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Research Article

Orthostatic Hypotension among Elderly Diabetics in Anambra State, Nigeria

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Abstract

Background: Orthostatic hypotension is a condition in which blood pressure drops abnormally when a person stands up from a sitting or a lying down position. Orthostatic hypotension is a sustained reduction of systolic blood pressure of at least 20 mmHg or diastolic blood pressure of at least 10mmHg within three minutes of standing or a head-up tilt to at least 60 degrees on a tilt table. Orthostatic hypotension has been observed in all age groups, but it occurs more frequently in the elderly, especially in persons who are sick and frail. Older people are prone to the autonomic dysfunctions induced by chronic illnesses such as diabetes, Parkinson's disease or pure autonomic failure and the use of several medications like anti-hypertensive drugs is common. People with orthostatic hypotension have poor prognosis if they are diabetic and hypertensive; and might have a higher mortality rate. Orthostatic hypotension is one of the clinical manifestations of diabetic autonomic neuropathy. In patients with diabetes, orthostatic hypotension is usually attributable to damage to the efferent sympathetic vasomotor fibers, particularly in the splanchnic vasculature with a decrease in total vascular resistance. The prevalence of orthostatic hypotension in diabetic subjects varies extremely from 8.2 to 43%, depending on the diagnostic criterion and study subject selection.

Methods: This community based multistage cross-sectional study determined the prevalence of orthostatic hypotension among elderly diabetics in Anambra state and the relationship between orthostatic hypotension and diabetes in the elderly.

Results: The prevalence of orthostatic hypotension among diabetic elderly in Anambra state was 6.7%. Diabetes was found to an independent risk factor for orthostatic hypotension. The presence of both diabetes and hypertension increased the prevalence to 8.5% and the presence of both hypertension and diabetes was also found to be an independent risk factor for OH.

Conclusion: Diabetes is an independent risk factor of orthostatic hypotension in the elderly

Keywords: Blood pressure; Diabetes; Elderly; Orthostatic hypotension; Population-based study

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Introduction

Orthostatic hypotension is a condition in which blood pressure drops abnormally when a person stands up from a sitting or a lying down position. Orthostatic hypotension is a sustained reduction of systolic blood pressure of at least 20 mmHg or diastolic blood pressure of at least 10 mmHg within three minutes of standing or a head-up tilt to at least 60 degrees on a tilt-table [1]. The tilt-table test is simple and inexpensive [2]. It involves placing a patient on a table with straps at the waist and knees which help patients stay in position. The table is tilted gradually by degrees to a completely vertical position after measuring the supine blood pressure. When orthostatic hypotension occurs after three minutes, delayed orthostatic hypotension is said to be present. Delayed orthostatic hypotension is the fall in blood pressure on standing that occurs after the crucial three-minute cut-off point [3]. Older people are prone to the autonomic dysfunctions induced by chronic illnesses such as diabetes, Parkinson's disease or pure autonomic failure and the use of several medications like anti-hypertensive drugs is common. Orthostatic hypotension is associated with significant morbidity in 30-50% of elderly persons with known risk factors, including age, medications like antihypertensives and certain diseases like diabetes [4]. The presence and effects of co-existing disease states also increases the prevalence of orthostatic hypotension and its complications and this further reduces the quality of life in the elderly [5]. People with orthostatic hypotension have poor prognosis if they are diabetic and hypertensive; and might have a higher mortality rate [5]. The diagnosis of orthostatic hypotension is therefore important for the treatment of elderly patients. Diabetes mellitus being a worldwide problem is still on the rise and its current estimated prevalence of 285 million people (6.4%) is expected to reach 438 million (7.8%) by 2030 [6]. Orthostatic hypotension is one of the clinical manifestations of diabetic autonomic neuropathy [7].

A change from lying to standing normally results in activation of a baroreceptor-initiated, centrally mediated sympathetic reflex, resulting in an increase in peripheral vascular resistance and cardiac acceleration. In patients with diabetes, orthostatic hypotension is usually attributable to damage to the efferent sympathetic vasomotor fibers, particularly in the splanchnic vasculature with a decrease in

total vascular resistance [8]. Orthostatic hypotension can be developed by defective contraction of resistance vessels in the standing position; abnormal reduction in blood volume, or; diminished cardiac output in the standing position due either to reduced venous return or to inability to accelerate the heart, or both [9]. Long - term diabetes is a frequent cause of orthostatic hypotension and indeed, in diabetes all three factors may be involved, alone or together. Recently, prediabetes has been suggested to produce a significant increase in all-cause mortality and combined diabetes and cardiovascular disease mortality risks and in diabetes orthostatic hypotension can be misjudged as hypoglycaemia. The prevalence of orthostatic hypotension in diabetic subjects varies extremely from 8.2 to 43%, depending on the diagnostic criterion and study subject selection [6,10]. The study done in Egypt on assessment of cardiac autonomic neuropathy in long standing type 2 diabetic women, orthostatic hypotension was demonstrated in 34% of the whole studied cases and in 60% of the CAN group while 25.5% was found in another study [11]. Only women between the ages of 40 to 60 years were studied in Egypt while the community based study in Taiwan investigated the relationship between prediabetes, diabetes and orthostatic hypotension [10,11].

In a 10 year follow up study done to assess the association of the orthostatic hypotension with macro vascular and micro vascular complications of diabetes mellitus among patients with both type 1 and type 2 diabetes, prevalence of orthostatic hypotension was slightly higher in those with type 2 diabetes (32.3% and 31.7%) [12]. The study done to find the relationship between glycemic control and orthostatic hypotension in type 2 diabetes mellitus in Japan found prevalence of orthostatic hypotension (7%) to be much less than in other studies [13]. Hypertension in diabetic patients increases the risk of orthostatic hypotension and findings from studies also suggest that coexistence of hypertension with diabetes poses greater risk of developing orthostatic hypotension; however the possibility of the use of antihypertensive medications is another reason of comparatively higher occurrence of orthostatic hypotension in diabetic hypertensive [6]. Across-sectional study done to evaluate orthostatic hypotension in normotensive and hypertensive patients with diabetes mellitus in Morocco found hypertensive diabetics had higher prevalence of orthostatic hypotension than normotensive diabetic patients [14]. Studies done in Pakistan and Japan also found the prevalence of orthostatic hypotension to be higher in hypertensive diabetics [6,15].

Methods

This study was part of a community based cross-sectional study conducted in Anambra State, South Eastern region of Nigeria among elderly people 60 years and above. Eligible persons include all consenting elderly people 60 years and above in the selected communities. We excluded all consenting elderly people 60 years and above in the selected communities who could not stand up on their own because standing blood pressure were measured and those with visual or hearing defects, due to associated balance impairment. A multistage sampling method was used to select consenting elderly people 60 years and above.

Data was collected with the aid of an interviewer-administered semi- structured questionnaire. Random blood sugar was measured using glucometer. A test strip was prepared as outlined in the manual of the glucometer and the meter turned on automatically when a strip was inserted. A spot was chosen on the thumb and cleaned with a swab wet with methylated spirit, the finger tip was lanced to get a drop of blood on the test strip and the result was viewed when the popping of the glucometer stopped. Blood pressures were measured with a mercury sphygmomanometer following a standardized protocol by The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure [16]. Supine measurements were taken after at least 5 minutes of rest in the supine position. Standing measurements were taken at 0 and 2 minutes after standing. BPs measured at 0 minutes was taken at the moment after rising from the supine to standing positions (usually within 15 seconds from the last supine measurement). Hypertension was defined by the following criteria:

1. The average of two BP measurements: A ≥140 (systolic) or ≥ 90 (diastolic) mmHg
2. A positive response to hypertension on the medical history questionnaire
3. Current use of antihypertensive medication

Diabetes mellitus was defined by the following criteria:

1. Those with a positive history of diabetes on medical history questionnaire
2. Those who currently use insulin or oral hypoglycaemic medications
3. Those with blood sugar 126 mg/dl and above

Data analysis was done using Statistical Package for the Social Sciences (SPSS) software version. The prevalence of orthostatic hypotension among the elderly patients was calculated, and also the prevalence in diabetics.

Ethical clearance was obtained from ethics committee of the Nnamdi Azikiwe University Teaching Hospital Ethical Committee (NAUTHEC). A written informed consent was obtained from the participants after a detailed explanation of the procedures involved. For those that could not read or write, thumb printing was used. Confidentiality was assured by not using names but numbers and participation was voluntary. Withdrawal can be verbal. Permission to conduct the study was sought for and obtained from Traditional rulers and the Officials of the town unions.

We wish to point out the following limitations in this Study: The prevalence of orthostatic hypotension is higher in the sick and frail that was excluded from the study because of inability to stand on their own.

Blood pressure was taken only once during the day. Literature indicates that OH varies over the course of the day. Sample size of 384 was determined using the formula for sample size determination in a finite population [17,18].

Results

The socio-demographic characteristics of the respondents in all the eight towns are shown in table 1. There were more females 209(52.3%) than males 191(47.7%) in the study population. The study population has a mean age of 70.62 ± 7.967. The age group 60 to 64 years were the most 99(24.7%) and they were mostly active farmer/artisans-132(33.0%).

Characteristics	Frequency	Percentage (%)
Sex		
Male	191	47.7
Female	209	52.3
Total	400	100
Age		
60-64	99	24.7
65-69	82	20.5
70-74	89	22.3
75-79	62	15.5
80+	68	17
Total	400	100
Mean(SD) 70.62(7.967)		
Occupation		
Active trader	79	19.7
Retired trader	55	13.8
Active civil servant	2	0.5
Retired civil servant	35	8.8
Active farmer/artisan	132	33
Retired farmer/artisan	97	24.2
Total	400	100

Table 1: Demographic characteristics of the study population.

The relationship between orthostatic hypotension and hypertension and diabetes is presented in table 2. Greater number of the participants were hypertensive - 343(85.8%), diabetics were 90(22.5%) and hypertensive diabetics were 76(20.8%) of the study population. Among those with orthostatic hypotension, 56(94.9%) were hypertensive, 6(10.2%) were diabetic while 5(8.5%) were both hypertensive and diabetic. There was statistically significant difference between hypertensive ($\chi^2 = 4.758$, p= 0.027), diabetics ($\chi^2 = 6.034$, p= 0.012) and hypertensive diabetics ($\chi^2 = 4.982$, p=0.030) participants having OH and those not having OH. The prevalence of OH among hypertensive, diabetics and hypertensive diabetics was 16.3%, 6.7% and 6.6% respectively.

Variables OH N= 59(%)	NOH N = 341(%)	Total N= 400(%)	χ2	P-value
Hypertension				
Hypertensive 56 (94.9)	287(84.2)	343(85.8)	4.758	.027*
Normotensive 3(5.1)	54(15.8)	57(14.2)		
Diabetes				
Diabetic 6(10.2)	84(24.6)	90(22.5)	6.034	.012*
Non- Diabetic 53(89.8)	257(75.4)	310(77.5)		
Hypertensive diabetics 5(8.5)	71(20.8)	76(19.0)	4.982	.030*

Table 2: Relationship between OH and hypertension and diabetes.

*Statistically Significant

In table 3 diabetics were about 5 times more likely to have OH than non diabetics (OR:4.689, CI:1.121-19.610, p = 0.012) ,those with both hypertension and diabetes were about 3 times more likely to have OH than those without(OR:2.840,CI:1.095-7.364, p= 0.032) and those with supine diastolic hypertension were about 2 times likely to have OH than those without supine diastolic hypertension (OR:1.699,CI:0.401-7.209, p= 0.000).

Variables OH N= 59(%)	NOH N = 341(%)	OR	95% CI	P-value
Diabetics 6(10.2)	84(24.6)	4.689	1.121, 19.610	.012
Hypertensive Diabetics 5(8.5)	71(20.8)	2.840	1.095,7.364	.032

Table 3: Odds ratios of OH with hypertension, diabetes, supine systolic and supine diastolic hypertension.

Discussion

Orthostatic hypotension is a clinical manifestation of diabetic autonomic neuropathy [7]. There were 90(22.5%) diabetics in the study group, 6(6.7%) of them had OH. There was statistically significant difference between diabetics with OH and non diabetics with OH. There were 76(19.0%) hypertensive diabetics, 5(6.6%) of them had OH. The association between diabetes mellitus and OH was statistically significant in our study and diabetes was found to an independent risk factor for orthostatic hypotension and those with diabetes were about 5 times more likely to have OH than those without (OR-4.689). The presence of comorbidity (hypertensive diabetics) had a statistically significant association with having OH and hypertensive diabetics were found to be about 3 times more likely to have OH than others without. This shows that having both diabetes and hypertension is an independent risk factor for OH. These findings are consistent with previous studies [6,12,13,15]. A study done in Pakistan among admitted adult diabetic patients with ages between 20 and 70 years found the prevalence of OH to be 26% [6]. A 10-year follow-up retrospective analysis of data collected from the outpatients of Diabetology office in Slovakia on Orthostatic hypotension in diabetic patients found that diabetes mellitus (both type 1 and type 2) was positively associated with the presence of OH [12]. The study done among diabetics in Japan found prevalence of OH to be 7% and their multivariate analysis also revealed that the association remained significant after adjustment for the treatment and duration of diabetes, age, sex and body mass index [13]. The study done in Morocco to determine if OH is more prevalent in hypertensive diabetics than in normotensive diabetics, OH was found in 42.3% of hypertensive diabetics while 13.6% of normotensive diabetics had OH with a statistically significant association [14].

Conclusion and Recommendation

The prevalence of orthostatic hypotension in the elderly diabetics was 6.7% and prevalence was higher among diabetic hypertensive (8.5%). Diabetes was significantly associated with OH and diabetes was found to be an independent risk factor of OH. Elderly persons with diabetes mellitus should receive regular monitoring of supine and upright blood pressure in order to detect orthostatic hypotension and prevent its complications.

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