Original Article

The Prevalence of Orthostatic Hypotension in Type 2 Diabetes Mellitus Patients in a Diabetic Clinic in Enugu South-East Nigeria

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ABSTRACT

BACKGROUND: Orthostatic Hypotension is a serious and common complication of diabetes mellitus.

AIMS: To determine the prevalence and risk factors of Orthostatic Hypotension in type 2 diabetic patients in a diabetes mellitus clinic in Enugu South-East Nigeria.

METHOD AND MATERIALS: A structured questionnaire was administered to the eligible and consenting seventy type 2 diabetes mellitus patients. The supine and erect blood pressures of each patient were recorded. The patients with Orthostatic Hypotension were compared with those without Orthostatic Hypotension for different clinical and biochemical parameters.

STATISTICAL ANALYSIS USED: The data was analyzed using Statistical Package for Social Sciences (SPSS) version 19 software. Odds ratio was calculated for the presence of Orthostatic Hypotension amongst the variables and p-value <0.05 was considered statistically significant.

RESULTS: The prevalence of Orthostatic Hypotension in type 2 diabetic patients was 23.3%. Orthostatic Hypotension had statistically significant association with the presence of peripheral neuropathy, retinopathy and proteinuria.

CONCLUSIONS: Orthostatic Hypotension is a common complication in type 2 diabetes mellitus patients seen at Enugu. It is recommended that measurement of erect and supine blood pressures should be part of the standard care of type 2 diabetic patients.

KEY WORDS: Prevalence, orthostatic, hypotension, Enugu, Nigeria

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INTRODUCTION

Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycaemia[1]. It currently assumes a pandemic status, with a global prevalence of 366million in 2011 and an expected rise to 552million by 2030[2]. It is the 2nd most common non-communicable disease in Nigeria.[3]

Autonomic dysfunction is a serious and common complication of DM.[4] Orthostatic hypotension (OH) is one of the manifestations of autonomic dysfunction and it carries a high risk of cardiovascular mortality[5].

OH is defined as a fall in blood pressure (i.e., =20 mmHg for systolic or/and =10 mmHg for diastolic blood pressure) in response to change from supine to erect posture[6]. In patients with diabetes, OH is usually due to damage to the efferent sympathetic vasomotor fibers, which leads to a decrease in splanchnic, cutaneous and total vascular resistance.[7]

Normally, in response to postural change, there is an increase in plasma norepinephrine. For individuals with orthostatic hypotension, there may be a reduction in this response relative to the fall in blood pressure.[8] Diminished cardiac acceleration and cardiac output, particularly in association with exercise, may also be important in the presentation of this disorder.[9,10] Less frequently, there is a rise in norepinephrine that may be due to low blood volume or reduced red cell mass.[11,12] Frequently, there are fluctuations in the degree of orthostatic hypotension. This may reflect postprandial blood pooling, the hypotensive role of insulin, and changing patterns of fluid retention due to renal failure or congestive heart failure.[13,14]

Patients with OH typically present with lightheadedness and presyncopal symptoms such as dizziness, weakness, fatigue, and visual blurring. Neck pain also may be due to orthostatic hypotension. Many patients, however, remain asymptomatic despite significant falls in blood pressure.[15] If the cause of orthostatic hypotension is cardiac autonomic neuropathy (CAN), treatment goals should not only consist of therapies to increase the standing blood pressure, balanced against preventing hypertension in the supine position[16], but should also provide education to patients so that they avoid situations (e.g., vasodilation from hot showers) that result in the creation of symptoms. Such symptoms can result in injuries from falling. Cardiovascular autonomic function testing may help differentiate CAN from other causes of weakness, lightheadedness, dizziness, or fatigue and promote appropriate therapeutic intervention.[17]

The prevalence of orthostatic hypotension in diabetic subjects varies from 8.2% to 43%, depending on the diagnostic criterion and study subject selection.[18,19] There is paucity of data on OH in Nigeria. Thus, it

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became necessary to determine the prevalence and risk factors of OH in Type 2 DM patients in a Diabetes clinic in Enugu South-East Nigeria.

METHOD AND MATERIALS

This was a cross-sectional, hospital based, descriptive and analytical study carried out in the DM Clinic of University of Nigeria Teaching Hospital (UNTH) Enugu between July and October 2011. UNTH receives referral from the states within south-east zone of Nigeria (Enugu, Ebonyi, Abia, Anambra, and Imo states) and the neighboring states (Kogi, Benue, Delta, and Cross-River States).

A sample size of 70 subjects was calculated using the WHO formula for sample size determination in a finite population.[20] Eligible and consenting type 2 diabetes mellitus patients of both sexes between the ages of 15-70yrs were drawn using systematic random sampling method ie first of every ten (10) patients seen at the UNTH diabetic clinic from July to October 2011
Ethical clearance was obtained from ethics committee of the UNTH Enugu.

A written consent was obtained after a detailed explanation of the procedures involved. For those that were illiterates, thumb printing was used.

The patients with the following conditions were excluded from the study:

- Chronic alcoholics with alcohol consumption of>120gm/wk
- Age >70yrs or <15yrs
- History of prolonged recumbency
- Use of drugs known to affect autonomic nerves functions e.g. Beta blockers, tricyclic antidepressants, isoniazid, oral nitrates.
- Chronic kidney disease (eGFR<60ml/min)
- Congestive cardiac failure
- Parkinson disease
- Leprosy

The subjects were allowed to withdraw verbally.
A structured pre-tested questionnaire was administered to the eligible and consenting patients by the investigator. It assessed history of diabetes mellitus including duration of DM, level of control and symptoms of autonomic neuropathy like postural dizziness, erectile dysfunction, bowel habit, abnormal sweating etc.

Anthropometric data (weight, height) were obtained using weighing scale and measuring tape. Body mass index (BMI) was calculated and obesity was defined as BMI of =30.[21]

Orthostatic hypotension was assessed by measuring the supine blood pressure of the subjects after 10 minutes of rest, with the cuff of the mercury sphygmomanometer applied to the right upper arm. The approximate systolic BP was obtained by palpation. Then, the cuff was deflated and re-inflated to about 10mmHg above the approximate systolic BP. Phases I and V korotkoff's sounds were used as systolic and diastolic BP respectively. The subjects then stood up and the BP was recorded after 2 minutes.

If standing was followed by a reduction of systolic BP of = 20mmHg and/ or diastolic BP of = 10mmHg, orthostatic hypotension was said to be present.[6]

A thorough neurological examination was carried out in a quiet room to assess functions of the higher centres, cranial nerves, motor and sensory systems.

Peripheral neuropathy was defined by the presence of Loss of ankle jerk, light touch sensation, vibration sense or proprioception.[21]

Also retinopathy was assessed for using a Welch-Allyn® ophthalmoscope after pupillary dilatation with 1% phenylephrine.

Venous blood was collected using a 10ml syringe and used as follows for laboratory tests;

- 5ml for serum creatinine assay using Jaffe's method and
- 5ml for serum fasting lipid profile estimation using enzymatic method. Both were read using colorimetry.

Capillary blood was collected through finger prick for fasting blood glucose (FBG) estimation using Accu-Chek® advantage glucometer. FBG values of 110mg/dl and above were regarded as poor control.
Clean catch mid-stream urine was collected for proteinuria using dipstick method.

DATA ANALYSIS

The data were analysed using Statistical Package for Social Sciences (SPSS) version 19 software. Qualitative data were described as proportions and percentages while quantitative data were reported as mean and standard deviations. Odds ratio (OR) was used in the assessment of associations between OH and the variables. A p- value <0.05 was considered statistically significant.

RESULTS

A total of 150 type 2 DM patients were screened for the study. Seventy (70) of them were studied, having met inclusion criteria. This was made up of 27 (38.6%) males and 43 (61.4%) females. The mean age of patients was 55.76±8.62years. The age distribution of patients is shown in figure 1.

Figure 1: Age distribution

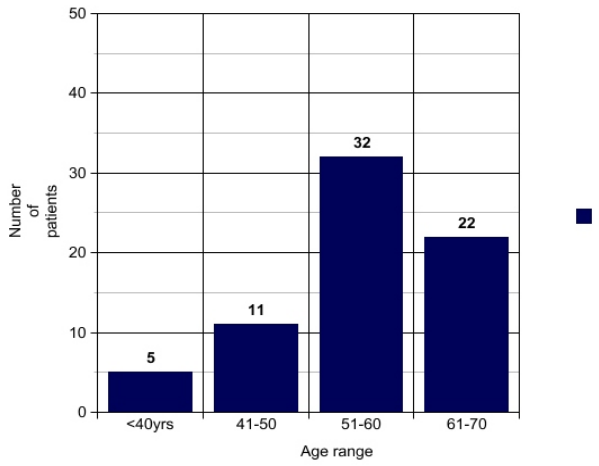
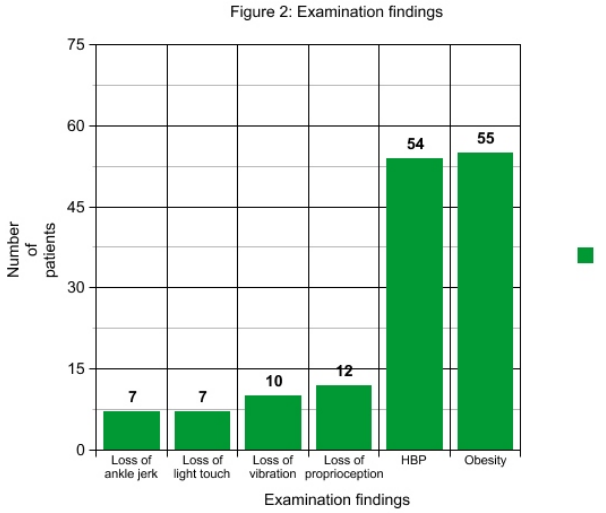


Figure 2: Examination findings



The mean duration of DM was 7.67yrs±7.87yrs. Fifty three patients (76%) and 17 (24%) have had DM < 10yrs and > 10years respectively.

The most common and least common symptom of autonomic neuropathy noted in the patients were abnormal sweating pattern (37.1%) and nocturnal diarrhoea (10%). Other symptoms include erectile dysfunction, postural dizziness, and constipation as shown in table 1.

Table 1: Symptoms of autonomic dysfunction in patients

Symptoms of DAN	Patients n(%)
Abnormal sweating pattern	26(37.1)
Erectile dysfunction (N=27)	20(74.1)
Postural dizziness	18(25.7)
Constipation	13(18.3)
Nocturnal diarrhoea	7(10.0)

Peripheral neuropathy was present in 14 (18.6%) patients. The details of examination findings were shown in figure 2.

The prevalence of OH in type 2 DM patients was 16(23.3%).

The prevalence of OH increased with increasing age as shown in table 2.

Table 2: The age distribution of OH

Age range years	OH present n(%)
<40(N=5)	0(0)
41- 50 (N=11)	2(20)
51- 60(N=32)	8(25)
61-70 (N=22)	6(27)

The analytic data were shown in tables 3, 4 and 5.

Table 3: Association of demographic factors and level of DM control with OH

Variables	OH Present N(%)	OH Absent N(%)	OR(95% CI)	p-value
Age (years)				
<60	10(20)	38(80)	0.70(0.22- 2.26)	>0.05
=60	6(27)	16(73)		
Sex				
Male	5(19)	22(81)	0.66(0.20- 2.17)	>0.05
Female	11(26)	32(74)		
Duration of DM				
1-10years	12(23)	41(77)	0.95(0.26- 3.46)	>0.05
> 10years	4(24)	13(76)		
FBG level(mg/dl)				
<110	4(29)	10(71)	1.47(0.39- 5.51)	>0.05
>110	12(21)	44(79)		

Table 4: Association of symptoms of DAN with OH

Variables	OH Present N(%)	OH Absent N(%)	OR(95%CI)	p-value
Postural dizziness	**5**(28)	13(62)	1.43(0.42- 4.89)	>0.05
Abnormal sweating	**9**(35)	17(65)	2.79(0.89- 8.77)	>0.05
Erectile dysfunction	**3**(15)	17(85)	0.50(0.17- 2.00)	>0.05
Nocturnal Diarrhoea	**3**(43)	4(57)	2.88(0.57- 14.53)	>0.05
Constipation	**5**(38)	8(62)	2.61(0.71- 9.56)	>0.05

Table 5: Association of co-morbidities with OH

Variables	OH Present N(%)	OH Absent N(%)	OR(95%CI)	p-value
Hypertension	**9**(16)	46(84)	0.22(0.06- 0.77)	>0.05
Obesity	**6**(11)	49(89)	0.06(0.02- 0.24)	>0.05
Retinopathy	10(40)	15(60)	4.33(1.34- 14.02)	<0.05
Dyslipidaemia	8(33)	16(67)	2.38(0.76- 7.43)	>0.05
Proteinuria	12(63)	7(37)	20.14(5.06- 80.26)	<0.05
Peripheral neuropathy	10(71)	4(29)	20.83(4.95-87.56)	<0.05

DISCUSSION

Autonomic dysfunction is a serious and common complication of DM.[4] Orthostatic hypotension (OH) is one of the manifestations of autonomic dysfunction and it carries a high risk of cardiovascular mortality.[5] It is associated with several diagnoses, and symptoms, including lightheadedness soon after standing, an increased rate of falls, and a history of myocardial infarction or transient ischemic attack and stroke.[22,23]

The sex ratio of 0.65 reported in this study is in agreement with a recent hospital based study[24] but not with some that reported 1.02.[25,26] The difference could be from different sampling techniques applied in the studies. The former used systematic sampling technique while the latter used quota sampling technique. The more preponderance of females in this study may suggest better health seeking behaviour of female patients considering equal sex distribution of type 2 DM.[1]

The mean age of 55.76±8.62years reported in this study closely approximates report of Odusan[26] which was 61.73±9.78years though some studies reported lower mean age.[24,25] The difference is because the former studied only type 2 DM patients while the later studied both type 1 and type DM patients with attendant lower mean age..

The prevalence of OH in this study was 23.3% and it is in agreement with some hospital based studies. Shafig et al[24] and Jin Shung et al[27] reported 26% and 28.4% respectively which are comparable with this study. However this is much less than that mentioned in literature for the indoor patients in spite of the fact that these patients were diabetic as well.[28,29] This is probably due to comparatively younger age group in this study (mean age 55.8 vs. 80 years).

The prevalence of OH in male and female patients were 19% and 26% respectively and it is in agreement with the report of Germaine CV et al.[30] The higher female prevalence of OH could be related to the BP lowering effects of female sex hormones.[31]

The symptoms of autonomic neuropathy observed in this study include abnormal sweating pattern, erectile dysfunction (ED), postural dizziness, nocturnal diarrhoea and constipation in descending order of frequency. None of the above symptoms had significant statistical association with OH. This is related to the fact that they could be caused by other factors other than autonomic neuropathy like drugs, and sepsis. Thus, above symptoms could not be used to predict the presence of OH.

Erectile dysfunction was noted in 74.1% of males in this study and it is higher than 7% reported by Abbasher et al.[32] This difference could be that the former reported for males while the later reported for total sample with women inclusive. Also sexual history is sensitive and could cause embarrassment amongst patients. This could make interviewers reluctant in getting proper sexual history.[33] Furthermore, multifactorial pathogenesis of ED could have contributed in its high frequency. The absence of significant association between ED and OH could have resulted from other aetiologies of ED like use of anti-hypertensive drugs, vascular disease, metabolic factors, malnutrition, endocrine disorders, psychogenic factors, and use of anti-diabetic drugs.

There was no significant association between hypertension and OH. This is not in agreement with Shafiq et al who reported significant association between hypertension and OH.[24] The difference could be due to the difference in the study populations.

DM retinopathy, proteinuria and somatic peripheral neuropathy all had significant statistical association with OH. This is due to the fact that they all have common aetiology which is microangiopathy from effect of chronic hyperglycaemia.[34-36]

The frequency of OH progressively increased with increasing age of the patients in this study. Those with

age <40years had the frequency of 0% while those between 61 and 70years had 27%. This association could be derived from the fact that older patients would have had DM for longer duration. Also, old age is an independent risk factor for OH in the absence of DM due to age-related neuropathy and other co-morbidities.[37]

In conclusion, the prevalence of OH is high amongst type 2 DM patients in south-east Nigeria. Retinopathy, proteinuria and somatic peripheral neuropathy had statistically significant association with OH. It is recommended that erect and supine BP measurement should be part of routine assessment of type 2 DM patients especially when above complications are present. There is need for more collaborative multi-centre study on OH in order to define the exact global burden.

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