

PREVALENCE OF ORTHOSTATIC HYPOTENSION AMONG DIABETIC PATIENTS IN A COMMUNITY HOSPITAL OF PESHAWAR

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Background: The postural drop in blood pressure caused by autonomic neuropathy in diabetes mellitus is regarded as a risk factor for cardiovascular disease. The objectives of this study were to assess the prevalence of orthostatic hypotension and its relation with hypertension in patients with diabetes mellitus admitted in a tertiary care hospital. **Methods:** Two hundred indoor diabetic patients were assessed. Lying and standing blood pressure of each patient was determined using standard procedure for determination of orthostatic hypotension. Patients having orthostatic hypotension were compared with those having no orthostatic hypotension for different clinical and biochemical parameters using statistical program for social sciences. **Results:** Twenty-six percent of the patients were found to have orthostatic hypotension. Fifty two percent of the total patients showed hypertension. Proportion of hypertension in the patients having orthostatic hypotension was more than those without orthostatic hypotension while other parameters showed no difference. **Conclusion:** Orthostatic hypotension is a common phenomenon in our diabetic patients admitted to tertiary care facilities. Diabetic hypertensive patients are more likely to have postural drop in blood pressure as compared to diabetic normotensive patients.

Keywords: Diabetes mellitus, Blood glucose, Prevalence, Orthostatic hypotension

INTRODUCTION

Upon assuming upright posture from a supine position, significant portion of blood gravitates in the lower extremities, reducing venous return and cardiac output leading to a fall in blood pressure and consequently reduced cerebral perfusion. Normally this happening is prevented by the interaction of several physiological processes e.g. muscle pump and neurovascular and neuro-humoral adjustments.¹ Abnormality of any of these adjustments will result in a fall in blood pressure on standing from lying or sitting position. This is termed as orthostatic or postural hypotension (OH). In addition to old age, long standing hypertension and use of certain medications, one of the most common causes of OH is diabetes mellitus.

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. According to latest figures from International Diabetes Foundation, more than 7 million people in Pakistan are currently suffering from diabetes mellitus.² Orthostatic Hypotension caused by autonomic neuropathy in diabetic patients carries a high risk of cardiovascular mortality.³ Diabetic orthostatic hypotension usually has a neurogenic cause associated with efferent involvement of the baroregulatory reflex arc with damaged sympathetic vasoconstrictor fibres in the splanchnic bed, muscle, and skin.⁴ Hypertension, supine blood pressure, age and glycaemic control are significantly related to orthostatic hypotension in subjects with normal glucose tolerance, pre-diabetes, and diabetes.⁵ The prevalence of orthostatic hypotension in diabetic subjects varies extremely from 8.2 to 43%,

depending on the diagnostic criterion and study subject selection.^{6,7} The purpose of the present study was to investigate about the prevalence of OH among a group of diabetic patients in our local setup and to know whether coexistence of diabetes and hypertension affected the occurrence.

MATERIAL AND METHODS

This cross sectional study was carried out in the Department of Diabetes and Endocrinology at Hayatabad Medical Complex Peshawar over a period of six months. A total of 200 consecutively admitted adult diabetic patients with ages between 20 and 70 years were included. Patients having ketoacidosis, recent myocardial infarction or stroke, serious and debilitating illness, blood glucose levels below 70 mg/dl and above 400 mg/dl and lying blood pressure below 100/60 mmHg were excluded from the study.

After noting different anthropometric data, relevant clinical history was taken and examination performed. Blood pressure of each patient was measured with a standard mercury sphygmomanometer first in lying and then in standing position after waiting for at least three minutes. Hypertension was defined as a lying blood pressure of ≥ 140 mm Hg systolic and/or ≥ 90 mmHg diastolic.⁸ Orthostatic hypotension was defined as a fall of ≥ 20 mm Hg in systolic and/or ≥ 10 mmHg in diastolic blood pressure from lying to standing position.⁹ Laboratory investigations included random blood glucose levels, lipid profile, renal function tests, electrocardiogram and other routine tests. Relevant data was collected and analyzed in SPSS-10 for means and percentages. Chi-square test and student's *t*-test were used to compare the means and percentages

in different groups. Cut-off value for the significance of statistical difference was taken as 0.05.

RESULTS

A total of 200 subjects were examined. Male to female ratio was about 1:2. Mean age and mean diabetes duration was 48.3 years and 8.5 years respectively. Mean random blood glucose level was 331 mg/dl. 55% of the patients had hypertension. Orthostatic Hypotension was noted in 26% of the patients. Significantly more hypertensive patients were found among those having OH than those having no OH (62% vs 53%; $p < 0.5$). General and clinical characteristics of the patients are given in Table-1, while Table-2 shows the overall status of blood pressure and orthostatic hypotension. Table-3 compares characteristics between patients having OH and having no OH.

Table-1: General and clinical characteristics of study population

Variable	Number (%)	Range	Mean±SD
Total Number	200	---	---
Males	68 (34)	---	---
Females	132 (66)	---	---
Type 1	32 (32)	---	---
Type 2	168 (84)	---	---
Age (years)	---	20–75	48.3±13.3
BMI (kg/m ²)	---	18.5–40	26.4±5.4
Diabetes duration (years)	---	1–30	8.5±5.6
Random blood glucose (mg/dl)	---	70–400	331±111
Family history of diabetes	92 (46)	---	---
Smokers	17 (8.5)	---	---

Table-2: Blood pressure status of the patients

	Number	%	Range	Mean±SD
Orthostatic Hypotension	52	26	---	---
Hypertension	110	55	---	---
Systolic BP (mm Hg)	---	---	100–210	131±25
Diastolic BP (mm Hg)	---	---	60–110	79±13

Table-3: Comparison of patients with and without orthostatic hypotension

	Orthostatic Hypotension (n=52)	No Orthostatic Hypotension (n=148)	<i>p</i>
Hypertension	32 (61.5%)	78 (52.5%)	<0.05
Age (Yr)	49.7±10	47.8±13	NS
BMI (Kg/m ²)	26.4±5	26.5±5	NS
Duration of Diabetes (Yr)	9.6±5	8.4±5	NS
Random blood glucose (mg/dl)	331±110	332±108	NS

($p < 0.05$ = statistically significant; NS = statistically non-significant)

DISCUSSION

Diabetic autonomic neuropathy with abnormal cardiovascular reflex has been associated with increased mortality from unexpected sudden death and renal failure. Orthostatic hypotension is one clinical manifestation of diabetic autonomic neuropathy and is also a significant risk factor for fall, syncope, cardiovascular disease, and all-cause mortality.^{4,10} It has been suggested that there are considerable differences in

the prevalence and associations of OH in different populations that are largely attributed to differences in population characteristics and methodology.¹¹

The prevalence of OH is lowest among community-dwelling older adults (5–30%) and is usually higher among hospitalized individuals (52–69%) and those living in long-term care facilities (50%).¹² The present study was conducted in a tertiary care hospital and we expected relatively higher prevalence of OH. However the overall presence of OH in this study is 26%. On the other hand, in a study by Jin Shung *et al*, diabetic subjects had a significantly higher prevalence (28.4%) of postural hypotension than non-diabetic controls.¹³ Our study herein has given comparable results in this regard. However this is much less than that mentioned in literature for the indoor patients¹⁴ in spite of the fact that these patients were diabetic as well. This is probably due to the age aspect as our study included comparatively younger patients (mean age 48.3 vs. 80 years). Some of the reported studies have revealed that poor glycaemic control can make diabetes mellitus more vulnerable to postural hypotension.⁶ In our study mean blood glucose levels remained similar in both OH and non-OH cases. This can be explained because most of the subjects had poorly controlled diabetes due to which no effect occurred on mean blood glucose even after grouping (Table-3).

Although the association between OH and systemic hypertension has been challenged by the results of some recent studies,¹⁵ our present study showed that hypertension was more prevalent in OH cases than in non-OH cases, a finding which is consistent with many earlier studies.^{13,16,17} In a more recently published study, raised blood pressure has been reported to be strongly associated with OH regardless of treatment status of diagnosed hypertension. Also in the same study OH has been shown strongly associated with the use of three or more anti-hypertensives and multiple co-morbidities.¹⁸ As diabetes is a well known cause of OH, our findings would suggest that coexistence of hypertension with diabetes poses greater risk of developing OH. However the possibility of the use of antihypertensive medications as another reason of comparatively higher occurrence of OH was not considered in our study.

OH is not the only manifestation of autonomic dysfunction in people with diabetes. Other features include sweating disturbances, urinary control abnormalities, gastric distension, diarrhoea, constipation and erectile dysfunction in males. In one study the prevalence of overall autonomic impairment was reported as 54% in type-1 and 73 % in type-2 diabetic patients with OH occurring in 8.4 and 7.4% respectively.¹⁹ Similarly a local study conducted in Rawalpindi has shown that 32% of the patients with

abnormal cardiovascular function tests suffer from autonomic symptoms including OH.²⁰ This shows that other features are not uncommonly presented in these patients. Apparent reason for looking for OH is the more objectivity and simplicity with which it can be detected in contrast to other manifestations.

Some studies have shown negative association of weight and a positive association of advancing age and cardiovascular disease with OH.¹¹ However, our study has concluded that although hypertension was more prevalent in OH cases than in non-OH cases yet there was no difference in age and BMI between the two groups. Duration of diabetes and random blood glucose levels were also without any apparent effect (Table-3). Differences in prevalence of and associations with orthostatic hypotension in the present study compared with others may be largely attributed to differences in population characteristics.

Lack of tests such as glycosylated haemoglobin was a limitation in the present study but it can be confidently mentioned that it has not adversely affected the basic objectives of the study.

CONCLUSION

Diabetic patients coming to the tertiary care hospitals have a considerable percentage of OH. Coexistence of diabetes and hypertension increases this fraction. These patients deserve attention regarding evaluation by simple measurement of standing compared to sitting or lying blood pressure so that appropriate management plan can be designed for minimizing the associated morbidity and mortality. Moreover, there is a need to further investigate the association of OH with other factors such as age, sex, metabolic control, disease duration and associated symptoms in diabetic patients.

REFERENCES

1. Kochar MS. Management of postural hypotension. *Current Hypertension Reports* 2000;2:457–62.
2. World diabetes foundation. *International Diabetes Federation, Diabetes Atlas*, 4th edition 2009.
3. Luukinen H, Airaksinen KE. Orthostatic hypotension predicts vascular death in older diabetic patients. *Diabetes Res Clin Pract* 2005;2(67):163–6.
4. Ewing DJ, Campbell IW, Clarke BF. The natural history of diabetic autonomic neuropathy. *Q J Med* 1980;49:95–108.
5. Jin-Shang Wu, Yi-Ching Yang, Feng-Hwa Lu, Chih-Hsing Wu, Ru-Hsueh Wang, Chih-Jen Chang. Population-based study on the prevalence and risk factors of orthostatic hypotension in subjects with pre-diabetes and diabetes. *Diabetes Care* 2009;1(32):69–74.
6. Tsutsu N, Nunoi K, Yokomizo Y, Kikuchi M, Fujishima M. Relationship between glycemic control and orthostatic hypotension in type 2 diabetes mellitus: A survey by the Fukuoka Diabetes Clinic Group. *Diabetes Res Clin Pract* 1990;8:115–23.
7. Krolewski AS, Warram JH, Cupples A, Gorman CK, Szabo AJ, Christlieb AR. Hypertension, orthostatic hypotension and the microvascular complications of diabetes. *J Chron Dis* 1985;38:319–26.
8. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL, *et al.* The national high blood pressure education program coordinating committee. Seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. *Hypertension* 2003;42(6):1206–52.
9. Consensus committee. The definition of orthostatic hypotension, pure autonomic failure, and multiple system atrophy. *J Auton Nerv Syst* 1996;58(1–2):123–4.
10. Rose KM, Eigenbrodt ML, Biga RL, Couper DJ, Light KC, Sharrett AR, *et al.* Orthostatic hypotension predicts mortality in middle-aged adults. The Atherosclerosis Risk in Communities (ARIC) Study. *Circulation* 2006;114:630–6.
11. Rutan GH, Hermanson B, Bild DE, Kittner SJ, LaBaw F, Tell GS for CHS Collaborative Research Group. Orthostatic hypotension in older adults. *Hypertension* 1992;19:508–19.
12. Kannayiram Alagiakrishnan. Approach to Management of Postural Hypotension. *Geriatrics and Aging* 2007;10(5):298–304.
13. Jin-Shang Wu, Feng-Hwa Lu, Yi-Ching Yang, Chih-Jen Chang. Postural hypotension and postural dizziness in patients with non-insulin dependent diabetes mellitus. *Diabetes Arch Intern Med* 1999;159:1350–6.
14. Vloet LC, Pel-Little RE, Jansen PA. High prevalence of postprandial and orthostatic hypotension among geriatric patients admitted to Dutch hospitals. *J Gerontological A Biol Sci Med Sci* 2005;60:1271–7.
15. Cooke J, Carew S, O'Connor M, Costelloe A, Sheehy C, Lyons D. Orthostatic hypotension: Is it really associated with an increased risk of systemic hypertension. *Journal of Human Hypertension* 2009;23:219–21.
16. Mader SL, Josephson KR, Rubenstein LZ. Low prevalence of postural hypotension among community-dwelling elderly. *JAMA* 1987;258:511–4.
17. Ensrud KE, Nevitt MC, Yunis C, Hulley SB, Grimm RH, Cummings SR for the Study of Osteoporotic Fractures Research Group. Postural hypotension and postural dizziness in elderly women. *Arch Intern Med* 1992;152:1058–64.
18. Kamaruzzaman S, Watt H, Carson C, Ebrahim S. The association between orthostatic hypotension and medication use in the British Women's Heart and Health Study. *Age and Ageing* 2010;39(1):51–6.
19. Low PA, Benrud-Larson LM, Sletten DM, Opfer-Gehrking TL, Weigand SD, O'Brien PC, *et al.* Autonomic Symptoms and Diabetic Neuropathy. *Diabetes Care* 2004;12(27):2942–7.
20. Murtaza Gondal, Osama Ishtiaq, Haider Z Baqai. Evaluation of diabetic autonomic neuropathy in 100 Diabetics of 5 years duration. *J Rawal Med Coll* 2003;7(2):52–5.

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