be unable to afford their costs. This is especially challenging for patients living in rural and semi-urban areas. However, the benefits of controlling blood pressure in diabetics cannot be over-emphasized as

evidenced from various studies. In the UK Prospective Diabetes Study, it was found out that for each 10 mmHg decrease in mean systolic blood pressure was associated with relative risk reduction of 12% for any complication of diabetes, 15% for deaths related to diabetes, 11% for myocardial infarction and 13% for micro-vascular complications.^[35] Also, in a *post-hoc* report of the Systolic Hypertension in Europe Trial, the relative benefit of anti-hypertensive treatment was greater in the group of patients with diabetes compared with the nondiabetic group in terms of overall mortality.^[36]

Limitations of this study will be the cross-sectional design and also other cardiovascular risk factors like dyslipidemia was not assessed in the study subjects.

CONCLUSION

The prevalence of hypertension among persons with DM in this study is high. Efforts must be geared towards patient education, behavioral intervention to adopt healthy lifestyle changes as well as compliance with medications. Thus, end-organ complications with resultant morbidity and mortality can be prevented. The cost of anti-hypertensives can be subsidized by government agencies in order to make them more affordable to patients.

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;27:1047-53.
2. Pinhas-Hamiel O, Zeitler P. The global spread of type 2 diabetes mellitus in children and adolescents. *J Pediatr* 2005;146:693-700.
3. National High Blood Pressure Education Program Working Group report on hypertension in diabetes. *Hypertension* 1994;23:145-58.
4. Gress TW, Nieto FJ, Shahar E, Wofford MR, Brancati FL. Hypertension and antihypertensive therapy as risk factors for type 2 diabetes mellitus. Atherosclerosis risk in communities study. *N Engl J Med* 2000;342:905-12.
5. Sowers JR, Epstein M, Frohlich ED. Diabetes, hypertension, and cardiovascular disease: An update. *Hypertension* 2001;37:1053-9.
6. Sowers JR. Treatment of hypertension in patients with diabetes. *Arch Intern Med* 2004;164:1850-7.
7. Bakers G, Williams M, Divorkin L, Elliot W, Epstein M, Toto R, *et al.* Impact of diabetes on mortality after the first myocardial infarction. The FINMONICA Myocardial Infarction Register Study Group. *Diabetes Care* 1998;21:69-75.
8. Sowers JR, Haffner S. Treatment of cardiovascular and renal risk factors in the diabetic hypertensive. *Hypertension* 2002;40:781-8.
9. Adler AI, Stratton IM, Neil HA, Yudkin JS, Matthews DR, Cull CA, *et al.* Association of systolic blood pressure with macrovascular and microvascular complications of type 2 diabetes (UKPDS 36): Prospective observational study. *BMJ* 2000;321:412-9.
10. Reaven GM. Banting lecture 1988. Role of insulin resistance in human disease. *Diabetes* 1988;37:1595-607.
11. Redley JM, Ader M, Moore D, Bergman RN. Angiotensin II induces insulin resistance independent of changes in interstitial insulin. *Am J Physiol Endocrinol Metab* 1999;277:E920-6.
12. Ogihara T, Asano T, Ando K, Chiba Y, Sakoda H, Anai M, *et al.* Angiotensin II-induced insulin resistance is associated with enhanced insulin signaling. *Hypertension* 2002;40:872-9.
13. WHO. The Use and Interpretation of Anthropometry. Geneva, Switzerland: WHO; 1995.
14. American Diabetes Association. Standards of medical care in diabetes. *Diabetes Care* 2009;32:513-6.

15. Kaplan NM, Lieberman E. Hypertension and diabetes obesity and dyslipidaemia in clinical hypertension. 7th ed. New Delhi: B.I. Waverly Pvt. Ltd.; 1998. p. 244-7.
16. Paul B, Sapra B, Maheshwari S, Goyal RK. Role of losartan therapy in the management of diabetic hypertension. *J Assoc Physicians India* 2000;48:514-8.
17. 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.
18. Akbar DH, Ahmed MM, Algambi AA. Cardiovascular risk factors in Saudi and non-Saudi diabetics. *Saudi Med J* 2003;24:686-7.
19. Baskar V, Kamalakannan D, Holland MR, Singh BM. The prevalence of hypertension and utilization of antihypertensive therapy in a district diabetes population. *Diabetes Care* 2002;25:2107-8.
20. Comaschi M, Coscelli C, Cucinotta D, Malini P, Manzato E, Nicolucci A; SFIDA Study Group – Italian Association of Diabetologists (AMD). Cardiovascular risk factors and metabolic control in type 2 diabetic subjects attending outpatient clinics in Italy: The SFIDA (survey of risk factors in Italian diabetic subjects by AMD) study. *Nutr Metab Cardiovasc Dis* 2005;15:204-11.
21. Thomas F, Bean K, Pannier B, Oppert JM, Guize L, Benetos A. Cardiovascular mortality in overweight subjects: The key role of associated risk factors. *Hypertension* 2005;46:654-9.
22. Baskar V, Kamalakannan D, Holland MR, Singh BM. Does ethnic origin have an independent impact on hypertension and diabetic complications? *Diabetes Obes Metab* 2006;8:214-9.
23. Satman I, Yilmaz T, Sengül A, Salman S, Salman F, Uygur S, *et al*. Population-based study of diabetes and risk characteristics in Turkey: Results of the Turkish diabetes epidemiology study (TURDEP). *Diabetes Care* 2002;25:1551-6.
24. Tseng CH. Higher risk of hypertension in indigenous type 2 diabetic patients in Taiwan. *J Hypertens* 2006;24:1817-21.
25. Hillier TA, Pedula KL. Characteristics of an adult population with newly diagnosed type 2 diabetes: The relation of obesity and age of onset. *Diabetes Care* 2001;24:1522-7.
26. Marley J. Lifestyle intervention in hypertension. *Practitioner* 1989;233:661-3.
27. Alderman MH. Non-pharmacological treatment of hypertension. *Lancet* 1994;344:307-11.
28. Williams G. Management of non-insulin-dependent diabetes mellitus. *Lancet* 1994;343:95-100.
29. Brown CD, Higgins M, Donato KA, Rohde FC, Garrison R, Obarzanek E, *et al*. Body mass index and the prevalence of hypertension and dyslipidemia. *Obes Res* 2000;8:605-19.
30. Daousi C, Casson IF, Gill GV, MacFarlane IA, Wilding JP, Pinkney JH. Prevalence of obesity in type 2 diabetes in secondary care: Association with cardiovascular risk factors. *Postgrad Med J* 2006;82:280-4.
31. Henry RR, Wiest-Kent TA, Scheaffer L, Kolterman OG, Olefsky JM. Metabolic consequences of very-low-calorie diet therapy in obese non-insulin-dependent diabetic and nondiabetic subjects. *Diabetes* 1986;35:155-64.
32. Pinkney JH, Wilding JP. The poorly controlled patient with type 2 diabetes. In: Gill GV, editor. *Unstable and Brittle Diabetes*. London: Martin Dunitz; 2004.
33. Berraho M, El Achhab Y, Benslimane A, El Rhazi K, Chikri M, Nejari C. Hypertension and type 2 diabetes: A cross-sectional study in Morocco (EPIDIAM Study). *Pan Afr Med J* 2012;11:52.
34. Eguchi K, Ishikawa J, Hoshida S, Pickering TG, Shimada K, Kario K. Masked hypertension in diabetes mellitus: A potential risk. *J Clin Hypertens (Greenwich)* 2007;9:601-7.
35. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. UK Prospective Diabetes Study Group. *BMJ* 1998;317:703-13.
36. Tuomilehto J, Rastenyte D, Birkenhäger WH, Thijs L, Antikainen R, Bulpitt CJ, *et al*. Effects of calcium-channel blockade in older patients with diabetes and systolic hypertension. Systolic Hypertension in Europe Trial Investigators. *N Engl J Med* 1999;340:677-84.

How to cite this article: Chinedu A, Nicholas A. Hypertension prevalence and body mass index correlates among patients with diabetes mellitus in Oghara, Nigeria. *Niger J Gen Pract* 2015;13:12-5.

Source of Support: Nil. **Conflict of Interest:** None declared.