COMPARATIVE ANALYSIS OF POSTURAL HYPOTENSION INCIDENCE BASED ON HYPERTENSION CONTROL STATUS IN THE ELDERLY

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ABSTRACT

Background*: The prevalence and severity of hypertension increase with age. Based on control status, more elderly individuals suffer from uncontrolled hypertension than from controlled hypertension. Some studies have shown that hypertension is associated with the risk of postural hypotension. Postural hypotension can lead to serious consequences, but it is often unnoticed due to the absence of symptoms, and there is still a misconception linking the use of antihypertensive medications to the onset of postural hypotension. Therefore, the researcher aims to examine the differences in the incidence of postural hypotension based on the status of controlled and uncontrolled hypertension in elderly patients.* ***Objective****: To assess the difference in the incidence of postural hypotension based on the hypertension control status in elderly patients at the Mojokerto Health Center.* ***Method****: This study is an observational analytic research with a cross-sectional design and purposive sampling technique. Data was collected from direct interviews, medical records of blood pressure history, and postural blood pressure examinations of elderly patients at the Tawang Sari Health Center, Kranggan Health Center, and Kedundung Health Center in Mojokerto during July to August 2024.* ***Results****: Among 34 elderly patients with controlled hypertension and 34 elderly patients with uncontrolled hypertension, the incidence of postural hypotension was higher in those with uncontrolled hypertension (88.89%) compared to those with controlled hypertension (11.11%). Fisher's exact test analysis showed a p-value of 0.027 (p<0.05) with a prevalence ratio (PR) of 8.* ***Conclusion****: There is a significant difference in the incidence of postural hypotension based on the control status of hypertension (controlled vs. uncontrolled) in elderly patients. Patients with uncontrolled hypertension are eight times more likely to experience postural hypotension than those with controlled hypertension.*

Keywords*: Hypertension control status; controlled hypertension; uncontrolled hypertension; postural hypotension; elderly.*

INTRODUCTION

The prevalence and severity of hypertension are increasing among the elderly.[1] Based on control status, hypertension is classified into controlled and uncontrolled hypertension. Controlled hypertension is defined as a systolic blood pressure (SBP) <140 mmHg and diastolic blood pressure (DBP) <90 mmHg in hypertensive patients who are on antihypertensive medication.[2] Uncontrolled hypertension is defined as a SBP ≥140 mmHg and/or DBP ≥90 mmHg in hypertensive patients based on follow-up measurements taken at least three times consecutively.[3]

According to the Framingham Heart Study, hypertension affects around 60% of the population aged 60, 75% of women, and 65% of men aged 70, with the prevalence of uncontrolled hypertension increasing with age.[4] Some studies have shown that hypertension is associated with the risk of postural hypotension.[5,6] However, other studies have

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indicated no such association.[7] To date, there are still misconceptions linking antihypertensive medications to the risk of postural hypotension, which causes clinicians to hesitate in prescribing antihypertensive drugs to the elderly.[8]

Postural hypotension is defined as a decrease in SBP ≥20 mmHg or DBP ≥10 mmHg after standing up from a lying position within 3 minutes.[9] The incidence of postural hypotension increases with age, but many elderly individuals are unaware of this condition because it is often asymptomatic.[10] Postural hypotension can have serious consequences, such as falls, cardiovascular disturbances, and even death in elderly individuals.[11]

Research on hypertension and postural hypotension is still limited and requires further investigation, particularly in Indonesia. The high prevalence of hypertension, inadequate hypertension control in the elderly, the large number of elderly individuals with uncontrolled hypertension, and the low awareness among the elderly about the early detection of postural hypotension and its dangerous impacts, have led the researcher to investigate the differences in the incidence of postural hypotension based on the control status of hypertension (controlled vs. uncontrolled) in elderly patients at the Mojokerto Health Center.

METHODS

This study used an observational analytical design with a cross-sectional method and purposive sampling technique. The data collected came from anamnesis results, medical records of blood pressure history, and postural blood pressure examinations of elderly patients at the Tawang Sari Health Center, Kranggan Health Center, and Kedundung Health Center in Mojokerto during July to August 2024. The study population included all elderly patients confirmed with hypertension who visited the three health centers during this period. The sample for this study consisted of elderly patients confirmed with controlled and uncontrolled hypertension who visited these health centers between July and August 2024 and met the inclusion and exclusion criteria. The sample size for this study was 68 individuals, consisting of 34 patients with controlled hypertension and 34 patients with uncontrolled hypertension. The data were analyzed using SPSS version 26, with Fisher's exact test performed between the two variables. The result was considered significant if the p-value was <0.05.

RESULTS

Table 1. Characteristics of the study sample based on hypertension control status.

Variable	Hypertension Control Status		Total n (%)
	Controlled HT n (%)	Uncontrolled HT n (%)	
Gender			
Male	12 (35.29)	14 (41.18)	26 (38.24)
Female	22 (65.71)	20 (58.82)	42 (61.72)
Total	**34 (100)**	**34 (100)**	**68 (100)**
Age (year)			
60–64	9 (26.47)	5 (14.71)	14 (20.59)
65–69	12 (35.29)	11 (32.26)	23 (33.82)
70–74	5 (14.71)	12 (35.29)	17 (25.00)
75–79	6 (17.65)	2 (5.88)	8 (11.77)
80–84	2 (5.88)	3 (8.82)	5 (7.35)
85–89	0 (00.00)	1 (2.94)	1 (1.47)
Total	**34 (100)**	**34 (100)**	**68 (100)**
Education Level			
Not in school/ Elementary School	18 (52.95)	22 (64.71)	40 (58.82)
Junior High School	3 (8.82)	5 (14.71)	8 (11.77)
Senior High School	9 (26.47)	4 (11.76)	13 (19.12)
Diploma	0 (00.00)	0 (00.00)	0 (00.00)
Bachelor's Degree	3 (8.82)	3 (8.82)	6 (8.82)
Master's Degree	1 (2.94)	0 (00.00)	1 (1.47)

Total	**34 (100)**	**34 (100)**	**68 (100)**
Employment Status			
Unemployed (Housewife/ Retired)	24 (70.59)	27 (79.41)	51 (75.00)
Employed	10 (29.41)	7 (20.59)	17 (25.00)
Total	**34 (100)**	**34 (100)**	**68 (100)**
Active Smoking Habits			
Smoking	1 (16.67)	5 (83.33)	6 (100)
Not smoking	33 (53.23)	29 (46.77)	62 (100)
Total	**34 (50.00)**	**34 (50.00)**	**68 (100)**
History of Antihypertensive Medication Use			
Regular	32 (94.12)	12 (35.29)	44 (64.71)
Irregular	2 (5.88)	22 (64.71)	24 (35.29)
Total	**34 (100)**	**34 (100)**	**68 (100)**

The majority of the uncontrolled hypertension sample were female (58.82%), aged 70–74 years (35.29%), with an education level of elementary school or not in school (64.71%), unemployed (79.41%), and have irregular antihypertensive medication use (64.71%).

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Table 2. Characteristics of the study sample based on the incidence of postural hypotension

Variable	Incidence of Postural Hypotension		Total n (%)
	Postural Hypotension n (%)	Not Postural Hypotension n (%)	
Gender			
Male	3 (33.33)	23 (38.98)	26 (38.24)
Female	6 (66.67)	36 (61.02)	42 (61.76)
Total	**9 (100)**	**59 (100)**	**68 (100)**
Age (year)			
60–64	1 (11.11)	13 (22.03)	14 (20.59)
65–69	2 (22.22)	21 (35.59)	23 (33.82)
70–74	4 (44.45)	13 (22.03)	17 (25.00)
75–79	1 (11.11)	7 (11.87)	8 (11.77)
80–84	1 (11.11)	4 (6.78)	5 (7.35)
85–89	0 (0.00)	1 (1.70)	1 (1.47)
Total	**9 (100)**	**59 (100)**	**68 (100)**
Employment Status			
Unemployed (Housewife/ Retired)	9 (100)	42 (71.19)	51 (75.00)
Employed	0 (00.00)	17 (28.81)	17 (25.00)
Total	**9 (100)**	**59 (100)**	**68 (100)**
Active Smoking Habits			
Smoking	1 (16.67)	5 (83.33)	6 (100)
Not smoking	8 (12.90)	54 (87.10)	62 (100)
Total	**9 (13.24)**	**59 (86.76)**	**68 (100)**
History of Antihypertensive Medication Use			
Regular	3 (33.33)	41 (69.49)	44 (64.71)
Irregular	6 (66.67)	18 (30.51)	24 (35.29)
Total	**9 (100)**	**59 (100)**	**68 (100)**

The majority of the study sample with postural hypotension were female (66.67%), older than those without postural hypotension, with the age range of 70–74 years (44.45%) compared to 65–69 years (35.59%), unemployed (100%), and have irregular antihypertensive medication use (66.67%).

Table 3. Characteristics of the study sample with postural hypotension based on blood pressure classification according to PERHI

Variable Blood Pressure Classification (Systolic/Diastolic)	Postural Hypotension n (%)
Normal (<130 dan 85 mmHg)	0 (00.00)
Normal-High (130–139/85–89)	1 (11.00)
First degree (140–159/90–99 mmHg)	2 (22.22)
Second degree (≥160/100 mmHg)	6 (66.67)
Total	**9 (100)**

The majority of the study sample with postural hypotension had stage 2 hypertension (66.67%).

Table 4. Characteristics of the study sample with postural hypotension based on the minute of occurrence

Variable Types of Postural Hypotension	Postural Hypotension n (%)
Postural Systolic Hypotension at 1st Minute Only	3 (33.33)
Postural Systolic Hypotension at 3rd Minute Only	2 (22.22)
Postural Diastolic Hypotension at 1st Minute Only	1 (11.11)

Postural Diastolic Hypotension at 3rd Minute Only	0 (00.00)
Mixed Postural Hypotension (Systolic/Diastolic OH at 1st and 3rd Minute)	3 (33.33)
Total	**9 (100)**

The majority of the study sample with postural hypotension experienced postural systolic hypotension at the 1st minute only and mixed postural hypotension (1st and 3rd minutes), with 3 individuals (33.33%).

Table 5. Analysis of the difference in the incidence of postural hypotension based on controlled and uncontrolled hypertension status and the results of Fisher's exact test

Fisher's Exact Test				
Variable Hypertension Control Status	**Incidence of Postural Hypotension**		**Total n (%)**	**Sig. (<0.05)**
	Postural Hypotension n (%)	**Not Postural Hypotension n (%)**		
Uncontrolled HT	8 (88.89)	26 (44.07)	34 (50)	p = 0.027 **Sig.**
Controlled HT	1 (11.11)	33 (55.93)	34 (50)	
Total	**9 (100)**	**59 (100)**	**68 (100)**	
Prevalence ratio (PR) = 8				

The majority of patients with postural hypotension were elderly individuals with uncontrolled hypertension (88.89%), while the majority of those without postural hypotension were elderly individuals with controlled hypertension (55.93%). Additionally, the prevalence ratio (PR) for the control of hypertension status in relation to the incidence of postural hypotension is 8.

DISCUSSION

In this study, the majority of patients with uncontrolled hypertension were women. Elderly women experience a decline in estrogen levels, which helps maintain HDL (High Density Lipoprotein) levels and blood vessel vasodilation, making them more susceptible to uncontrolled hypertension.[12] Additionally, the patients with uncontrolled hypertension were generally older than those with controlled hypertension (70–74 years vs. 65–69 years). This could be due to a decrease in the elasticity and increased stiffness of blood vessels as a result of aging.[13]

Most patients with uncontrolled hypertension had a history of elementary school education or no formal schooling. Individuals with lower education levels tend to have less knowledge compared to those with higher education. Those with lower education levels often have poor self-management of hypertension, which affects their ability to control blood pressure.[14] Furthermore, most patients with uncontrolled hypertension were not working, which is linked to reduced physical activity. The more active a person is, the better their blood pressure control, as physical activity helps strengthen the heart muscle, improve arterial vasodilation, and reduce norepinephrine levels.[15]

Most elderly patients with uncontrolled hypertension had an irregular history of taking antihypertensive medication, while the majority of those with controlled hypertension had a history of regular medication use. Antihypertensive medications are a key measure to reduce blood pressure through the specific mechanisms of each class of drugs.[1] Additionally, most patients who smoked had uncontrolled hypertension, while most non-smokers had controlled hypertension. Smoking increases oxidative stress, which damages the endothelial cells and tunica intima of blood vessels, leading to uncontrolled hypertension.[4]

This study also found that the majority of elderly patients with controlled hypertension were women. This may be due to women being more proactive about their health, leading them to be more consistent with doctor visits, dietary control, and medication adherence.[16] Moreover, the majority of elderly patients with controlled hypertension had elementary school education and were not working.

This might be related to the characteristics of the sample population in this study, which was dominated by individuals with low education levels and no employment due to economic limitations and the physical condition of the elderly. Consequently, this may indirectly influence the characteristics of elderly individuals with controlled hypertension.

In this study, the majority of elderly patients with postural hypotension were women. Postmenopausal women experience a drastic decrease in estrogen, which impairs the reuptake of norepinephrine (NE), potentially leading to postural hypotension.[17] Postural hypotension was most common among older elderly individuals, specifically those aged 70–74 years. Aging is associated with impaired baroreceptor reflex, which reduces the body's ability to adapt to a drop in blood pressure during position changes.[18]

All elderly patients in the study who had postural hypotension were not working. Employment is linked to physical activity, and regular physical activity can prevent and improve autonomic dysfunction due to age-related baroreflex impairment, thus minimizing the incidence of postural hypotension.[19]

The majority of elderly patients with postural hypotension had an irregular history of taking antihypertensive medication. Irregular medication use is associated with an increased risk of uncontrolled hypertension, which can trigger postural hypotension due to baroreflex dysfunction.[20] Most elderly smokers did not suffer from postural hypotension. Smoking can lead to acute increases in blood pressure, preventing postural hypotension.[21]

The majority of elderly patients in this study who had postural hypotension had grade 2 hypertension. The higher a person's blood pressure, the greater the damage and stiffness to blood vessels, which can trigger postural hypotension.[22] Additionally, most elderly patients experienced systolic postural hypotension in the first minute and mixed postural hypotension (systolic/diastolic in the 1st and 3rd minutes). This is related to a delayed NE response in the first minute.[23]

The Fisher's exact test in this study showed a significant difference between the control status of hypertension (controlled and uncontrolled) and the incidence of postural hypotension ($p = 0.027$). Most patients with postural hypotension have uncontrolled hypertension, while the majority of those without postural hypotension have controlled hypertension. Uncontrolled hypertension can increase arterial stiffness, including the large internal carotid and aortic arch arteries, thereby reducing arterial compliance and impairing baroreceptor sensitivity to maintain blood pressure during orthostatic stress. As a result, inadequate compensation occurs, such as the sympathetic response that should happen when blood pressure drops, leading to postural hypotension.[18]

Uncontrolled hypertension can also increase afterload, which disrupts diastolic filling of the heart and reduces cardiac output. This leads to sustained blood pressure drops during orthostatic stress and the occurrence of postural hypotension.[24] In this study, the prevalence ratio was 8, meaning that patients with uncontrolled hypertension were eight times more likely to experience postural hypotension than those with controlled hypertension.

CONCLUSION

Based on the results of the study, it is concluded that there was a significant difference in the incidence of postural hypotension based on the control status of hypertension (controlled vs. uncontrolled) among elderly patients at the Mojokerto Health Center. The incidence of postural hypotension was more commonly found in elderly

patients with uncontrolled hypertension than in those with controlled hypertension.

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