

# Adherence to blood pressure control and association with comorbidities in elderly Vietnamese patients

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**ABSTRACT.** To date, the only study to evaluate blood pressure control in Vietnam in accordance with Eighth Joint National Committee (JNC 8) recommendations has been Nguyen Van Tri's 2015 study, which included nearly 6,000 older people with hypertension. This study showed that the proportion of blood pressure control at that time was 21.9%. We examined the relationship between blood pressure control and functional status, associated chronic diseases, multiple diseases, and medication. This was a descriptive cross-sectional study using multivariate analysis. The subjects of the study were patients with arterial hypertension older than 60 years who underwent outpatient treatment at the clinic of the department of the senior headquarters of the 175 Military Hospital of the Ministry of Defense from October 2015 to March 2016. There were significant associations between blood pressure control and orthostatic hypotension (OR = 0.456, 0.26-0.81 95% CI, P < 0.007), daily activity (Activities of Daily Living, ADL) (OR = 0.127, 0.06-0.25 95% CI, P < 0.025), instrumental activities (Instrumental Activities of Daily Living, IADL) (OR = 0.270, 0.16-0.47, 95% CI, P < 0.007), dyslipidemia (OR = 0.534, 0.307-0.927 95% CI, P < 0.024), diabetes (OR = 0.293, 0.19-0.45 95% CI, P <

0.001), chronic kidney disease (CKD) (OR = 0.307, 0.181-0.522 95% CI, P < 0.001), cardiovascular diseases (OR = 0.389, 0.218-0.694 95% CI, P < 0.001) and multiple drug therapy (OR = 0.529, 0.332-0.844 95% CI, P < 0.007). The greatest association was with ADL/IADL, diabetes and CKD. It is imperative to increase control over blood pressure, especially for patients with such concomitant diseases as diabetes mellitus and chronic kidney disease.

**Key words:** Blood pressure control; Arterial hypertension; Diabetes; Chronic kidney disease; Orthostatic hypotension

## INTRODUCTION

High blood pressure is one of the main risk factors for mortality worldwide. Achieving adequate blood pressure control can significantly reduce the risk of cerebrovascular events, heart failure, and overall mortality, especially in the elderly (Artom et al., 2016). Strict blood pressure control in people with hypertension is a priority for the primary prevention of stroke. In elderly people with arterial hypertension, systolic blood pressure (SBP) can be considered a marker of an increased risk of stroke (Yannoutsos et al., 2017). Recommendations for the treatment of persons with arterial hypertension over 60 years of age are based on a target blood pressure of less than 150/90 mm Hg (James, 2014).

Systolic hypertension, especially isolated (ISH), is common in older people aged  $\geq 65$  years and is a major risk factor for stroke and heart attack regardless of gender or ethnicity, and effective control of SBP is associated with a significant reduction in the incidence of these complications (Chrysant, 2018). Poorly controlled hypertension is widespread in Vietnam according to previous studies (Nguyen, 2020). According to the JNC 8 Blood Pressure Guidelines, for patients 60 years of age or older, it is recommended that they start drug therapy to lower their SBP to 150 mm Hg and diastolic blood pressure (DBP) <90 mm Hg, and in case of concomitant diabetes or chronic kidney disease (CKD), SBP should remain <140 mm Hg and DBP <90 mm Hg (Burns et al., 2019). In elderly patients with diabetes (>80 years), blood pressure should be in the range of 140-150/90 mm Hg and carefully monitored, while drug therapy should be structured in such a way as to prevent an excessive decrease in blood pressure (Grossman and Grossman, 2017).

Several studies show that regular monitoring and control of blood pressure provides effective prevention of complications of hypertension and a decrease in the incidence of acute cardiovascular diseases (Volpe et al., 2018). At the same time, analysis of data from the European registry (Redon et al., 2016) showed that on average only 39% of patients with hypertension achieve adequate control of blood pressure.

Study objectives were:

Determine the level of blood pressure control in connection with the recommendations of JNC 8 in elderly people with arterial hypertension.

Determine the proportion of orthostatic hypotension (OH) in the elderly with arterial hypertension, studying the relationship between blood pressure and OH control.

Study the relationship between blood pressure control and functional status, concomitant chronic diseases, multiple diseases, and medication intake.

## MATERIAL AND METHODS

This was a descriptive cross-sectional study designed to collect blood pressure monitoring data. All patients provided written informed consent to participate in the study, as well as to use the data in this article. The study protocol was approved by an independent institutional ethics committee. All procedures were carried out in accordance with the ethical principles of the Helsinki Declaration.

Patients with arterial hypertension  $\geq 60$  years old, undergoing outpatient treatment in the clinic of the department of the senior staff of the 175 Military Hospital of the Ministry of Defense. Observations were carried out from October 2015 to March 2016. The number of participants in the study was 390 people. The assessment was carried out taking into account risk factors for cardiovascular diseases (Table 1).

**Table 1.** Cardiovascular risk factors in Vietnamese patients  $\geq 60$  years old (n=390).

Risk factors	Frequency	Proportion (%)
Smoking	93	23.8
Physical activity	328	84.1
Dyslipidemia	321	82.3
Diabetes	145	37.2
Hereditary burden (Family history)	50	12.8

Blood pressure was measured in a standard manner as recommended by the World Health Organization. In subjects in a sitting position after a 5-minute rest, 2 measurements were taken with an interval of 2 min. The average value of 2 measurements was calculated. If the difference between the measurements was  $\geq 5$  mm Hg, then an additional third measurement was conducted.

Statistical analysis was carried out by generally accepted methods using the software Statistica 10.0 (StatSoft, USA). The odds ratio and the 95 percent confidence interval (CI) were calculated for the variables of interest. Multivariate analysis included variables such as daily activity (ADL), instrumental actions (IADL), dyslipidemia, diabetes, CKD, cardiovascular disease, and multiple drug therapy. Differences were considered statistically significant at  $P < 0.05$ .

## RESULTS

When assessing blood pressure control, patients were divided into groups in accordance with concomitant diseases (Table 2).

The number of patients exercising tight control of blood pressure was 43 people, of which 37 people had SBP  $< 120$  mm Hg and six had DBP  $< 60$  mm Hg. As can be seen, a relatively small number of patients carry out tight blood pressure control. The number of individuals with orthostatic (Table 3) and symptomatic (Table 4) hypotension is presented below.

**Table 2.** Assessment of blood pressure control in Vietnamese patients  $\geq 60$  years old (n=390) according to the recommendations of JNC 8.

Patient groups	Target (mmHg)	Frequency (number of patients)	Proportion (%)
Arterial hypertension (without diabetes and chronic renal failure)	< 150/90	150 (206)	72.8
Arterial hypertension + diabetes (without chronic renal failure)	< 140/90	43 (108)	39.8
Arterial hypertension + chronic renal failure (without diabetes)	< 140/ 90	25 (76)	32.9
General		218 (390)	55.9

**Table 3.** The proportion of orthostatic hypotension in elderly Vietnamese patients.

Orthostatic hypotension	Frequency	Proportion (%)
Postural hypotension after standing 1 minute	18	4.6
Postural hypotension after standing 3 minutes	23	6
Postural hypotension after standing 1 and 3 minutes	15	3.8
General	56	14.4

**Table 4.** The proportion of symptomatic arterial hypotension in elderly Vietnamese patients.

Symptom	Frequency	Proportion (%)
With symptomatic hypotension	29	51.8
Without symptomatic hypotension	27	48.2

We conducted a search for associations between blood pressure and OH. The results showed the presence of a statistically significant relationship between these parameters (Table 5).

**Table 5.** The relationship between blood pressure control and orthostatic hypotension in elderly Vietnamese patients.

Orthostatic hypotension	Blood pressure control		OR	95% CI	P
	Yes (n, %)	No (n, %)			
Yes	22 (39.3)	34 (60.7)	0.456	0.26 – 0.81	0.007
No	196 (58.7)	138 (41.3)			

Arterial hypertension is known to have a negative effect on Activities of Daily Living (ADL) (Canavan et al., 2015). In this regard, we analyzed the relationships between blood pressure control and ADL (Table 6). The main ADL parameters that we took into account: shower, self-changing, toilet, hiking, walking, and eating.

The relationship between blood pressure control and instrumental activities (Instrumental Activities of Daily Living (IADL)) is also important (Qian and Ren, 2016).

We analyzed such parameters as using the phone, shopping, cooking, cleaning, washing, traveling by car, self-medication, financial management taking into account blood pressure control (Table 7). The data in the table indicate that there is a high interdependence between IADL and blood pressure control.

**Table 6.** The relationship between blood pressure control and limitation of Activities of Daily Living (ADL) in elderly Vietnamese patients.

ADL restriction	Blood pressure control		OR	95% CI	P
	Yes (%)	No (%)			
Yes	14.3	85.7			
No	56.7	43.3	0.127	0.06-0.25	0.025

**Table 7.** The relationship between blood pressure control and Instrumental Activities of Daily Living (IADL) data in elderly Vietnamese patients.

IADL	Blood pressure control		OR	95% CI	P
	Yes (n,%)	No (n, %)			
Yes	23 (30.7)	52 (69.3)			
No	195 (61.9)	120 (38.1)	0.27	0.16 – 0.47	< 0.001

A special place in increasing the risk of mortality in hypertension is occupied by chronic diseases (Kitaoka et al., 2016). We have analyzed the relationship between blood pressure control and chronic diseases (Table 8).

**Table 8.** The relationship between blood pressure control and chronic diseases in elderly Vietnamese patients.

Chronic diseases		Blood pressure control		OR	95% CI	P
		Yes (%)	No (%)			
Dyslipidemia	Yes	53.3	46.7	0.534	0.307 – 0.927	0.024
	No	68.1	31.9			
Diabetes	Yes	37.2	62.8	0.293	0.191 – 0.45	< 0.001
	No	66.9	33.1			
Chronic kidney disease	Yes	32.9	67.1	0.307	0.181 – 0.522	< 0.001
	No	61.5	38.5			
Chronic joint disease	Yes	56.5	43.5	1.059	0.707 – 1.586	0.781
	No	55.1	44.9			
Digestive diseases	Yes	54	46	0.897	0.578 – 1.392	0.627
	No	56.7	43.3			
Respiratory disease	Yes	48.8	51.2	0.696	0.427 – 1.134	0.144
	No	57.8	42.2			
Cardiovascular disease	Yes	55.3	44.7	0.957	0.641 – 1.429	0.829
	No	56.4	43.6			
Cerebrovascular disease	Yes	36.2	63.8	0.389	0.218 – 0.694	0.001
	No	59.3	40.7			

As can be seen from the data presented, the greatest risk is dyslipidemia, diabetes mellitus, CKD, and cardiovascular pathologies.

Another important factor that needs to be controlled is the simultaneous administration of several drugs (Leeman et al., 2018). In our study, 284 people (72.8%) used combination drug therapy. The results obtained in our study indicate the presence of a significant relationship between these factors (Table 9).

**Table 9.** The relationship between blood pressure control and use of multiple drugs in elderly Vietnamese patients.

Multiple drugs	Blood pressure control		OR	95% CI	P
	Yes (%)	No (%)			
Yes	51.8	48.2	0.529	0.332 – 0.844	0.007
No	67.0	53.0			

In the final stage of the study, we conducted a multivariate analysis to search for associations between blood pressure control and various factors (Table 10).

**Table 10.** Multivariate analysis of the relationship of blood pressure control with various factors in elderly Vietnamese patients.

Factors	OR	95% CI	P
ADL/IADL	0.36	0.20 – 0.66	0.001
Dyslipidemia	0.69	0.38 – 1.26	0.224
Diabetes	0.34	0.21 – 0.54	< 0.001
Chronic kidney disease	0.45	0.25 – 0.80	0.007
Cerebrovascular disease	0.63	0.33 – 1.20	0.157
Multiple drugs	0.89	0.53 - 1.48	0.643

OR = odd ratio; CI = confidence interval. P = P value.

The greatest dependence was shown by such factors as ADL/IADL, diabetes, and CKD.

## DISCUSSION

The goal of treating hypertension is not just a reduction in blood pressure, but the prevention of cardiovascular events such as heart attack and stroke. From this point of view, the early diagnosis and treatment of hypertension are of particular importance, especially in patients with a high risk of these pathologies (Whelton et al., 2018). Data from cohort studies show that the relationship between blood pressure and cardiovascular disease is more pronounced in the Asian population than in the European population, Asians have a higher sensitivity to salt intake, compared with the western population. Probably, genetically, Asians have factors that increase the body's sensitivity to salt intake. For example, the Japanese are more prone to the development of prehypertension and hypertension even with a slight increase in body mass index (Kario et al., 2018). In this regard, early and tight control of blood pressure within 24 hours is considered as one of the main methods of protecting target organs and preventing cardiovascular diseases for natives of the Asian region (Nakagawa and Hasebe, 2019).

It is important to control blood pressure in diabetes patients. Intensive treatment of hypertension if diabetes mellitus is present significantly reduces the incidence of myocardial infarction, stroke, acute coronary syndromes, heart failure, and mortality from cardiovascular diseases (HR = 0.83; 0.74–0.92 95% CI;  $P < 0.001$ ) (Aggarwal et al., 2018). Currently, available data leaves no doubt that an effective reduction in blood pressure prevents cardiovascular complications in type 2 diabetes, regardless of the drugs used. In a meta-analysis that included 40 studies involving 100,354 people, it was shown that with each decrease in SBP by 10 mm Hg the risk of mortality is reduced by 13%, the risk of cardiovascular events by 11%, the risk of developing coronary heart disease by 12% and the risk of stroke by 27% (Emdin et al., 2015).

Patients with hypertension and diabetes are at increased risk of developing microvascular diseases such as microalbuminuria or diabetic retinopathy (Do et al. 2015). A stable decrease in blood pressure in diabetes reduces not only the risk of cardiovascular pathologies, but also microvascular lesions, however, long-term benefits can be achieved only with strict antihypertensive drug therapy throughout life (Kintscher, 2015).

There is strong evidence that a decrease in blood pressure targeted indicators when non-diabetic CKD is present leads to a decrease in heart failure and mortality. Similar data exist for patients with diabetes and CKD to reduce the risk of stroke (Ruzicka and Hiremath, 2017).

OH occurs when the compensatory mechanisms of the autonomic nervous system, providing a normal transition from a prone position to an upright position, are insufficient. The most common hallmark is a decrease in SBP  $\geq 20$  mm Hg or DBP  $\geq 10$  mmHg within 3 min after getting up. Risk factors associated with hypertension include older age, hypertension, antihypertensive drugs, and diabetes, and hypertension can lead to postural instability, fall, and fainting, an increased risk of stroke, coronary events, and general mortality (Fleg et al., 2016). In this regard, the control of blood pressure in diabetes combined with OH is of particular importance.

## CONCLUSIONS

We found associations between blood pressure control and orthostatic hypotension, activities of daily living, instrumental activities of daily living, dyslipidemia, diabetes mellitus, chronic kidney disease, cardiovascular pathologies, and combined drug therapy in elderly Vietnamese patients.

Blood pressure control is important to reduce the risk of complications of cardiovascular disease and mortality. However, its share in domestic health care today does not exceed 55.9%.

Various factors affect the control of blood pressure, such as hypotension, functional status, existing chronic diseases, and medication. It seems appropriate to increase control over blood pressure, especially in patients with concomitant diseases, such as diabetes mellitus and chronic kidney disease. The results of the study provide evidence to improve the proportion of blood pressure target indicators in a hospital setting, as well as limiting future complications of hypertension. The data obtained are important for improving health policies in the prevention of complications of arterial hypertension and reducing cardiovascular disease in Vietnam.



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## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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