

## ORIGINAL ARTICLE

# Prevalence of hypertension amongst persons with diabetes mellitus in Benin City, Nigeria

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## Abstract

**Objective:** To determine the prevalence of hypertension amongst persons with diabetes mellitus (DM) in Benin city.

**Materials and Methods:** Four hundred and fifty diabetic subjects were evaluated for hypertension by measuring their blood pressure using a sphygmomanometer at the diabetes clinics of the University of Benin Teaching Hospital and Central Hospital, both in Benin City, Nigeria. Other data obtained included age, sex, type of DM, weight, height, body mass index and waist hip ratio.

**Results:** Two hundred and forty-four out of 450 subjects had hypertension, thus giving a prevalence rate of 54.2%. 124 males (50.8%) were hypertensive compared with 120 (49.2%) females, but this difference was not significant ( $\chi^2 = 0.1$ ,  $df = 1$ ,  $P > 0.05$ ). Thirteen (22.4%) of the 58 Type 1 subjects had hypertension, while 231 (58.9%) of the Type 2 subjects had hypertension, and this difference was statistically significant ( $\chi^2 = 27$ ,  $df = 1$ ,  $P < 0.05$ ).

**Conclusions:** Hypertension is prevalent in persons with DM. Studies have shown that adequate control of the blood pressure reduces the microvascular and macrovascular complications of DM. DM care providers must prescribe appropriate antihypertensive therapy to control hypertension in persons with DM.

**Key words:** Benin city, diabetes, hypertension, prevalence

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## Introduction

Hypertension is an extremely common co-morbidity amongst persons with diabetes mellitus (DM) and is said to be twice as prevalent in diabetics than in non-diabetic individuals.<sup>[1]</sup> 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.<sup>[2]</sup> Macrovascular disease accounts for the majority of deaths in patients with Type 2 DM. The prevalence of hypertension in this type of diabetes is associated with a fourfold to fivefold increase in mortality, predominantly from coronary artery disease and stroke.<sup>[3]</sup> Cardiovascular disease is the most costly complication of DM and is the cause of 86% of deaths in patients with DM.<sup>[4]</sup> Recent studies have demonstrated the effectiveness of blood pressure treatment in reducing the complications of diabetes.<sup>[5]</sup>

In this study, we aimed to find out the prevalence of hypertension amongst persons with DM, attending the Diabetes clinic in Benin City.

## Materials and Methods

This was a cross-sectional, descriptive study. Four hundred and fifty persons with DM (diagnosed using the 1999 WHO criteria),<sup>[6]</sup> who consented, were recruited from the diabetes clinics of the University of Benin Teaching Hospital and Central Hospital, both in Benin City. The study period was from January to December, 2004.

Data obtained include age, anthropometrical indexes,

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duration of diabetes and blood pressure. The weight was recorded in kilograms to the nearest 0.1 kg using a weighing scale, and the height was recorded in meters to the nearest 0.05 m. The body mass index (BMI) was calculated as the weight in kilograms divided by the square of the height in meters.<sup>[7]</sup> The waist circumference was measured using a non-stretch metric tape and taken at the mid-point between the rib cage and iliac crest, while hip circumference was taken at the maximal circumference of the buttocks.<sup>[8]</sup> Patients were diagnosed as having Type 1 DM if the diagnosis of DM was made before the age of 30 years and the patients were on insulin for survival of DM. Classification of patients as Type 2 DM was based on clinical grounds of non-dependence on insulin for survival. Hypertension was diagnosed using a mercury sphygmomanometer, with a systolic blood pressure of  $\geq 140$  mmHg or a diastolic blood of  $\geq 90$  mmHg on at least two occasions, or if the patient was on antihypertensive drugs.<sup>[9]</sup>

Ethical approval for this study was obtained from the Ethics Committee of the University of Benin Teaching Hospital, Benin City.

Data analysis was done using SPSS version 10 (1990–1994). Comparison of means was done using the Student's *t* test. 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 clinical characteristics of the study group are shown in Table 1. There were 225 males, and 225 females, giving a male:female ratio of 1:1. The mean age of the study subjects was 51.1 years. The mean BMI was 26.3 kg/m<sup>2</sup> and the mean waist hip ratio was 0.93. The mean duration of DM was 6.6  $\pm$  3.7 years. There were 392 subjects with Type 2 DM and 58 subjects with Type 1 DM. The mean ( $\pm$ SD) systolic blood pressure was 148.2  $\pm$  24.5 mmHg and the mean ( $\pm$ SD) diastolic blood pressure was 89.8  $\pm$  24.1 mmHg.

Two hundred and forty-four subjects with DM had hypertension, giving a prevalence rate of 54.2% in this study. 124 males (50.8%) had hypertension and 120 females (49.2%) had hypertension, but there was no significant difference between the proportions in both sexes ( $\chi^2 = 0.1$ , *df* = 1,  $P > 0.05$ ). Thirteen (22.4%) of the 58 subjects with Type 1 DM had hypertension, while 231 (58.9%) out of 392 subjects with Type 2 DM had hypertension; this difference was statistically significant ( $\chi^2 = 27$ , *df* = 1,  $P < 0.05$ ).

Tables 2 and 3 show the association between hypertension and the gender of the patients, and hypertension and type of DM, respectively.

**Table 1: Clinical characteristics of study subjects (N = 450)**

Parameters	Mean $\pm$ SD
Age	51.1 $\pm$ 7.0
BMI	26.3 $\pm$ 3.0
WHR	0.93 $\pm$ 0.12
Duration of DM	6.6 $\pm$ 3.7

BMI = Body mass index, WHR = Waist hip ratio, DM = Diabetes mellitus

**Table 2: Association between hypertension and gender of patient**

	Hypertension	NIL hypertension	Total
Male	124	101	225
Female	120	105	225
Total	244	206	450

$\chi^2 = 0.1$ , *df* = 1,  $P > 0.05$

**Table 3: Association between hypertension and type of DM**

	Hypertension	No hypertension	Total
Type 1	13	45	58
Type 2	231	161	392
Total	244	206	450

$\chi^2 = 27$ , *df* = 1,  $P < 0.05$ , DM = Diabetes mellitus

## Discussion

Hypertension is twice as prevalent in diabetics as in non-diabetic individuals.<sup>[1]</sup> Hypertension is also associated with accelerated progression of both microvascular and macrovascular complications in diabetics.<sup>[2]</sup> In patients with Type 1 DM, hypertension is generally not present at diagnosis, but develops as renal insufficiency progresses and exacerbates the progression to end-stage renal disease. In Type 2 DM, many patients are already hypertensive at the time of diagnoses.<sup>[10]</sup> The frequency of hypertension in Type 2 DM is related to the degree of obesity, advanced age and extreme atherosclerosis that is present in these patients. Hyperglycemia and increase in total body exchangeable sodium leading to extracellular fluid accumulation and expansion of the plasma volume contributes to the pathogenesis of hypertension in DM.<sup>[11]</sup>

The prevalence of hypertension in persons with DM is variable worldwide. Hypertension and DM are independent risk factors for microvascular and macrovascular disease. Earlier, Osuntokun *et al.*,<sup>[12]</sup> in 1972, reported a prevalence rate of hypertension in DM of 25% in Ibadan, Nigeria, while Okesina *et al.*<sup>[13]</sup> reported a prevalence rate of 30% in Ilorin in Nigeria. Kumwenda *et al.*<sup>[14]</sup> and Swai *et al.*<sup>[15]</sup> in their reports recorded a prevalence rate of between 37% and 45%. A more recent study by

Chuhwak *et al.*,<sup>[16]</sup> conducted in Jos, Nigeria, reported a prevalence rate of 35%. The high prevalence rate of 54.2% in our study as opposed to the earlier reports may be due to the fact that lower blood pressure values are now being used to diagnose hypertension as opposed to the earlier reports.<sup>[9]</sup>

Other reports elsewhere have been in keeping with this high prevalence of hypertension in persons with diabetes.<sup>[17,18]</sup> More people with Type 2 DM in our study had hypertension than those with Type 1 DM, and this difference was significant. In Type 2 DM, hypertension may be present at the time of diagnosis or even before the development of hyperglycemia and approximately 20–60% of patients with Type 2 DM will present with hypertension.<sup>[19]</sup>

Hypertension, if uncontrolled in persons with diabetes, causes microvascular and macrovascular complications.<sup>[2]</sup> Diabetic nephropathy affects 30% of patients with Type 1 DM and 10–20% of Type 2 DM patients and is now the leading cause of end-stage renal failure in the western world.<sup>[5]</sup> Control of hypertension with antihypertensives has been shown to retard its progression.<sup>[5]</sup> Retinopathy is also closely associated epidemiologically with hypertension and various studies have shown that there was a significant reduction of 34% in the number of patients requiring photocoagulation and a 47% reduction in the risk of decreasing vision in both eyes with tight blood pressure control.<sup>[4]</sup> In the UKPDS study, 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 microvascular complication.<sup>[5]</sup>

## Conclusions

The prevalence of hypertension amongst persons with DM in this study is high. Individuals with both hypertension and diabetes are at high risk for both microvascular and macrovascular complications of DM. Diabetic patients with hypertension should be treated with appropriate antihypertensive drugs and carefully monitored to ensure satisfactory blood pressure control and prevention of the end-organ complications of hypertension.

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