Journal of
Diabetes and Clinical Studies

RESEARCH ARTICLE

Hypertension Amongst the Diabetic Patients Assessing Care in A Primary Care Setting in South-Eastern, Nigeria

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Abstract

Introduction: The increasing scourge in hypertension and its complications are attributed to the effect of globalization and the rise in the prevalence of diabetes mellitus amongst other factors. This study is therefore set to determine the prevalence of hypertension amongst the diabetic cohort in a primary care setting in Nigeria.

Methodology: It was a descriptive cross-sectional study done between January and March, 2017. A total of 300 diabetic patients aged 20 years and above were randomly recruited into the study by the use of pre-tested and a well-structured questionnaire. The Fasting blood glucose, Random blood glucose and blood pressure (BP) were determined and recorded.

Results: The prevalence of hypertension amongst diabetics was 44%. The mean systolic and diastolic BPs were 152.32 ± 25.08 mmHg and 92.08 ± 12.01 mmHg respectively. The relationship between the duration of diabetes and the prevalence of hypertension was statistically significant (p-value=0.04)

Conclusion: The prevalence of hypertension and duration of diabetes reported in this study were high. Early detection of diabetes is very essential at reducing the scourge of hypertension amongst the diabetic cohort.

Keywords: Hypertension; Prevalence; Diabetes; Owerri; Nigeria

Introduction

Hypertension is probably the most important public health problem in developing countries and has been implicated in several studies for the rising morbidity and mortality in Africa [1-3]. Elevated blood pressure (BP) is the most significant risk factor for the development of atherosclerotic coronary artery disease and constitutes about 40% of all cardiovascular diseases [4]. Hypertension affects 20 million people in Africa and about 1 billion people globally [5,6]. Recent studies done in Nigeria and other parts of the world have shown an increasing prevalence of hypertension and this rise in prevalence has been attributed to globalization and the scourge in the prevalence of diabetes amongst others [6,7]. Data from several epidemiologic studies have shown that the prevalence of hypertension in patients with diabetes mellitus is approximately 1.5-2 times greater than in an approximately matched non-diabetic cohort [3,5,6]. The incidence of hypertension in diabetes mellitus (DM) is related to the degree of obesity, advanced age and extensive atherosclerosis (that is typically present). Hypertension increases the risk of long term vascular complication of type 2 diabetes such as stroke, chronic renal failure, heart diseases, peripheral vascular diseases and death [7]. It has also been observed that blood pressure reduction has been associated with a decreased risk of diabetic-related complications such as accelerated large vessel atheromatous diseases and microvascular complications of retinopathy and nephropathy [8-10]. It is estimated that after 30years of type 1 diabetes, 50% of the patients have hypertension and most of them have nephropathy [11]. Causes of hypertension in diabetic patients are commonly nephropathy, essential hypertension and particularly in type 2 diabetes mellitus, obesity [1]. Hypertension in diabetes is generally attributed to hyperinsulinaemia with resultant increases in renal sodium retention and / or sympathetic nervous system activity. Hyperinsulinaemia induces hypertension through increased insulin resistance, renal tubular reabsorption of Na+ and water, increased sympathetic nervous system activity, proliferation of vascular smooth muscle cells and alteration of transmembrane cation transport [12]. Recent studies suggest that impaired cellular response to insulin predisposes to increased vascular smooth muscle tone which is the hallmark of raised blood pressure in diabetes mellitus [12]. For instance, it has been shown that insulin in physiologic doses attenuate the vascular contractile response to phenylephrine, serotonin and potassium chloride. Hence insulin resistance or insufficiency is associated with enhanced vascular reactivity and increase in total peripheral resistance.

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Received: Nov 08, 2017; **Accepted:** Nov 13, 2017; **Published:** Nov 15, 2017

The high prevalence of hypertension in diabetic patients has been exemplified by many descriptive studies; for example, while the prevalence rates reported in non-diabetic cohorts ranged from <1% to 24.4%, that of hypertensive diabetics ranged from 18-85.5% [7,13-23]. Furthermore, a study on the prevalence of hypertension among a population of Black South African diabetics of mean age 57 ± 11years recorded a prevalence of 53% [19]. Here in Nigeria, wokoma reported a prevalence of 42.1% amongst Non Insulin Dependent Diabetic (NIDD) patients in University of Port Harcourt Teaching Hospital (UPTH), Portharcourt [20] while Ikem et al. [21] and Okubadajo et al. [22] both groups working independently in Lagos on hypertension among diabetics, reported prevalence rates of 41.2% and 41.9% respectively.

Further epidemiological surveys conducted in Asia recorded prevalence rates of 60.2% and 76.5% at a BP threshold of 140/90mmHg and 130/85mmHg respectively. It was also noted that the value rose to 85.5% by the age of 80years [23].

In the Triage Unit of the General Out Patient Clinic (GOPC) of Federal Medical Centre, Owerri, Nigeria where the index study was conducted, the authors' experience over the years showed that most of both the newly and previously diagnosed diabetic patients presented with elevated BP readings, however, this observation was not evidence based as no study had been done in the past to show a higher prevalence of hypertension amongst the diabetic group in this centre, hence the need for the present study. The aim of this study was to determine the prevalence of hypertension amongst the diabetic respondents assessing care in a primary care setting in Nigerian. The outcome might lead to the formulation of a policy that would encourage routine BP check for all diabetic patients irrespective of the primary reason for encounter in the study location.

Materials and Method

The study was conducted at the GOPC of Federal Medical Centre (FMC), Owerri. Owerri is the capital of Imo State, South-Eastern, Nigeria and is pre dominantly inhabited by career civil servants, students, businessmen, professionals and semi-skilled workers of mainly Igbo extraction. The stable food is bulky carbohydrate meal eating with soup. The last few years have witnessed a huge influx of fast food restaurants with a concomitant rapid rise in the consumption of refined food and western diets such as soft drinks, Ice cream and snacks. The import of the above nutritional transition is a proven rise in the burden of non-communicable diseases in Nigeria.

This was a cross-sectional descriptive study conducted between Jan, 2016 and March, 2017. Both old and nearly diagnosed diabetics aged 20years and above were randomly recruited into the study.

With a degree of error of 5%, confidence interval of 95%, significant level of 0.05 [24] and prevalence of DM set at 25% [23], the minimum sample size (N) of 288 was calculated. However, a sample size of 300 was used for this study to make up for attrition.

Diabetics who gave informed consent to participate in the study and those who satisfied the diagnostic criteria for DM were included in the study while patients with gestational diabetes, patients on anti-hypertensive drugs as at the time of contact and very ill patients were excluded from the study.

Data were collected using a self administered and well-structured questionnaire. The questionnaire was first pre-tested in a cohort of 30 adults assessing care in a nearby private hospital located in Imo State, Nigeria. The questionnaire sought information on socio-demographic variables such as age, sex, occupation, religion and tribe. Other data recorded on the questionnaire were past history of diabetes (with duration) and if the respondent was on medication as at the time of contact. In addition, the questionnaire had a column for the recording of the average blood pressure reading (mmHg) and the fasting/random blood glucose level (mg/dl).

Blood glucose determination

Blood samples were drawn from the fore-arm vein with the subjects seated and relaxed and were put into fluoride oxalate bottles and analyzed within 24 hours at the clinical chemistry laboratory of FMC, Owerri. The glucose oxidase method was used. Subjects with Fasting Blood Glucose (FBG) greater or equal to 7.0 mMol/L (126 mgldl) or Random Blood Glucose (RBG) greater or equal to 11.1 mMol/L (200 mgldl) with symptoms of DM were classified as diabetic. More so, subjects on treatment for DM were recruited into the study and classified as known diabetic patients. Numbers and simple percentages were used to describe categorical variables while mean and standard deviation were used to describe continuous variables.

Blood pressure determination

The blood pressure of the respondents was taken after the patient had rested for about 5minutes with the hands on the table and the feet on the floor. Accoson Mercury sphygmomanometer was the instrument used for the entire patient and it was ensured that the cuff covered at least 2/3 of the upper arm. Korotkoff phases 1 and 5 were identified as corresponding to systolic and diastolic blood pressures respectively. Two readings were taken at an interval of 5minutes. Systolic BP less than 140mmHg and Diastolic BP less than 90 mmHg were taken as normal. Readings above these values were interpreted as elevated BP. The BP was categorized using the 7th Report of the Joint National Committee (JNC7) on the Prevention, Detection, Evaluation and Treatment of High Blood Pressure [15].

Ethical Issues

The ethical certificate to conduct this study was obtained from the ethics and research committee of FMC, Owerri. Anonymity was assured as names were not required at any stage of the study. The participants benefitted from the study by having the knowledge of their blood pressure and blood glucose levels. Participation was voluntary and patients that refused to participate were made to understand that their refusal would not affect their subsequent care.

Results

(Tables 1-7)

Discussion

This study reported the findings from a cohort of Nigerians with diabetes mellitus attending the primary care centre of a

Age Group (YEARS)	Frequency Male	Frequency Female	Frequency Total	Percentage
20-29	2	-	2	0.67%
30-39	10	20	30	10.00%
40-49	22	26	48	16.00%
50-59	40	62	102	34.00%
60-69	40	36	76	25.33%
70 and above	22	20	42	14.00%
Total	**136**	**164**	**300**	**100%**
One hundred and thirty-six (45.33%) of the respondents were males while 164(54.6%) were females. The male: female ratio was 1:1.2. Respondents aged 50-59years were the most represented while those aged 20-29years were the least represented.				

Table 1: Age (years) and sex distribution of the study population.

Blood Pressure (mmHg)	Classification	Frequency	Percentage
<120/<80	Optimal	100	33.33
120-139/80-89	Pre-hypertension	91	30.33
140-159/90-99	Stage 1 Hypertension	38	12.67
160-179/100-109	Stage II Hypertension	48	16.00
180-200/110-119	Severe Hypertension	15	5.00
>200/>119	Severe Hypertension	8	2.67
Total		**300**	**100**
From the above table, 33.33% (n=100) of the subjects had optimal blood pressure while 36.33% (109) of the respondents were hypertensive. Majority of the hypertensive patients had stage II or severe hypertension.			

Table 2: Blood Pressure of the study population using the JNC 7 Classification.

Feature	Frequency	Percentage
Known Hypertensives	108	36
Newly Diagnosed Hypertensives	24	8
Normotensives	168	56
Total	**300**	**100**
The prevalence of hypertension in diabetic patients as shown above is 44%.		

Table 3: Prevalence of HBP in diabetic patients.

Blood Pressure (mmHg)	Classification	Frequency HTN	Frequency NTN	Frequency TOTAL	Percentage
100-119	Optimal	10	108	118	39.33
120-139	Prehypertension	31	60	91	30.33
140-159	Stage 1 Hypertension	45	-	45	15.00
160-179	Stage II Hypertension	33	-	33	11.00
180-199	"	5	-	5	1.67
200-219	"	6	-	-	2.00
220-239	"	2	-	-	0.67
Total		**132**	**168**	**300**	**100**
The mean Systolic BPs of the study population were 152.32 ± 25.08mmHg for the hypertensive (HTN) and 116.64 ± 9.58mmHg for the normotensive (NTN) subjects.					

Table 4: Systolic blood pressure of the study population.

Blood Pressure (mmHg)	Classification	Frequency HTN	Frequency NTN	Frequency TOTAL	Percentage
60-69	Optimal	2	93	95	31.67
70-79	Optimal	23	74	97	32.33
80-89	Prehypertension	21	1	22	7.33
90-99	Stage 1 Hypertension	58	-	58	19.33
100-109	Stage II Hypertension	15	-	15	5.00
110-119	"	13	-	13	4.33
Total		**132**	**168**	**300**	**100**
The mean diastolic blood pressures of the study population were 92.08 ± 12.01mmHg for the hypertensive (HTN) and 69.02±5.10mmHg for the normotensive subjects.					

Table 5: Diastolic blood pressure of the study population.

Duration	Old (Known) Diabetics on Treatment		New Diabetics	
Months	**Frequency**	**Percent%**	**Frequency**	**Percent%**
0<1	8	2.67	6	2.00
1-5	14	4.67	6	2.00
6-12	22	7.33	12	4.00
13-36	54	18.00	-	-
37-60	52	17.33	2	0.67
61-120	92	30.67	-	-
121-180	25	8.33	-	-
181-240	4	1.33	-	-
241-300	3	1.00	-	-
Total	**274**	**91.33**	**26**	**8.67**
Majority of the patients were known diabetics with 3 out of every 10 having had the disease between 5-10 years (61-120 months). Three of the respondents were diabetic for more than 20 years (240 months). Of the new diabetics, about half have had the symptoms for 6-12 months prior to presentation.				

Table 6: Duration of Disease and Symptoms for Known and New Diabetic.

Variable	Hypertensive	Normotensive	P-value
Gender	132(44.0%)	168(56.0%)	>0.05
Distribution			
Male (n=136)	59(43.38%)	77(56.62%)	
Female (n=164)	73(44.51%)	91(55.49%)	
Mean age(Years)			
Overall	59.41 ± 8.59	50.56 ± 9.67	<0.001
Male	59.48 ± 8.26	51.25 ± 9.87	<0.001
Female	59.33 ± 8.94	49.89 ± 9.49	<0.001
Mean Duration of Diabetes (Years)	5.48 ± 4.09	4.48 ± 4.29	<0.04
Mean Systolic BP (mmHg)	152.23 ± 25.08	116.64 ± 9.58	<0.001
Mean Diastolic BP (mmHg)	92.08 ± 12.01	69.02 ± 5.10	<0.001
Majority of the respondents were normotensive with a slight female preponderance, (P-value>0.05). The mean age of the hypertensives and their mean duration of diabetes were higher than those of the normotensive population (P-value<0.05).			

Table 7: Comparative Variables-Hypertensives vs. Normotensives.

tertiary health facility in Owerri, Imo State, South-Eastern Nigeria. It was a cross-sectional descriptive survey with similarities to studies done by Mairiga in Jos [25], Wokoma in Port Harcourt [20], Okesina at Ilorin [26], Ofoegbu at Enugu [27], and Okubadejo and Fasanmade in Lagos [22]. However, the present study is different from the above cited studies carried out by Wokoma [20], Okesina [26] and Okubadejo/ Fasanmade [22] as these studies concentrated on only known type II diabetic patients. Patients with Type I DM were identified and excluded. More so, newly diagnosed diabetic patients were excluded by these researchers.

The male: female ratio of 1:1.2 recorded from this study is a reflection of a more health seeking behavior noted amongst women. However, more males than females were recruited by Wokoma [20] in Port Harcourt and Unadike et al. [28] in Benin City while working on a similar study.

Though, the age group of the study population was 20 to 70 years and above, it was equally observed that respondents aged 50-59 years predominated in the study while respondents aged 20-29 years were the least in frequency. This age distribution is consistent with the observations reported in similar studies

[21,25,28] but different from the age group recruited by Balogun et al. [29] while working on the co-occurrence of diabetes and hypertension at Ibadan, Nigeria. While the mean age of the respondents recruited in this study is 57 ± 12.08 and 55.12 ± 11.62 years respectively, Balogun and co-workers [29] recruited subjects with a mean and median age of 66.1 ± 11.1 years and 60.1 years respectively [29].

Hypertension affects about 1 billion people worldwide and it has been estimated that by 2025, up to 1.5 billion adults globally will be hypertensive. Raised BP is estimated to cause 7.5 million deaths which accounts for 57 million disability adjusted life years (DALYs) [30]. The exponential rise in the burden of hypertension has been worsened by globalization and more worrisome, the increasing prevalence of diabetes mellitus. For instance, while the prevalence of hypertension ranged from 11.2-32.4% in non-diabetic subjects, the prevalence ranged from 18-85.5% in diabetic patients [7,13,23,31,32]. This study recorded a prevalence rate of 44% amongst diabetic patients and with no significant gender bias. Furthermore, it was observed from this study that hypertensive diabetics were more significantly older and had a longer duration of diabetes. The prevalence rate of 44% noted from this study is higher than the prevalence rates of 11.2-32.4% reported amongst the non-diabetic cohorts from several epidemiological studies. The difference in the prevalence rates of hypertension in diabetic when compared to the non-diabetic groups might be a reflection of the effect of extensive atherosclerosis with reduced vascular contractile response and hyper-insulinaemia that have been reported in diabetic patients [10,12].

A similar study done by Wokoma in Port Harcourt (PH) [20], Nigeria reported a prevalence of 42.1%. The PH study did not show any significant difference in the mean values for age (years) and duration of diabetes mellitus (months) unlike the index study. Okubadejo and Fasanmade also reported a similar prevalence (41.9%) amongst type II diabetic patients [22]. Other epidemiological studies that reported similar prevalence rates were carried out by Ofoegbu [6], and Ikem et al. [21] However, the outcome of this study is quite different from the results of some studies done both in Nigeria and in other parts of the world. For instance, lower prevalence rates were reported by Osotokun [30] (50.8%) at Ibadan and Chuhwak et al. [28] in Jos, Nigeria while prevalence rates of 32% and 39% were reported from Turkish and Taiwanese populations respectively [32]. Several factors would have been responsible for the lower prevalence of HPB recorded in these cited studies; first is the use of a BP of ≥ 160/95 mmHg as the cut-off point for the diagnosis of HBP while the second reason could be the exclusion of known hypertensives, subjects that took caffeine, smoked cigarette or were involved in strenuous physical exercises few hours prior to presentation. On the other hand, higher prevalence rates were also reported by some authors; for example, In Nigeria, Balogun [29] and Unadike [28], independently, while working on a similar study reported prevalence rates of 49.6% and 54.2% respectively. However, exponentially high prevalence rates of 74%, 74.4%, 73% and 70.4% were reported in Britain, Italy, Spain and Morocco respectively while working on the prevalence of HBP amongst DM patients in these countries [32]. A common denominator in these studies that recorded very high prevalence rates as compared to the present study was the predominance of respondents who were aged more than 60 years of age. This factor could be a possible reason for the reported high rates.

Early diagnosis and treatment of DM is a sine qua non to the effective prevention and development of diabetic complications. Hence the duration of presentation of symptoms of diabetes mellitus should be targeted to be as short as possible. The United Kingdom (UK) Prospective Diabetes Study (UKPDS) reported that each 10mmHg decrease in mean systolic BP was associated with relative risk of 12% for any complication of DM, 15% for death that are related to DM, 11% for myocardial infarction and 13% for microvascular complications and it also noted that these morbidity and mortality indices are further reduced if the duration of DM is shortened [28]. In Morocco, Mohamed et al. [32] while working on hypertension and Type 2 DM observed that HBP was positively associated with age ($p<0.001$), Body Mass Index ($p<0.0002$) and duration of DM ($P<0.01$).

The outcome of the index study showed that for known diabetics, duration of the disease ranged from two (2) weeks to 24 years with a mean duration of 5.5 ± SD years and most of the known diabetics (64.24%) have had the disease for more than 3 years. Thus, majority of the patients had long outstanding diabetes. The mean duration of DM observed from this study is similar to the mean duration of DM noted from a study done by Wokoma et al. [20] (5 ± S Dyears) but slightly less than a mean duration of 6.6 ± 37 years reported by Unadike et al. [28] in a study aimed at finding the prevalence of hypertension amongst persons with diabetes in Benin City, Nigeria.

Limitation

The cross-sectional design of this study was unable to identify a causal relationship between HBP and DM. The use of analytical study design would have been a better option. More so, variables such as caffeine/steroid intake, obesity, sedentary lifestyle and alcohol consumption that are known to increase the prevalence of hypertension in the general population were not excluded.

Conclusion

The prevalence of hypertension amongst diabetic patients and the duration of presentation of the disease recorded from the present study are high. For an appreciable reduction in the prevalence of HBP, early diagnosis of DM is of great importance. Further studies using the analytical design and exclusion of co-founding variables such as alcohol consumption, obesity, smoking, steroid intake and sedentary life style would bring out a better outcome.

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Citation: Onuoha Franklin M, Egwim Jideoma I (2017) Hypertension Amongst the Diabetic Patients Assessing Care in A Primary Care Setting in South-Eastern, Nigeria. J Diab Clin Stud 1: 001-006.