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Research Article

PATTERNS OF ORTHOSTATIC BLOOD PRESSURE CHANGES IN HYPERTENSIVE ELDERLY WOMEN

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ABSTRACT

The present study reveals to determine the patterns of orthostatic blood pressure (OBP) changes and clinical characteristics in elderly women. 120 hypertensive subjects of aged group between 50 and 90 were used. Different measurements of BP were done in lying position and then standing position at two time intervals (1min, 3min) to check their orthostatic hypotension (OH). The Results showed that OH significantly increased in the age group 73.1, moderate in 82.43 and 69.8. No changes occurred in 50.55. The symptoms of head ache, blurred vision, falling and light headedness as well as blood hemoglobin levels were independent of OH in all aged groups. Concurrent medication usage aggravated the condition. Based on Body Mass Index, subjects were identified as 19% well nourished; 6% under-nourished and 75% overweight. The systolic OH ($P<0.01$) was more common than diastolic OH ($P>0.05$). Based on the present study, we conclude that OH incidence increases with increase in age and usage of medications. Symptoms are independent of physical recording.

Key words: Blood pressure, elderly, orthostatic hypotension, women, symptoms.

INTRODUCTION

Orthostatic blood pressure (OBP) is a measure of cardiovascular reactivity reflecting autonomic function which is indicated by baroreceptor reflex. The causes of rapid shifting blood from the thoracic and abdominal cavities to the lower extremities of body are due to movement from a supine or sitting position to standing which decreases venous return and stroke volume. This stimulates baroreceptors to activate the sympathetic nervous system, leading to vasoconstriction and increased heart rate so as to maintain a stable blood pressure as parasympathetic nerve signals to the heart are withdrawn, causing short-term blood pressure changes (Wilker et al., 2009).

Orthostatic hypotension (OH) was defined by the American Autonomic Society and the American Academy of Neurology as a decrease of at least 20mm Hg in systolic blood pressure (SBP) or 10mm Hg in diastolic blood pressure (DBP) within three minutes of standing (John G Bradley et al., 2003., Maule et al., 2007) .

OH is an important cause of recurrent falls in the elderly and is associated with increased morbidity and mortality (Räihä et al., 1995., Masaki et al., 1998). The prevalence of OH in elderly is about 6% to 30 % (Mader et al., 1987., Alli et al., 1992., Rutan et al., 1992., Räihä et al., 1995). This phenomenon has been attributed to age associated systolic hypertension (Harris et al., 1991., Mukai and Lipsitz 2002). Older people differ from the young or middle aged adults with the same disease in many ways, one of which is the frequent occurrence of co morbidities and of subclinical disease. A second way in which older adults differ from younger adults is the greater likelihood that their diseases present with nonspecific symptoms and signs (Alagiakrishnan 2007). Hemodynamic homeostasis becomes less effective with aging and is associated with a reduced ability to control blood pressure. OH is a common clinical disorder among the older population without symptoms (Gupta and Lipsitz 2007). Blood pressure is regulated by activity in autonomic nervous system. Due to age related physiologic changes, the response of the sympathetic system is usually decreased. Hence elder people tend to be more vulnerable to orthostatic stress than the younger ones. Also such elder ones having some associated diseases like hypertension, diabetes mellitus, and low blood volume become further weaker (Low 2008).

In the present study, we examined the effect of standing posture on blood pressure Viz, systolic and diastolic blood pressure and heart rate. Blood hemoglobin percentage in different age groups of hypertensive Malaysian women was recorded.

METHODOLOGY

Study Population

The subjects were selected in the ages between 20 and 90 years of female gender at General hospital in Johor bahru, Malaysia. All subjects belonging to mixed socioeconomic status were taken and were smokers and rest from any cardio respiratory diseases. Questionnaires evaluated smoking habits, medication use and history of past illness. Institutional Ethics Committee approved the study protocol.

Experimental Design

The Orthostatic Test was conducted in elderly hypertensive women. Readings were taken in supine posture followed by standing posture. The test was performed between 7.00 AM to 10.30 AM before breakfast. A total of 120 subjects with hypertension were studied. The study subject was considered to have hypertension if she was already on anti-hypertensive medication i.e. a known hypertensive or according to the **Joint**

National Committee (JNC)-VII Classification (Kumar et al., 2005) which is as follows:

Blood Pressure Reading	**Category**
< 120 mm Hg / < 80 mm Hg	-Normotensive
120-139 mm Hg / 80-89 mm Hg	- Pre-hypertensive
140-159 mm Hg / 90-99 mm Hg	-Hypertension Stage I
≥ 160 mm Hg / ≥100 mm Hg	-Hypertension Stage II

Samples were divided into four groups of 30 each.

Group I : Subjects of 51 - 60 years
Group II : Subjects of 61 - 70 years
Group III : Subjects of 71 - 80 years
Group IV : Subjects of 81 – 90 years

Physical examinations including measurement of height and weight were carried out. Body mass index (BMI) was calculated as weight (in kilograms) divided by height (in square meters) (Quetelet's index). Cyanmethaemoglobin method described by Drabkin DL and Austin JM (1932) was used to estimate blood levels of haemoglobin in all the four groups.

Measurements

Blood pressure was measured in right upper arm using a mercury sphygmomanometer and stethoscope after five minutes rest in the supine position with the arm supported at heart level, resting on the examination table with the elbow extended. The higher of the

two similar BP readings was taken for analysis. The subject was asked to stand up quickly, and the blood pressure was measured by the same examiner at 1 minute and 3 minutes of supported standing respectively. The average of two readings of systolic blood pressure (SBP) and the two readings of diastolic blood pressure (DBP) were taken to determine the blood pressure of the study subject. In case the two readings were differed by more than 10 mm Hg, a third reading was obtained and the three measurements were averaged.

Previous studies have noted that most hemodynamic changes related to the assumption of standing posture occur within the 1min of standing (Akselrod et al., 1997., Wilker et al., 2009). In standing posture, the accurate BP was measured by keeping the person's hand in extended position with support at heart level (Adiyaman et al.,2006). Heart rate (HR) was recorded by palpation of the radial artery for one minute.

Statistical Analysis

Data are expressed as mean ± standard deviation. A two tail Probability value ($p<0.05$) considered as significant.

RESULTS

The symptoms of head ache, blurred vision, falling and light headedness as well as blood hemoglobin levels were independent of OH in all three groups shown in Table 1. Based on Body Mass Index the subjects were identified as 72% well nourished; 4% under-nourished and 24% overweight. OH significantly increased in the group III and IV, less prevalent in group II and no changes occurred in group I. Four women in Group III had OH recorded physically were on medications for Parkinson's disease.

Table 2 shows the mean BP values measured in different age groups. The systolic OH ($P<0.01$) was more common among the elderly subjects than diastolic OH ($P>0.05$). Heart rate in supine position was higher compared with standing position. Results show that OH incidence increases with increase in age and symptoms are independent of physical recording.

DISCUSSION

OH is an important risk factor for cardiovascular diseases and all-cause mortality (Luukinen et al.,1999., Shin et al., 2004). Prevalence of OH among elderly persons has significantly increased in developed countries during the past decade (Shin et al., 2004).OH is a frequently encountered problem affecting about 30 % of the population more than 60 years (Gupta and Nair 2008). Luukinen et al. (1999) observed that systolic OH was associated with low BMI. Similar observations were made in the present study. OH was associated with a combination of medications usage in Group III (Low 2008).

Orthostatic symptoms as well as Blood Hb levels were independent of OH in all aged groups. Usage of medications was the most common underlying conditions. Two women of Group II were already suffering from hypertension showed fall in SBP after 1 minute, but no difference was observed after 3 minutes of standing (Weiss et al., 2002., Fedorowski et al., 2010., Lagi et al., 2003).

Four elderly women of Group III were on medications for Parkinson's disease showed similar fall in SBP (Harris et al., 1991). Earlier study on elderly showed medications such as antihypertensive and diuretics can cause or aggravate OH (Hajjar 2005). Two other women showed a fall in SBP had no history of Parkinson's disease. Neurological diseases such as diabetic neuropathy, Parkinson's disease, multiple system atrophy and the autonomic neuropathies further increase the likelihood of OH (Low 2008). The impaired orthostatic homeostasis was associated with age, history of hypertension and antihypertensive drug usage (Low 2008., Fedorowski et al., 2010., Ooi et al., 1997). OH was not present in any of the subjects in Group I.

Table 1: Clinical characteristics of different age groups

Group	Number	Symptoms				OH recorded	Hb (g/dl)	BMI (Wt/Ht²)
		Head ache	Blurred vision	Falling	Light Headed			
I	30	3	0	0	0	0	14.26 ± 1.28	23.87 ± 2.35
II	30	4	3	0	1	2	13.34± 1.89	27.62 ± 3.28
III	30	4	4	4	8	2+4*	13.12 ± 2.07	28.45 ± 1.05
IV	30	7	3	2	3	3	10.23± 1.56	24.76± 2.97

***** Past history of Parkinson's disease with medication along with anti-hypertensive medications. Values are given in Mean ± SD.

Table 2: Blood pressure measurement in different age groups

Groups	Mean of Age	During Lying Down Position		During Standing Position			
		SBP mm Hg	DBP mm Hg	SBP at 1 Min	DBP at 1 Min	SBP at 3 Min	DBP at 3 Min
I	50.55± 2.37	117.7± 6.63	82 ± 6.81	115.5± 7.40*	79.3± 5.70**	117.6 ± 6.64*	78.4 ± 4.93**
II	69.8± 5.40	123.4± 7.72	84.9 ± 6.28	119.4±11.66*	89.7 ± 7.12**	123.9 ± 8.69*	85.9 ± 7.72**
III	73.1± 9.70	127.2± 15.33	89 ± 9.91	110.4±11.23*	78 ± 13.10**	114 ± 11.66*	76.2 ± 10.64**
IV	82.43± 2.55	128.8± 2.45	92.3±4.23	112.8 ± 6.83*	87.3± 7.65**	121.3± 1.45*	90.76± 10.8**

*Values are statistically significant at $P < 0.05$;
**Values are statistically not significant at $P < 0.05$;
Values are given in Mean ± SD for three groups.

CONCLUSION

The results indicate that underlying disease process and the medications used for treatment are major causes for orthostatic hypotension in the elderly groups. Further studies are required to confirm these findings especially using a large group of geriatric subjects. Symptoms of OH are independent of physical recording.

REFERENCES

Adiyaman A., Verhoeff R., Lenders JW., Deinum J., Thien T. The position of the arm during blood pressure measurement in sitting position. Blood Press Monit. 2006;11(6): 309-313.

Akselrod S., Oz v., Greenberg M., Keselbrener L. Autonomic response to change of posture among normal and mild-hypertensive adults: investigation by time-dependent spectral analysis. J

Auton Nerv Syst.1997;64(1): 33-43.

Alagiakrishnan K. Postural and Postprandial Hypotension: Approach to Management. Geriatr Aging. 2007;10(5): 298-304.

Alli C., Avanzini F., Bettelli G., Colombo F., Corso R., Di Tullio M., Marchioli R., Mariotti G., Radice M., Taioli E. Prevalence and variability of orthostatic hypotension in the elderly. Results of the 'Italian study on blood pressure in the elderly (SPAA)'. The 'Gruppo di Studio Sulla Pressione Arteriosa nell'Anziano'. Eur Heart J. 1992;13(2):178-182.

Drabkin DL., Austin JM. Spectrophotometric constants for common haemoglobin derivatives in human, dog and rabbit blood. J Biol Chem. 1932;98:719-733.

Fedorowski A., Stavenow L., Hedblad B. Orthostatic hypotension predicts all- cause mortality and coronary events in middle aged individuals (The Malmo Preventive Project). Euro Heart J. 2010;31(1): 85-91.

Gupta D, Nair MD. Neurogenic orthostatic hypotension: chasing "the fall". Postgrad Med J. 2008;84(987): 6-14.

Gupta V., Lipsitz LA. Orthostatic hypotension in the elderly: diagnosis and treatment. Am J Med .2007;120(10): 841-847.

Hajjar I. Postural blood pressure changes and orthostatic hypotension in the elderly patient: impact of antihypertensive medications. Drugs Aging. 2005;22(1): 55-68.

Harris T., Lipsitz LA., Kleinman JC., Cornoni-Huntley J. Postural change in blood pressure associated with age and systolic blood pressure. The National Health and Nutrition Examination Survey II. J Gerontol. 1991;46(5): 159-163.

John G Bradley MD., Kathy A., Davis RN. Orthostatic Hypotension. Am Fam Physician. 2003; 68(12): 2393-2399.

Kumar DS., Kalyan S., Arindam B. Study of the Urban Community Survey in India: Growing trend of high prevalence of Hypertension in a developing country. International Journal of Medical Sciences. 2005;2(2): 70-78.

Lagi A, Rossi A., Comelli A., Rosati E., Cencetti S. FADOI Hypertension Group. Postural hypotension in hypertensive patients. Blood Press. 2003;12(5-6):340-344.

Low P A. Prevalence of orthostatic hypotension. Clin Auton Res. 2008;18(1): 8-13.

Luukinen H., Koski K., Laippala P., Kivelä SL. Prognosis of diastolic and systolic orthostatic hypotension in older patients. Arch Intern Med. 1999;159:273-280.

Mader SL., Josephson KR., Rubenstein LZ. Low prevalence of orthostatic hypotension among community-dwelling elderly. JAMA. 1987; 258:1511-1514.

Masaki KH., Schatz IJ., Burchfiel CM. Orthostatic hypotension predicts mortality in elderly men: the Honolulu Heart Program. Circulation. 1998;98: 2290-2295.

Maule S., Papotti G., Naso D., Magnini C., Testa E., Veglio F. Orthostatic Hypertension: Evaluation and treatment. Cardiovasc Hematol Disord Drug Targets. 2007;7(1): 63-70.

Mukai S., Lipsitz LA. Orthostatic hypotension. Clin Geriatr Med. 2002;18: 252-268.

Ooi WL., Barrett S., Hossain M., Kelley-Gagnon M., Lipsitz LA. Patterns of orthostatic blood pressure change and their clinical correlates in a frail, elderly population. JAMA. 1997;277(16):1299-1304.

Räihä I., Luutonen S., Piha J., Seppänen v, Toikka T., Sourander L. Prevalence, predisposing factors, and prognostic importance of postural hypotension. Arch Intern Med. 1995;155(9): 930-935.

Rutan GH., Hermanson B., Bild D E., Kittner SJ., LaBaw F., Tell G S. Orthostatic hypotension in older adults. The Cardiovascular Health Study. CHS Collaborative Research Group. Hypertension. 1992;19(6): 508-519.

Shin C., Abbott RD., Lee H., Kim J., Kimm K. Prevalence and correlates of orthostatic hypotension in middle-aged men and women in Korea: the Korean Health and Genome Study. J Hum Hypertens 2004;18(10):717-723.

Weiss A., Grossman E., Beloosesky Y., Grinblat J. Orthostatic hypotension in acute geriatric ward: is it a consistent finding? Arch Intern Med. 2002;162(20): 2369-2374.

Wilker E., Murray A., Mittleman, Augusto A., Litonjua, Poon A., Baccarelli A., Suh H., Robert O., Wright, Sparrow D., Vokonas P., Schwartz J. Postural Changes in Blood Pressure Associated with Interactions between Candidate Genes for Chronic Respiratory Diseases and Exposure to Particulate Matter. Envir Healt Persp. 2009; 117(6): 935-940.