

Regional Differences in the Prevalence of Arterial Hypertension in Croatia

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ABSTRACT

This paper analyzes the Croatian Adult Health Survey data, collected in 2003 with a total of 9,070 respondents aged 18+. Based on an average of two measurements, respondents with the mean systolic arterial pressure ≥ 140 mmHg or mean diastolic pressure ≥ 90 mmHg were classified as hypertensive. The data for men and women were analyzed separately, according to regions. Prevalence of hypertension in men was 40.5% (95% confidence interval CI 37.9–43.01; coefficient of variability CV=3.2), women 34.9% (95% CI 33.2–36.7; CV 2.5). There were no significant differences in regional prevalence in men, except in the Northern and Eastern region. In women we did not detect any significant regional difference. Non-controlled arterial hypertension is an important public health problem in all monitored regions of Croatia. Raising awareness about the problem, early detection and encouraging the population to adhere to the therapy for elevated arterial pressure, in addition to a healthy life style, are important for successful control and harm reduction.

Key words: arterial hypertension, prevalence, Croatian Adult Health Survey, regional differences

Introduction

Arterial hypertension is considered today one of the most important preventable causes of premature death¹. Elevated blood pressure increases the probability of developing myocardial infarction, heart failure, insult and kidney disease². The public health significance of hypertension is the result of the finding that hypertension is an independent risk factor for cardiovascular diseases³. The risk grows continually as the blood pressure surpasses the values considered normal². For an individual aged 40–70 any increase in systolic blood pressure by 20 mmHg, or in diastolic pressure by 10 mmHg doubles the risk of developing cardiovascular diseases⁴.

Arterial hypertension significantly contributes to the population's burden of disease. According to the WHO, hypertension, according to its contribution to burden of disease, ranked first in 2000 with a 12.8% share in overall disability causes expressed in DALYs (Disability Adjusted Life Years)⁵. According to the same estimations of contributing to burden of disease for the Croatian population, hypertension ranked second, immediately after smoking, with a 13.8% share in overall DALYs⁶.

Estimated hypertension prevalence of the global population over 20 years of age in 2000 counted 26.4% (1 billion inhabitants); 26.6% for men, 26.1% for women⁷.

In developed countries of the world, in 2000 male prevalence registered 37.4%, female 37.2%⁷. One should mention here that the registered rates of arterial hypertension in America (20.3%) and Canada (21.4%) were lower than those of certain European countries, such as Sweden (38.4%), Italy (37.7%), England (29.6%), Spain (40%) and Germany (55.3%)⁸. The countries of former socialist economy in 2000 registered a male prevalence of 35.3%, female 39.1%⁷.

The projections for 2025 suggest a rise in hypertension prevalence to 29.2% of the global population (1.56 billion), both for men and women⁷.

Data on arterial hypertension in Croatia is available via several studies. According to an early study (1969–1972) on a sample of 1 543 respondents aged 35–54, a prevalence of 16.7% was registered for diastolic hypertension (criterion: diastolic pressure ≥ 95 mmHg)⁹. A study con-

ducted between 1995 and 1997 on 5840 respondents registered a prevalence of arterial hypertension of 31.9% for men, 23.6% for women, at the ages 18–64, (criterion: systolic pressure ≥ 140 or diastolic ≥ 90)¹⁰. A study on 1222 respondents over 18 was chosen based on randomization lists of GP insurants, age-adjusted arterial hypertension prevalence had a 35.5% share for men, 39.7% for women (criteria: therapy administration or systolic pressure ≥ 140 or diastolic pressure ≥ 90)¹¹. The studies conducted in 2003 based on the *Croatian Health Survey* (»Hrvatska zdravstvena anketa«) noted arterial hypertension prevalence of 45.6% for men, 43% for women (criteria: therapy administration or systolic pressure ≥ 140 , or diastolic pressure ≥ 90)^{12,13}.

Based on the same data, with stricter pressure criteria (systolic pressure ≥ 135 mmHg or diastolic pressure ≥ 85 mmHg), the prevalence rate surpassed 50% in all monitored regions for men, 44% for women¹⁴.

Regardless of the methodological differences in the above studies, the results have shown an increase in the arterial hypertension prevalence in Croatia, similarly as in other countries of the world.

Studying the characteristics of arterial hypertension and related risk factors in the population is a precondition for planning preventive programs based on evidence which can be used to prevent hypertension consequences^{15–17}. Investigating regional differences may produce valuable indicators for planning targeted prevention programs, as well as evaluate their success^{18–19}.

Regional differences in arterial hypertension have already been studied based on the data collected in the *Croatian Health Survey*^{12–14}. This paper will examine the regional distribution of the prevalence of non-controlled arterial hypertension in men and women with somewhat differently defined regions in Croatia.

Materials and Methods

The paper analyzes the data collected in the *Croatian Health Survey* project of the Ministry of Health and Social Welfare, No. 108-1080135-0264, conducted in 2003 on the stratified random sample of Croatian inhabitants 18 or older. The methodology of the *Croatian Health Survey*, as a tool for monitoring risk factors for cardiovascular diseases, was described in a special paper in the latest issue of the journal²⁰.

Answers and measurements were collected for 9 070 respondents (2 890 men and 6 180 women). Response was 84.3%.

Data was collected by visiting nurses through a structured questionnaire, which, among other things, included anthropometric measurements (height, weight, waist circumference, blood pressure), questions on diseases and taking medication, everyday habits and blood pressure measurements. Arterial pressure was measured by a calibrated mercury sphygmomanometer, which uses a standard cuff. Measurements were done in respondents' homes, in a sitting position. Values were read twice in

intervals of 20 minutes or longer and used to compute the average for every respondent.

The criteria for including respondents in the group of non-controlled elevated blood pressure were measured mean systolic pressure ≥ 140 mmHg and/or mean diastolic pressure ≥ 90 mmHg.

The paper shows analytic results expressed in percentages of the prevalence of non-controlled arterial hypertension, their 95% confidence intervals (further on referred to as 95%CI) and coefficients of variability (further on CV). The recommended acceptable CV level ranges between 0.0 and 16.5, while careful examination is advised with values 16.6–33.3. The variability of results with CV ≥ 33.3 is unacceptable, and no subsequent conclusions concerning the entire population may be made²¹.

Data processing was performed by the SPSS statistical package²². The bootstrap re-sampling method was used to compute standard deviations²¹.

Results

According to the study results, Croatian inhabitants aged 18 and older have shown a prevalence of non-controlled arterial hypertension of 40.5% (95%CI= 37.9–43.01) for men and 34.9% (95%CI=33.2–36.7) for women.

The prevalence of non-controlled arterial hypertension in monitored regions is higher in men than in women, with the exception of the Eastern region where women manifested higher values (Table 1). The registered differences in the prevalence in the Eastern, Central and Highland Croatia have no significance as the related 95%CI in men and women overlap, unlike the substantial differences in the Northern and Adriatic regions, and the City of Zagreb, where the related 95%CI do not overlap.

The highest male prevalence level of 47.06% (95%CI= 41.45–52.67) was registered in the Northern region, the lowest, 33.23% (95%CI= 28.42–38.04), in the Eastern region (Table 1). The above high male prevalence in the Highland region should be studied with a grain of salt, given the associated wide range of 95% CI and the high CV. 95%CI values overlap in the majority of monitored regions. A significant difference in the prevalence and related 95%CI was registered only in the Northern and Eastern regions. In the male group no clear gradient is visible in the distribution of the arterial hypertension prevalence among the monitored regions (Figure 1).

In the female group, the highest prevalence of 42.33% (95%CI= 28.06–56.59) was registered in the Highland Croatia. However, given the associated wide range of 95%CI and the high CV, this result should be taken with caution (Table 1).

The next region, according to the height of the arterial hypertension prevalence, is the Eastern region, with a record of 39.81% (95%CI= 33.88–45.73) women with non-controlled arterial hypertension. The lowest number of women with non-controlled arterial hypertension was

TABLE 1
PREVALENCE OF NON-CONTROLLED ARTERIAL HYPERTENSION IN POPULATION 18+ YEARS OLD BY SEX IN CROATIA

Region	Male		Female	
	Prevalence (%)	95%CI	Prevalence (%)	95%CI
Eastern	33.23	28.42–38.04	39.81	33.88–45.73
Northern	47.06	41.45–52.67	32.47	28.36–36.58
Central	40.60	35.76–45.44	36.98	33.26–40.70
Zagreb	41.92	35.96–47.87	30.91	27.10–34.72
Mountainous	44.41	27.08–61.74*	42.33	28.06–56.59*
Coastal	41.98	36.05–47.91	32.61	30.60–34.63
Croatia	40.50	37.90–43.01	34.99	33.20–36.70

*coefficient of variability between 16.6 and 33.3%
95% CI – 95% confidence interval

registered in the City of Zagreb, namely 30.91% (95% CI= 27.10–34.72). Given the overlapping of 95% CIs among the monitored regions, it may be ascertained that there are no significant differences in the prevalence of non-controlled arterial hypertension in the women from monitored regions.

The female group has not produced a clear gradient in the prevalence of arterial hypertension in between the monitored regions (Figure 2).

Discussion

Differences in the prevalence of arterial hypertension are found in certain countries and regions, as a consequence of different demographic and social factors and life style of the population. Estimations suggest a higher prevalence in Europe and North and South America than on other continents⁷. Differences are noticeable between

certain groups of countries grouped with a similar economic status. For example, the prevalence in the USA and Canada is lower than in developed European countries⁸. There are also differences among European countries. The Mediterranean Greece has noticeably lower prevalence in comparison with the continental Germany, which registers higher values. On the other hand, Mediterranean countries, such as Italy and Spain register prevalence rates similar to that of Sweden⁷.

Regional differences were also studied within given countries. German studies, thus, proved a higher prevalence in the northern regions than southern, but also, paradoxically enough, almost identical hypertension management quality within monitored regions¹⁹. China's experience has shown a higher prevalence in the northern regions, but also a disappearance of previous differences between urban and rural regions, which is ascribed to prevalence growth in the latter¹⁸.



Fig. 1. Prevalence of non-controlled arterial hypertension in 18+ years old men by regions of Croatia.



Fig. 2. Prevalence of non-controlled arterial hypertension in 18+ years old women by regions of Croatia.

Croatia is a Mediterranean country and can expect differences in the prevalence of arterial hypertension between the north and the south. The research conducted between 1995 and 1997 showed a significantly lower prevalence in the Mediterranean region of Rijeka and the continental region of Osijek than in the continental Zagreb and the Mediterranean Splita¹⁰. The results of the *Epidemiology of Hypertension in Croatia* (EHUH) study have yielded a lower prevalence in the Mediterranean regions of Istria and the Croatian coast, and higher levels in the continental north-west region¹¹. The data collected through the *Croatian Health Survey* was used for several studies which also analyzed regional differences in arterial hypertension^{12–14}. Not all research, regardless of the applied criteria for inclusion into the hypertensive group, produced a clear gradient between the Mediterranean and the continental Croatia.

The results of this study, which, unlike previous ones, separated the southern Mediterranean and the continental highlands, could not prove significant differences in the regional distribution of non-controlled arterial hypertension in Croatian men and women. The only significant difference was found between two continental regions, the North and the East, in a group of men. However, without further research into demographic, social

and risk factors of the same population groups, the above differences cannot be interpreted.

Some of the limitations of this study which could have affected the presented results were a low number of blood pressure readings and using a standard cuff with all respondents, regardless of their weight. The white coat effect, caused by being in a doctor's office or clinic, or by being in the presence of a physician, was avoided by measurements done in respondents' homes by a visiting nurse.

This study too has confirmed that arterial hypertension is an important public health problem in all regions of Croatia. Raising awareness about the problem, early detection and encouraging the population to adhere to the therapy for elevated arterial blood pressure, in addition to a healthy life style, are important for successful control and harm reduction.

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ARTERIJSKA HIPERTENZIJA U HRVATSKOJ – REGIONALNE RAZLIKE

SAŽETAK

U radu su analizirani podaci iz projekta »Hrvatska zdravstvena anketa«, prikupljeni tijekom intervjua 9070 ispitanika u dobi 18+godina provedenom tijekom 2003. godine. Na osnovu prosjeka dva mjerenja ispitanici sa prosječnim sistoličkim arterijskim tlakom ≥ 140 mmHg ili prosječnim dijastoličkim tlakom ≥ 90 mmHg svrstani su u skupinu ispitanika s nereguliranim arterijskim tlakom. Odvojeno su analizirani podaci za muškarce i žene prema regijama Hrvatske. Utvrđena prevalencija za muškarce bila je 40,5% (95% interval pouzdanosti (CI)= 37,9–43,01; koeficijent varijabilnosti (CV)=3,2), a za žene 34,9% (95%CI=33,2–36,7; CV=2,5). U skupini muškaraca nisu zabilježene značajne razlike između promatranih regija osim Sjeverne i Istočne, a za njihovo pojašnjenje potrebno je provesti daljnja istraživanja. U skupini žena nisu zabilježene značajne razlike između promatranih regija. Neregulirana arterijska hipertenzija značajan je javnozdravstveni problem u svim promatranim regijama Hrvatske. Osvješčivanje problema, rano otkrivanje i poticanje stanovništva na redovitu terapiju povišenog krvnog tlaka, uz usvajanje zdravih životnih navika, važni su za postizanje njegove uspješne kontrole i ublažavanje posljedica.