

# Blood Pressure Variations with Postural Changes among Elderly

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## ABSTRACT

**Introduction:** Orthostatic hypotension (OH) is a common physical finding in elderly people. It is associated with several medical conditions and its prevalence increases with age. Study aimed to estimate the prevalence and symptom characteristics of orthostatic hypotension in apparently healthy people aged 60 years and above

**Material and methods:** Cross-sectional prospective study was done on residential population near Thirupporur, Kancheepuram District. The study group comprised of healthy non hypertensive, non diabetic elderly individuals aged 60 years and above (n=50, mean age 68.3±4.7) and another group, healthy aged 30 to 59 years age (n=50, mean age 39.2±5.3).

**Results:** Orthostatic hypotension was defined as 20 mm Hg or greater decrease in systolic blood pressure (SBP) and/or 10 mm Hg or greater decrease in diastolic blood pressure (DBP) within 3 minutes of standing. Subjects were divided into OH positive group and OH negative group. Orthostatic hypotension was found in 5 out of 50 (10%) in elderly group at either 0 or 3 minutes after standing. Symptoms were independent of OH recorded.

**Conclusion:** Orthostatic hypotension is common in the elderly and retired population. Symptoms do not correlate with the physical recording of OH.

**Keywords:** Orthostasis, postural hypotension, healthy elderly, blood pressure, young adults, symptoms.

## INTRODUCTION

About 15–55% of the residents of a retirement home have an abnormal blood pressure (BP) regulation.<sup>1,2</sup> These BP changes can be related to many factors.

Orthostatic hypotension (OH) develops when the compensatory mechanisms fail to resist reduction of nearly 500-mL blood coming to the heart as a person stands up from a lying position. When cardiac output decreases, baroreceptors located in the heart, aorta, and carotid artery are stimulated to increase the heart rate and cause peripheral vasoconstriction to maintain the blood pressure.<sup>3</sup>

Acute OH is usually secondary to medication, blood or fluid loss, or adrenal insufficiency. Chronic OH is due to altered blood pressure regulatory mechanisms and autonomic dysfunction.<sup>2</sup> Older people commonly use several medications, especially anti-hypertensive drugs. Older patients show several changes in the complex autonomic regulation of BP as part of the adaptations related to ageing. All these conditions facilitate dysautonomic reflexes.<sup>4-6</sup> Chronic illnesses such as diabetes, Parkinson's disease or pure autonomic failure make elderly people prone to the autonomic dysfunctions. OH detection is essential in terms of prevention, since only 25% of patients show any symptoms. Hence falls can be wrongly attributed to different diseases.<sup>7</sup>

The measurement of orthostatic BP in elderly persons is a necessity, because low BP and OH form the chief contributing factors for falls mainly in frail elderly persons.<sup>8</sup>

## MATERIAL AND METHODS

The study population included 50 healthy subjects  $\geq 60$  years of age (Group II) and 50 healthy volunteers aged 30 to 59 years (Group I) who were studied in their residential houses in and around the villages of Nellikuppam panchayat, Kancheepuram district.

**Definition of OH:** Orthostatic hypotension was defined as a decline of 20mm of Hg or more in systolic blood pressure or 10 mm of Hg or more in Diastolic blood pressure on assumption of upright posture within 3 to 5 minutes.<sup>9</sup> The study subjects were selected according to their willingness to give written informed consent to collaborate in our study.

Age, sex of the subjects, symptoms of OH and the medical history (which included history of diabetes and hypertension, history of smoking, medications taken) was recorded. The elderly subjects having hypertension, diabetes mellitus, any other debilitating illnesses, on medications, subjects unable to stand up were excluded from the study. The subjects in the age group 30 – 59 years were non diabetic, non hypertensive, non alcoholic, non smokers, not on any medications and not suffering from any diseases. All subjects in the study satisfied the exclusion and inclusion criteria. The study was approved by the Institutional Ethics Committee 2011 of Shri Satya Sai Medical College and Research Institute.

Blood pressure was measured in the right upper arm with the subjects lying in supine position for supine blood pressure. Blood pressure was measured by the same examiner using a standard mercury sphygmomanometer. Blood pressure readings in supine posture were taken at 5 minutes of rest. After recording this, the subject was made to stand for 3 minutes and blood pressure reading was taken on immediate standing and at 3 minutes of standing. The arm position was kept in extended position in both the postures.<sup>10</sup>

## STATISTICAL ANALYSIS

The Statistical software named SPSS 22 was used for the analysis of data. Data were expressed as Mean  $\pm$  SEM.

## RESULTS

Only 5 out of the 50 elderly healthy subjects (Group II) had OH and OH was not observed in Group I (Table 1). The mean systolic and mean diastolic blood pressures were higher in

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Age (years)	With OH		Without OH	
	n	%	n	%
30-59	0	0	50	100
60-69	2	6.67	28	93
70-79	1	10	9	90
>80	2	20	8	80

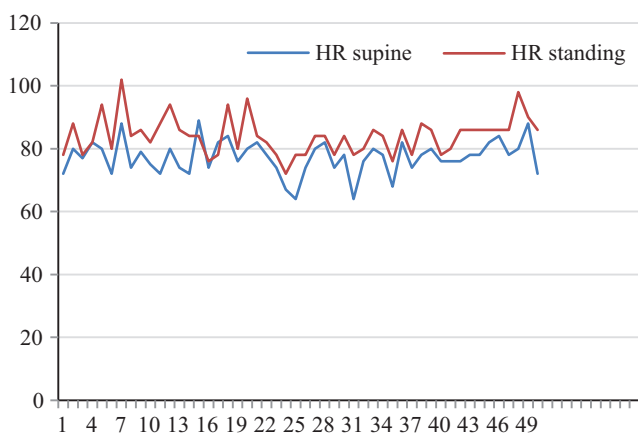
**Table-1:** Percentage distribution of orthostatic hypotension (OH) according to age groups.

Posture	Blood Pressure	Mean $\pm$ SD	Mean $\pm$ SD
		aged $\geq$ 60 years	aged 30-59 years
Supine	Systolic	138 $\pm$ 7	123 $\pm$ 6
	Diastolic	90 $\pm$ 13	80 $\pm$ 4
After 3 min of standing	Systolic	122 $\pm$ 7	117 $\pm$ 6
	Diastolic	86 $\pm$ 8	78 $\pm$ 8

**Table-2:** Postural variations in Blood Pressure in subjects.

Group	Number	Symptoms				OH recorded
		Head ache	Blurred vision	Falling	Light Headedness	
I	50	4	2	1	3	0
II	50	10	4	7	5	5

**Table-3:** Clinical symptoms of different age groups



**Figure-1:** Heart rate variability with posture in Group II

older subjects when compared to the younger subjects (Table 2). Symptoms of OH like headache, blurred vision, falls and light headedness were independent of OH in Group II (Table 3). Heart rate variability was obvious during comparison of supine with standing posture (Figure 1).

## DISCUSSION

In the present study Group II subjects aged 60 years and above had a higher baseline systolic and diastolic Blood Pressure. Younger subjects belonging to Group I did not show this elevation in blood pressure in the baseline lying position. This increase in BP with age may be due to arterial wall stiffening and loss of elasticity of the vessel wall layers. On standing there was an obvious increase in the heart rate indicating of the

autonomic response to the orthostasis. And this response was a little sluggish in case of aged individuals.

OH prevalence among healthy elderly in this study accounted to 10%. Previous studies on normal elderly subjects showed the prevalence between 5 and 30%.<sup>9</sup> Concurrent usage of medications by the elderly, such as antihypertensive and diuretics might have aggravated OH. Parkinson's disease, diabetic neuropathy, multiple system atrophy with neurological diseases and autonomic insufficiencies further increase the likelihood of OH.<sup>9</sup> OH in the elderly may be due to age-related physiologic changes in blood pressure regulation of baro receptor reflex, to certain disorders, or drugs side effects. No OH was recorded in Group I. The impaired orthostatic homeostasis was associated with age, low BMI, male gender, hypertension.<sup>11</sup> Group I subjects had no hypertension, no diabetes, no alcohol consumption and no smoking habits detected. Their mean age recorded was not too high. The above reasons explained the absence of OH among subjects of this group.

## CONCLUSION

10% of the studied elderly population near Thirupporur had OH recorded. Symptoms were independent of OH physical recording. No significant changes were noted in heart rate with change in body posture except the autonomic response of rise in the rate on standing. Further research needs to be done to confirm these findings in a larger group of geriatric healthy subjects to represent the local Indian population.

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