



POSTURAL CHANGES IN BLOOD PRESSURE IN AN ELDERLY POPULATION

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ABSTRACT

The present study reveals to determine the patterns of orthostatic blood pressure (OBP) changes, symptoms and clinical factors in different aged groups. A total of 90 subjects of different aged group between 20 and 90 were used in this study. In these groups, different measurements of BP were done in lying as well as standing position at two time intervals (1min, 3min) to check their orthostatic hypotension (OH). Blood hemoglobin was estimated by using the cyanmethaemoglobin method. Orthostatic hypotension significantly increased in the age group 74.1 and less in 42.81 and no changes occur in 21.35. 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. Based on the nutritional status, Body Mass Index was measured in these subjects and identified as 72% well nourished; 4% under-nourished and 24% overweight. The systolic OH ($P < 0.01$) was more common among the elderly subjects than diastolic OH ($P > 0.05$). Prevalence was similar in either gender of elderly group. Past history of Hypertension and usage of medications were the most common underlying conditions. Study concludes that OH incidence increases with increase in age and symptoms are independent of physical recording. The results indicate that underlying disease process and the medications used for treatment are major causes for orthostatic hypotension in the elderly and middle aged groups.

Keywords: Blood Pressure, Orthostatic Hypotension, Ageing, 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 of body from a supine or sitting position to standing which reduces 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and increased heart rate so as to maintain a stable blood pressure as parasympathetic nerve signals to the heart are withdrawn, thus causing short-term blood pressure changes¹. 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^{2,3}. OH is an important cause of recurrent falls in the elderly and is associated with increased morbidity and mortality^{4,5}. The prevalence of OH in elderly is about 6% to 30%⁶⁻⁸. This phenomenon has been attributed to age associated systolic hypertension⁹⁻¹⁰. 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 signs¹¹. Hemodynamic homeostasis becomes less effective with aging and is associated with a decreased ability to regulate blood

pressure. OH is a common clinical disorder among the older population without symptoms¹².

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 weaker¹³.

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

MATERIALS AND METHODS

The subjects were carefully selected in the ages between 20 and 90 years from Kurnool and Kadapa district urban areas. All subjects belonging to mixed socioeconomic status were taken and subjects were non smokers and rest from any cardio respiratory diseases. Questionnaires evaluated smoking habits, medication use and history of past illness. The Institute Ethics Committee approved the study protocol.

The Orthostatic Test was conducted on apparently healthy subjects. Readings were taken in supine posture followed by standing posture. The test was performed between 6.30 AM and 10.30 AM before breakfast. In the experiment, a total of 90 healthy subjects of different



aged samples were used. The samples were divided into three groups of 30 each.

Group I: The subjects of 20 years and above of either sex

Group II: The subjects of 40 years and above of either sex

Group III: The subjects of 60 years and above of either sex

The participants were carried out the physical examinations including measurement of height and weight, and body mass index (BMI) was calculated as weight (in kilograms) divided by height (in square meters) (Quetelet's index). The level of haemoglobin was estimated by using the cyanmethaemoglobin method described by¹⁴.

Blood pressure was measured in right arm using a mercury Sphygmomanometer (Diamond, India) and Stethoscope (Lifeline, India) after five minutes rest in the supine position with the right 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 unsupported 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. The two readings were differed by more than 10 mm Hg, in such case, 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^{1, 15, 16}. Postural changes in SBP and DBP were calculated as mean lying minus standing for SBP (Δ SBP) and DBP (Δ DBP). In standing posture, the accurate BP was measured by keeping the person's hand in extended position with support at heart level¹⁷. Heart rate (HR) was recorded by counting the pulse rate by palpation of the radial artery for one minute. Data are expressed as mean \pm standard deviation. Two tail Probability value ($p < 0.05$) was considered 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 the nutritional status, Body Mass Index were measured in these subjects and identified as 72% well nourished; 4% under-nourished and 24% overweight. OH significantly increased in the group III, less prevalent in group II and no changes occur in group I.

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 compared with standing position. Heart rate was higher in standing position in all three groups. Based on our results, OH incidence increases with increase in age and symptoms are independent of physical recording.

Table 1: Clinical characteristics of different age groups, their symptoms and signs

Group	Number	Symptoms				OH recorded	Hb (g/dl)	BMI (Wt/Ht ²)
		Head ache	Blurred vision	Falling	Light Headed			
I	30	3	0	1	0	0	13.12 \pm 3.24	26.87 \pm 1.36
II	30	1	2	0	1	1*	13.64 \pm 3.69	24.52 \pm 2.58
III	30	6	5	4	8	7*	12.62 \pm 3.17	24.75 \pm 1.73

* With previous history of Hypertension with Medication; Values are given in Mean \pm SD for three groups.

Table 2: BP 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	21.35 \pm 2.26	118.7 \pm 6.43	75 \pm 4.81	114.9 \pm 7.60*	78.34 \pm 4.70**	117.7 \pm 6.54*	77.3 \pm 4.63**
II	42.81 \pm 5.40	124.1 \pm 7.43	85.9 \pm 5.21	118.9 \pm 11.76*	88.72 \pm 6.15**	122.9 \pm 8.69*	84.9 \pm 1.72**
III	74.1 \pm 6.73	124.6 \pm 13.63	78 \pm 9.54	111.5 \pm 10.53*	79 \pm 12.16**	115 \pm 10.66*	78.2 \pm 10.64**

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

DISCUSSION

Orthostatic hypotension is a risk factor for cardiovascular diseases and all-cause of mortality^{18, 19}. The prevalence of OH among elderly persons has significantly increased in developed countries during the past decade¹⁹.

Gupta and Nair²⁰ and Ratan *et al*⁷ found that OH is a frequently encountered problem affecting about 30 % of the population more than 60 years. Luukinen *et al*¹⁸

observed that systolic OH was associated with low BMI. Similar observations were made in the present study.

The Study on elderly subjects revealed that OH was not associated with anti hypertensive medication use²¹. But In the present study OH was associated with anti hypertensive medication use in Group II and Group III¹³.

Orthostatic symptoms as well as Blood Hb levels were independent of OH in all aged groups. Past history of



Hypertension and usage of medications were the most common underlying conditions. One subject of Group II had past history of hypertension showed fall in SBP after 1 minute, but no difference was observed after 3 minutes of standing^{22, 23}. Seven elderly subjects of Group III were on anti hypertensive medications showed similar fall in SBP⁹. Earlier study on elderly showed medications such as antihypertensive and diuretics can cause or aggravate OH²⁴. Neurological diseases such as diabetic neuropathy, Parkinson's disease, multiple system atrophy and the autonomic neuropathies further increase the likelihood of OH¹³. The impaired orthostatic homeostasis was associated with age, low BMI, hypertension and antihypertensive treatment^{22, 13}. Group I subjects were non diabetic, non hypertensive, non alcoholic and non smokers and their mean age was less. OH was not present in any of the subjects in this group.

CONCLUSION

The results indicate that underlying disease process and the medications used for treatment is major causes for orthostatic hypotension in the elderly and middle aged groups. Further studies are required to confirm these findings especially using a large group of geriatric healthy subjects to represent the Indian population.

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