

## Assessment of presentation of blood pressure control in the elderly with increased blood pressure

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### Abstract

To date, the only study to evaluate blood pressure control in Vietnam in accordance with 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%. In this regard, we conducted this research project in order to find out the proportion of blood pressure control in accordance with the new recommendations in the Army Hospital in Ho Chi Minh City. The purpose of the study is to determine the level of blood pressure control in connection with the recommendation of JNC 8 in elderly people with arterial hypertension. Assessing the proportion of orthostatic hypotension in elderly people with arterial hypertension, studying the relationship between blood pressure control and orthostatic hypotension. The study of the relationship between blood pressure control and functional status, combined chronic diseases, multiplied diseases, and medication. This is a descriptive cross-sectional study using multivariate analysis. The subject of the study are patients with arterial hypertension older than 60 years who undergo 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. Research results showed the presence of statistically 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 multiplied drug therapy (OR = 0.529, 0.332-0.844 95% CI, p < 0.007). Moreover, the greatest dependence was revealed when comparing with ADL/IADL, diabetes and CKD. It seems appropriate to increase tight control over blood pressure, especially 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 (BP) is one of the main risk factors for mortality worldwide while 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 in the primary prevention of stroke. At the same time, in elderly people with arterial hypertension, systolic blood pressure (SBP) can be considered as a marker of an increased risk of stroke (Yannoutsos et al., 2017).

Systolic hypertension, especially isolated (ISH), is very 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). According to the JNC 8 Blood Pressure Guideline, 60 years of age or older, it is recommended that you start drug therapy to lower your SBP to 150 mm Hg and diastolic blood pressure (DBP)  $\geq 90$  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 A. and Grossman E., 2017).

A number of studies indicate that timely monitoring provides a steady decrease in blood pressure and a decrease in the frequency 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 are:

1. Determining the level of blood pressure control in connection with the recommendations of JNC 8 in elderly people with arterial hypertension.
2. Determining the proportion of orthostatic hypotension (OH) in the elderly with arterial hypertension, studying the relationship between blood pressure and OH control.
3. Study of the relationship between blood pressure control and functional status, concomitant chronic diseases, multiple diseases, and medication intake.

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## MATERIAL AND METHODS

This is 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 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

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

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Blood pressure was measured in a standard manner 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 minutes. 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  $P < 0.05$ .

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## RESULTS

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

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Table 2. Assessment of blood pressure control 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

The number of patients exercising tight control of blood pressure was 43 people, of which 37 people had SBP <120 mm Hg and 6 persons 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 3. The proportion of orthostatic hypotension

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 the studied sample

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

Orthostatic hypotension	Blood pressure control	OR	95% CI	P
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	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.

Table 6. The relationship between blood pressure control and limitation of ADL

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

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 7. The relationship between blood pressure control and IADL restriction

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

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

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Table 8. The relationship between blood pressure control and chronic diseases

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			

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

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

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Table 9. The relationship between blood pressure control and multiple drugs

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			

At the final stage of the study, we conducted a multivariate analysis to search for associations between blood pressure control and various factors (Table10).

Table 10. Multivariate analysis of the relationship of blood pressure control with various factors

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

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 very important to control blood pressure in diabetes. 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).

197 Patients with hypertension and diabetes are at increased risk of developing  
198 microvascular diseases such as microalbuminuria or diabetic retinopathy (Do et al.  
199 2015). A stable decrease in blood pressure in diabetes reduces not only the risk of  
200 cardiovascular pathologies, but also microvascular lesions, however, long- term  
201 benefits can be achieved only with strict antihypertensive drug therapy throughout life  
202 (Kintscher,2015).

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

207 OH occurs when the compensatory mechanisms of the autonomic nervous  
208 system, providing a normal transition from a prone position to an upright position, are  
209 insufficient. The most common hallmark is a decrease in SBP  $\geq 20$  mm Hg or DBP  $\geq$   
210 10 mmHg within 3 minutes after getting up. Risk factors associated with hypertension  
211 include older age, hypertension, antihypertensive drugs, and diabetes, and  
212 hypertension can lead to postural instability, fall, and fainting, an increased risk of  
213 stroke, coronary events, and general mortality (Fleg et al., 2016). In this regard, the  
214 control of blood pressure in diabetes combined with OH is of particular importance.

## 215 216 **CONCLUSION**

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218 The results indicate the presence of strictly defined associations between blood  
219 pressure control and orthostatic hypotension, activities of daily living, instrumental  
220 activities of daily living, dyslipidemia, diabetes mellitus, chronic kidney disease,  
221 cardiovascular pathologies, and combined drug therapy in the Vietnamese population.

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

225 A number of factors affect the control of blood pressure, such as the presence of  
226 hypotension, functional status, existing chronic diseases, and medication intake. It  
227 seems appropriate to increase tight control over blood pressure, especially with  
228 concomitant diseases such as diabetes mellitus and chronic kidney disease. The results  
229 of the study provide an opportunity to improve the proportion of blood pressure target

231 indicators in a hospital setting, as well as limiting future complications of  
 232 hypertension. The data obtained are important for improving health policy in the  
 233 prevention of complications of arterial hypertension and reducing cardiovascular  
 234 disease in Vietnam.

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## 236 **ACKNOWLEDGEMENTS**

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238 The authors are grateful to 175 Military Hospital for the material support.

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## 240 **CONFLICTS OF INTEREST**

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242 The authors declare no conflict of interest.

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