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Prevalence of hypertension in adults in the Šumadija District, Serbia – A cross-sectional study

Prevalencija hipertenzije kod odraslih u Šumadiji – unakrsno istraživanje

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Abstract

Background/Aim. World Health Organization (WHO) studies on the global level have shown that one of the major problems of the public health is hypertension. Blood pressure level greater than 140/90 mmHg is directly and predictively linked to other cardiovascular diseases. The aim of this research was to determine the prevalence of hypertension and the risk groups among the adult population in the Šumadija District, Serbia. **Methods.** This cross-sectional study included 1.669 elderly population of the Šumadija District, aged 25–74. The study was performed according to the protocol of the Countrywide Integrated Noncommunicable Disease Intervention (CINDI) international program. **Results.** In the Šumadija District more than a half of the population aged 25–74 suffers from hypertension (53%). In the Šumadija District 9% of population has undiagnosed hypertension. In the group of people familiar with their high blood pressure problems, good disease control is achieved in only 46% of them. Statistically, hypertension occurs more frequently in males aged 45–74, of lower education, and in rural population. This is the target group for implementation of the high risk strategy. Statistically, there is a higher prevalence of hypertension in people suffering from myocardial infarction ($p = 0.04$), angina pectoris ($p = 0.00$), other cardiac diseases (cardiac insufficiency) ($p = 0.00$) and cerebrovascular crises ($p = 0.04$). **Conclusion.** A continuous increase of patients with hypertension, coupled with the developed complications and increase in cardiovascular diseases as a cause of death, points to the lack of effective access to prevention and early detection of these diseases in the primary health care among the risk groups in Šumadija.

Key words:
hypertension; serbia; prevalence; incidence; risk factors.

Apstrakt

Uvod/Cilj. Istraživanja Svetske zdravstvene organizacije na globalnom nivou pokazala su da je hipertenzija jedan od najvećih problema narodnog zdravlja. Visina krvnog pritiska iznad 140/90 mmHg direktno ukazuje na povezanost sa drugim kardiovaskularnim bolestima (KVD). Bolesti srca i krvnih sudova u Srbiji u 2006. godini su u strukturi mortaliteta činile više od polovine svih smrtnih ishoda. Cilj ovog istraživanja bio je da se utvrdi prevalencija hipertenzije, kao i rizične grupe kod odraslih stanovnika Šumadije. **Metode.** Ova studija preseka obuhvatala je reprezentativni uzorak od 1 669 odraslih u Šumadiji, starosti 25–74 godine, koji je formiran u skladu sa protokolom međunarodnog programa *Countrywide Integrated Noncommunicable Diseases Intervention* (CINDI). **Rezultati.** U Šumadiji više od polovine stanovništva (53%), starosti 25–74 godine ima hipertenziju. Novootkrivenu hipertenziju ima 9% stanovnika Šumadijskog okruga. U grupi osoba koje su znale da imaju povišen krvni pritisak dobra kontrola bolesti postignuta je samo kod 46%. Hipertenzija se statistički češće javljala kod ispitanika muškog pola, starosti 45–74 godine, kod ispitanika nižeg obrazovanja i seoskog stanovništva. Ovo su ciljne grupe za primenu strategije visokog rizika. Postoji statistički značajno veća učestalost hipertenzije kod osoba koje boluju od infarkta miokarda ($p = 0,04$), angine pektoris ($p = 0,00$), drugih bolesti srca (srčana insuficijencija) ($p = 0,00$) i cerebrovaskularnih kriza ($p = 0,04$). **Zaključak.** Neprekidan porast obolevanja od hipertenzije, skopčano s razvojem komplikacija i porastom udela kardiovaskularnih bolesti u strukturi uzroka smrti, ukazuje na nedovoljno efikasan pristup prevenciji i njihovom ranom otkrivanju na nivou primarne zdravstvene zaštite kod rizične grupe u Šumadiji.

Ključne reči:
hipertenzija; srbija; prevalenca; incidenca; faktori rizika.

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Introduction

The epidemic of cardiovascular diseases (CVDs) in the world marked the 20th century with a clear tendency to keep the trend of increasing prevalence in many countries as well as in the 21st century. The increasing prevalence of CVD, primarily linked to aging population, and the population in Serbia is among the oldest in Europe [1, 2].

In the world, according to the World Health Organization (WHO), in 2006 from heart and vascular diseases died 17.5 million people, accounting for 30% of all deaths. In European countries, in the same year there were 5.1 million deaths, representing 52% of all deaths [3]. Deaths from heart and blood vessels diseases in Serbia in 2006 were more than half of all deaths (57.3%). The standardized heart and vascular mortality rate diseases in Serbia in 2006 was 567.0 deaths *per* 100,000 population (in Central Serbia, 544.2). Compared to the average mortality rate in Europe of 479.4 *per* 100,000 population, Serbia was in that year in a group of countries with a high risk of daying from cardiovascular diseases [4, 5].

Hypertension is a major risk of damaging blood vessels and consequent organ damage, especially heart, kidney and brain [6]. Studies on risks of mortality and morbidity, conducted by the WHO at the global level, have shown that hypertension is one of the biggest public health problems. It is shown that this disease is a higher risk factor of all the identified factors, such as consumption of tobacco smoke, hypercholesterolemia and obesity, even in developing countries [7, 9]. Hypertension is attributed to 9.7% of total years of life lost (YLL) due to premature death for males and 13.3% for women [10].

Hypertension is defined as the value of blood pressure which causes a higher risk of adverse consequences in the form of organ damage. That results in the increased cost of treatment of hypertension [6]. According to the definition of hypertension, based on criteria adopted by consensus JNC 7 (Joint Committee on Detection, Evaluation and Treatmant of High Blood Pressure) [11], hypertension is a permanent increase in arterial blood pressure to the values above 140 mmHg in systole and 90 mmHg in diastole. Elevation of blood pressure above 140/90 mmHg [11, 12] is a continuous, gradual, consistent, independent and directly predictive, associated with apoplexy, coronary artery disease, chronic renal disease progression [13, 14], thus with that value of blood pressure it is necessary to start treatment urgently for all applicable protocols [11].

The aim of this study was to determine the prevalence of hypertension in the population of adults in the Šumadija District, Serbia, and risk groups for the diseases such as hypertension and its association with other cardiovascular diseases.

Methods

This research was a part of the project "Capacity building of primary health care for the primary prevention of chronic disease-development model" implemented at the Institute of Public Health, Kragujevac, in 2011. Epidemiological studies in a type-sectional study was conducted on a representative sample of the Šumadija District population, aged 25–74 years. The study was conducted in 7 municipalities of Šumadija: Kragujevac, Aranđelovac, Topola, Rača, Lapovo, Batočina and Knić. The study of each municipality included the number of patients proportional to the number of inhabitants *per* municipality in Šumadija, aged 25–74 years. The sample consisted of 1,850 respondents, but 181 subjects were excluded from the study. Exclusion criteria were: incomplete survey data relevant to this research and irregular blood pressure. The sample was divided, by the age of respondents, into 5 groups: 25–34, 35–44, 45–54, 55–64, 65–74. Within these defined groups, the same number of males and females was randomly included according to the list received from the Serbian Ministry of Internal Affairs. The final sample consisted of 1,669 respondents, 50.8% males and 49.2% females.

The investigation protocol was developed in accordance with the protocol of the international Countrywide Integrated Noncommunicable Diseases Intervention (CINDI) program [15]. The data surveyed were collected, systemic examination of subjects, other anthropometric measurements and laboratory analyzes were performed.

The survey respondents were conducted by the physicians (respondents in the households or in the office of the Health Center), "face to face." A systematic review of the subjects was done by the physician at the Health Center. Blood pressure was measured during systematic examination 3 times at 1-minute intervals. Blood pressure elevation was obtained as the mean value of systolic and diastolic blood pressures of the second and third measurements.

We defined 4 categories of hypertension as follows: no hypertension, newly identified, controlled and uncontrolled hypertension, based on the values of blood pressure measured at examination by a physician, and on the answers given by the examinees to 2 questions: 1) Did a doctor or other health worker tell you that you have high blood pressure during last year (12 months)?, and 2) Do you regularly take drugs that your doctor has prescribed you to lower blood pressure?

Based on measurement data and the answers to these questions they were classified into 4 subgroups: no hypertension (doctor found no hypertension, it was under control amounting to < 140/90 mmHg; newly identified hypertension (≥ 140/90 mmHg); controlled hypertension (< 140/90 mmHg); uncontrolled hypertension (≥ 140/90 mmHg).

According to the analysis of associated diseases and conditions the subjects were classified into 2 categories: no hypertension; yes hypertension (uncontrolled hypertension).

The study was conducted in accordance with the ethical standards of the Declaration of Helsinki 1975, revised in 1983. The study was approved by the Ethics Committee of the Institute of Public Health in Kragujevac, and each respondent was familiar with the aims and methods of the study, and in connection with the information sheet and signed consent to participate in the survey.

For statistical analysis we used SPSS Kall and software packages. For examination of dependence of categorical

variables the χ^2 test used. Hypertension was considered dependent, all other variables were independent.

Results

At the time of the study we measured high blood pressure in 32.4% of the representative sample. Another 20.1% of them knew to have hypertension but and regularly took medication, which and their blood pressure was normal at the time of blood pressure testing.

The results of measurements at the time of study were classified on the basis of the ESH/ ESC 2007 (ESH – European Society of Hypertension, ESC – European Society of Cardiology) [12]. The majority of people with hypertension had mild hypertension, 22.3% (grade I). High-normal pressure (130/85 to 139/89 mmHg) had 17.7% of the population. Moderate hypertension (grade II) was established in 7.9%, and severe (grade III) in 2.2% of respondents. Blood pressure > 160/100 mmHg had as many as 10% of the Šumadija population (Figure 1).

In Šumadija more than half of the population aged 25–74 had hypertension. One out of 5 people with hypertension did not previously know to have this disease. This study also found that 9% of the Šumadija population had a newly discovered hypertension (incidence). In addition, good disease control was achieved in 46% of people be awaring to have high blood pressure, and the disease was not well controlled in more than half of cases previously diagnosed with hypertension (Figure 2).

The categories of hypertension in relation to socioeconomic characteristics are shown in Table 1.

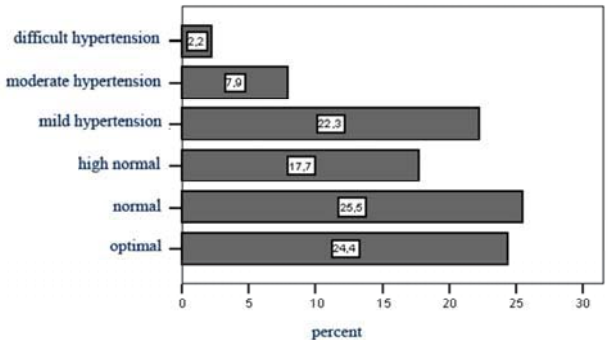

Fig. 1 – Frequency of blood pressure values in the classified groups (ESH/ESC 2007) in the Šumadija District, Serbia, during the research.

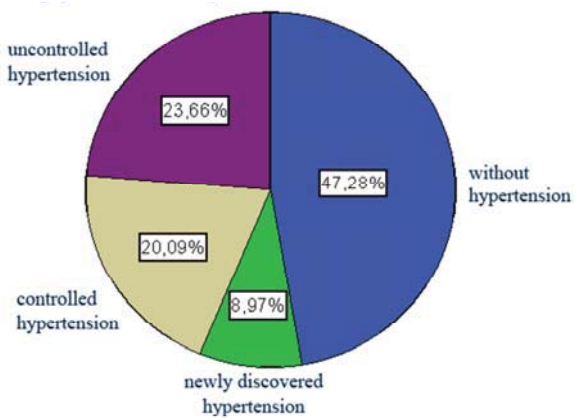

Fig. 2 – Prevalence of hypertension subgrups among the population of the Šumadija District, Serbia.

Table 1

Categories of hypertension in relation to some sociodemographic characteristics

Characteristics of populations (n = 1669)	Hypertension (% of patients)			
	no	controlled	uncontrolled	newly discovered
Patients	47.3	20.1	23.6	9.0
Sex				
male	44.2	19.1	25.2	11.5*
female	50.4	21.0	22.1	6.5*
Age groups, (years)				
25–34	80.8**	6.9**	7.0**	5.3*
35–44	67.4**	10.5**	11.1**	11.0
45–54	45.1	23.6	20.9	10.4
55–64	24.1**	31.9**	34.7**	9.3
65–74	15.0**	27.1*	49.3**	8.6
Education				
primary	27.4**	22.1	41.1**	9.2
secondary	50.6	21.1	19.1**	9.3
high	60.3**	15.2*	16.6**	7.9
The percentage of income for food	43.1	22.0	28.1	6.8
< 30	49.6	19.0	21.6	9.8
31–50	44.5	21.2	25.1	9.2
51–70	49.6	20.1	23.6	6.7
> 71				
Type of settlement				
city	52.2	21.7	18.8**	7.3
suburb	45.4	20.9	26.1	7.6
village	42.1	17.5	28.4*	12.0*

Values given as percentages of the hypertension variables by the category within the examined sociodemographic characteristics, and expressed as percentages of sequence (the sum of the percent in the line is 100%); n = total number of patients; *$p < 0.05$; **$p < 0.01$.

The males were more likely to suffer from hypertension than the females (55% *vs* 50%), and there were no significant intergroup differences among categories with respect to sex ($p = 0.000$). A significant deviation from the average was in the population of newly discovered hypertension (9.0%) by sex, $p < 0.05$, while women had a lower frequency (6.6%), and men had a higher incidence of newly detected hypertension (11.5%). The males were more likely to have uncontrolled hypertension (25.2%) than the females (22.1%), but with no statistical significance compared to the average frequency.

Hypertension is a disease of the elderly and its incidence increases in proportion to age. In the age groups 55–64 and 65–74 the incidence of hypertension was 76–85%. It was significant that in the age group 45–54 the percentage of people with hypertension exceeded 50%. Also, one out of 5 people aged 25–34, and one out of 3 people aged 35 to 44 years had hypertension. Analysis of categories of hypertension by age groups showed the expected results, namely statistically significantly higher incidence of controlled and uncontrolled hypertension in people older than 55 years. The incidence of uncontrolled hypertension was highest among the oldest respondents, 65–74 (49.3%). Surprisingly, a high prevalence of newly detected hypertension was in the age group 35–44 (11.0%), and 45–54 (10.4%), showing that every 10th person in these age groups did not know to have hypertension.

No significant incidence of hypertension was found in relation to the socioeconomic status of the respondents ($p = 0.40$).

Hypertension was more common in people living in rural areas compared to the suburbs and the cities (58% *vs* 55% of village *vs* suburban city 48% $p = 0.00$). The incidence of uncontrolled (28.4%) and newly discovered (12.0%) hypertension among residents of villages in Šumadija was significantly higher than the average frequency of these categories of hypertension in the city population ($p < 0.05$), while city dwellers had less frequent uncontrolled hypertension, 18.8% ($p = 0.01$).

The incidence of the other cardiovascular diseases, which are also complications of hypertension, is shown in Table 2.

Table 2

Cardiovascular disease (CVD) association with hypertension

Type of CDV (n = 1669)	Hypertension (% of patients)	
	without	with
All comorbidities	47.3	52.7
Myocardial infarction		
without	47	53
with	29	71
Angina pectoris		
without	48	52
with	15*	85*
Other heart related issues		
without	49	51
with	27*	73*
Stroke		
without	47	53
with	38	62
Cerebrovascular crisis		
without	47	53
with	25	75

Values in the table are given as percentages of the hypertension variables by categories of variables in the CVD, and expressed as percentages of sequence (the sum of the percent in the line is 100%); n = total number of patients; *$p < 0.01$.

There were a statistically significant intergroup differences in the incidence of myocardial infarction, angina pectoris, other heart diseases (heart failure) and cerebrovascular crises in people with hypertension.

Of all the people with heart attack, 71% had hypertension, and 73% had other heart diseases (heart failure). People with angina pectoris had hypertension in 85%, cases, which was significantly more likely than the average ($p < 0.01$). There were no significant differences in the incidence of diseases such as stroke ($p = 0.97$).

Discussion

Analysis of data on the prevalence of hypertension at the global level indicates that the increase in prevalence was expected. In 2000 the prevalence of hypertension was 26.4%; in 2010 we had the planned increase by 50% [16], and by the 2025 will be it more than 60% [7].

The first health survey conducted on a representative sample in 2000 in Central Serbia, showed hypertension in 43.3% aged 19 and over, in 2006 it was 46.0% [5]. Our results showing the incidence of hypertension of 53% in Šumadija indicate further increase in the prevalence of hypertension in this area, with an increase of 10% in 10 years, the greater increase trend than in developed countries. In the United States an increasing prevalence of 8.3% was found between studies in 1988–94 and 1999–2000 [17]. The Canadian study showed that hypertension was increased from 153.1 *per* 1,000 adults in 1995, to 244.8 *per* 1,000 adults in 2005, an increase in the relative risk of > 60% [18]. Increasing age of Serbian popula-

tion [2] is definitely one of the important factors, but can not be crucial for such a dramatic increase in the prevalence of hypertension. Education as an independent factor was associated with hypertension in several studies [19, 20]. In our study it was shown that subpopulations of lower educated persons represent a risk group for increased morbidity from hypertension, with particularly high prevalence of uncontrolled hypertension and newly discovered. People with lower education generally live in villages and in old age groups. There is evidence that communities with predominant population engaged in agriculture and lower level of education is directly associated with age and disappears as an independent factor for the onset of hypertension [21]. Although there are studies that indicate that lower socioeconomic status is associated with a higher incidence of hypertension [20], in our study it was not the case. In the studied area hypertension includes both rich and poor groups of population.

Despite improving knowledge and treatment options for controlling hypertension, the prevalence of patients with uncontrolled hypertension remains high in developed countries [22, 23]. Our research shows that with ¼ of the total population, or even 54% of the population known to have hypertension does not establish control over the height of arterial pressure, indicating the ineffectiveness of treatment. Research conducted in the United States indicated that pharmacological therapy provides control of hypertension in only 39% of patients treated in primary care, which coincides with our findings [16]. Also, many prospective studies have demonstrated the ineffectiveness of drugs in preventing complications of hypertension [24]. Medications maintenance of blood pressure < 135/85 mmHg in hypertensive individuals does not provide additional benefits in extending life and reducing heart attack, angina or heart failure [25, 26]. Unfortunately, there is a well-known problem of the influence of pharmaceutical industry at all levels of care, in Serbia and in our circumstances the problem of hypertension is solved in curative rather than preventive level. On the other hand, the development capacity of secondary health care level in the field of gerontology, and emergency services in urgent care situation in the field over the past decade were the key reasons for the comforting fact that in the Šumadija District in a 1998–2008 period revealed decline in mortality from hypertension-derived diseases (ICD 10: I10 - I15) [10].

Our results suggest that other cardiovascular diseases such as myocardial infarction, angina pectoris, heart failure and cerebrovascular stroke in ¾ patients were associated with hypertension. Literature data indicate that the absolute individual risk of developing complications of hypertension and organ damage depends not only on the amount of blood pressure, but also on other risks for cardiovascular disease and associated clinical disorders. Therefore, it is necesary to divert the struggle against hypertension from diagnosis and treatment, to programs of prevention of hypertension and its complications [6, 27].

The results indicating that 53% of population suffers from hypertension, 9% of the population do not know to have hypertension, the incidence of hypertension exceeds 50% of population already in the age group of 45–54 years, and that the incidence of other cardiovascular diseases is significantly higher in patients with hypertension, may be considered alarming. Therefore, the focus of hypertension problem solving in Šumadija is just at the primary level of care and implementation of effective intervention projects on prevention and early detection of heart and blood vessels diseases.

In Serbia there are no data on socio-economic impact of diseases such as hypertension and development of its complications. According to economic analysis of the American Heart Association (AHA) in the U.S.A. in 2006 more than 430 billion dollars was spent for the diagnosis, outpatient and inpatient care of patients with CVD, including the cost of lost work capacity [28]. It is scientifically proven that the technique of detecting and reducing risk factors is very efficient and cost-effective [15, 29].

Our research shows that the target groups for preventive action and early detection are: male sex, age of 25–44 years, persons with lower education and rural population. Prevention and early detection activities should focus precisely on these risk groups in order to investigate the risk factors, their prevention or modification, in order to prevent the start or progress of the disease and to prevent disability and premature death.

The potential for improving population health in Šumadija lies in a comprehensive strategy to prevent and control hypertension, which would also improve promoting health at population level, programs to prevent the disease actively targeted to individuals and groups at high risk, and maximum population coverage with systematic preventive reviews.

Conclusion

Hypertension is present in 53% of population and its prevalence in Šumadija increased in comparison to previous studies in Serbia, which in some way indicates the inefficiency of primary health care level. About 54% of respondents who know they have hypertension do not regulate blood pressure levels, although they take medications. We found 9% of new cases of hypertension, which indicates the quality of primary care activities in the early detection.

The prevalence of hypertension is significantly higher in males, in older age groups, in less educated people and inhabitants of rural environment, so they should be the target group for the application of the so-called high-risk strategy.

Newly discovered hypertension is more common in men, middle aged, in the countryside, and they should be a target for interventions to early detect the disease.

Using these strategies we can expected to reduce comorbidity caused by hypertension, as confirmed by the association of hypertension with myocardial infarction, angina pectoris, other heart diseases and cerebrovascular crises.

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