FACTORS AND ESTIMATION OF RISK FOR CARDIOVASCULAR DISEASES AMONG PATIENTS IN PRIMARY HEALTH CARE IN CENTRAL SERBIA

Bojan Đokić2, Nela Đonović1,2, Bojana Tadić3, Divna Nikolić4

1Public Health Institute Kragujevac, Serbia
2Faculty of Medical Sciences, University of Kragujevac, Kragujevac, Serbia
3Health Centre “Danica i Kosta Šamanović”, Knjić, Serbia
4Health Centre, Kragujevac, Serbia

SUMMARY

Aim: Cardiovascular diseases present major cause of morbidity and mortality in the world as well as in Central Serbia. The aim of this study is to analyze the frequency of risk factors and estimate risk for the development of cardiovascular diseases.

Methods: The database was collected from health records of the Health Centre in Kragujevac. The following parameters were observed: gender and age, smoking, anthropometrical measurements and Body Mass Index, the value of systolic and diastolic blood pressure, diabetes, levels of cholesterol, and triglycerids in blood serum. The estimation of risk for developing the fatal cardiovascular disease during the period of ten years is determined according to SCORE system model. The statistical package SPSS version 18.0 was used for the statistical analysis.

Results: The study sample consisted of 1,053 people, 505 men and 548 women. 68.8% of people were overweight and obese, arterial hypertension was noted in 72.6%, and diabetes type II in 13.3% of people. 67.6% of people had a high level of total cholesterol in blood serum and 39.6% of people had a high level of triglycerids in blood serum. The metabolic syndrome was noted in 44.3%, and 3 or more risk factors for cardiovascular disease were noted in 65% of the population. We determined a significant statistic difference for age, smoking, nutritional status, dyslipidemia, and diabetes.

Conclusion: The high incidence of potentially modifiable risk factors for cardiovascular disease gives a possibility to apply prevention measures for promotion and preservation of health.

Key words: risk factors, cardiovascular disease, prevention

Address for correspondence: B. Đokić, University of Kragujevac, Faculty of Medical Sciences, Milivoja Živanovića 3/13, 34000 Kragujevac, Serbia. E-mail: bbojandj@yahoo.com

INTRODUCTION

Cardiovascular diseases present a major cause of morbidity and mortality in the world as well as in Central Serbia. It is a large public health problem because cardiovascular diseases may cause disablement. More than the third of deaths among middle aged people are caused by cardiovascular diseases (1).

According to the database of the World Health Organization, 17 million of deaths in the whole world are caused by cardiovascular diseases annually (2).

Atherosclerosis, as the main pathology process for diseases of coronary and cerebral blood vessels, is encouraged by using tobacco, unhealthy nutrition and physical inactivity, hypertension, dyslipidemia, and diabetes (3).

The primary health care insists on early identification of patients with high risk for developing cardiovascular diseases. The main reason is to preserve health by applying suitable measure on time.

This study focuses on modifiable risk factors like: hypertension, smoking, nutritional status, diabetes and increased level of cholesterol, and triglycerids in blood serum.

The aim of this research is to analyze the frequency of risk factors and to estimate the risk for the development of cardiovascular diseases in the population under study.

MATERIALS AND METHODS

This epidemiological study included patients aged 40–65 years, who had periodical medical check-ups conducted in the period between 1 March and 30 September 2013. The data were collected during this time period from medical records of the Health Centre of Kragujevac located in the city centre. The following parameters were monitored: gender, age, smoking habits, anthropometrical measures, and Body Mass Index, the value of systolic and diastolic blood pressure, diabetes, levels of cholesterol, and triglycerids in blood serum. The subjects were divided into the following age categories: 40–49 years old, 50–59 years old and more than 60 years old.

We observed the following anthropometrical parameters: body height, body weight and waist circumference. Body Mass Index (BMI) was used for estimating the degree of nutritional status. The World Health Organization suggests these parameters: ≤ 18.4 kg/m² underweight, 18.5–24.9 kg/m² normal BMI, 25–29.9 kg/m² overweight, 30–34.9 kg/m² obesity level I, 35–39.9 kg/m² obesity level II and ≥40 kg/m² massive obesity. We used the waist circumference as a parameter to identify the level of fat.

WHO recommends the following waist measures: 95–102 cm for men and 81–88 cm for women at increased risk, and the waist circumference over 102 cm for men and over 88 cm for women.
correspond to the very high risk for metabolic complications of obesity.

We monitored the following biochemical parameters: cholesterol and triglycerids, whose higher level can significantly contribute to the development of cardiovascular diseases. The guidelines of the national clinical practice suggest that a desirable total cholesterol level should be below 5.2 mmol/l, while the levels of 5.2–6.19 mmol/l and more than 6.2 mmol/l correspond to high levels and high-risk levels, respectively. The levels of triglycerids should be below 1.7 mmol/l, the levels from 1.7–2.29 mmol/l and the levels exceeding 2.30 mmol/l are considered high and very high, respectively.

We noted the records that include patients with hypertension and the levels of systolic and diastolic blood pressure with regular monthly check. According to the national clinical practice guidelines, the targeted blood pressure in treated hypertensive patients should be 140/90 mmHg, and these levels of hypertension indicated how to divide patients into two groups: the group of well regulated hypertension, and the group with the poorly regulated, with a systolic pressure is predicted above 140 mmHg and the group with the poorly regulated, with a diastolic pressure is predicted above 90 mmHg.

We made reports of the patients with the metabolic syndrome. This syndrome was determined according to the following criteria: abdominal obesity (waist circumference greater than 102 cm for men and greater than 88 cm for women), triglycerids higher than 1.7 mmol/l, HDL cholesterol lower than 1.0 mmol/l for men and lower than 1.3 mmol/l for women, blood tension higher than 130/85 mmHg, and presence of glucose intolerance. Three of the five criteria were required for diagnosis.

Individual assessments of the ten-year risk of fatal cardiovascular diseases were determined according to the Systematic Coronary Risk Evaluation system (SCORE). We noted the following facts: the low risk with a score less than 4%, the moderate risk with 4–5%, the high risk with 5–8%, and the very high risk with levels above 8%.

We used objective statistical and mathematical methods for the statistical analysis of the data, and the type of data and statistical tests followed. The database was created in the statistical package SPSS ver. 18.

**RESULTS**

This epidemiological study included 1,053 people, 505 men and 548 women in the city of Kragujevac with the average age of 55.65 ± 8.272 years. All the examinees were from the urban area of the city of Kragujevac. BMI showed the following results: 18 (1.7%) were underweight, 310 (29.4%) of normal weight, 438 (41.6%) overweight, 225 (21.4%) with the first degree obesity, 52 (4.9%) with the obesity of the second degree, and 10 (0.9%) were of massive obesity. BMI was not statistically significant between men and women (χ² = 10.699, p = 0.058). The older patients had higher prevalence of overweight and obesity: 153 (60.5%) subjects aged 40–49 years, 238 (66.7%) subjects aged 50–59 years, and 334 (75.4%) over 60 years of age. This proved to be statistically significant (χ² = 67.89, p < 0.05). There were 134 (46.4%) patients who did not suffer from hypertension, but had a normal weight, compared to 106 (24.3%) well-regulated hypertensive patients with normal BMI and only 70 (21.3%) with normal BMI among poorly regulated hypertensive patients (Table 1). The patients with overweight, obesity I, II and III also suffered more from diabetes compared to those with normal weight (χ² = 30.686, p < 0.001) (Table 1). The increased triglycerids levels (over 1.7 mmol/l) were present in up to 337 (80.6%) subjects with BMI ≥ 25 kg/m² compared to the subjects with normal nutrition – 79 (18.9%). This is statistically significant difference (χ² = 158.5, p < 0.05). The increased total of cholesterol was also significantly higher in the obese and overweight patients than in normal weight subjects (70.8% vs. 28.4%, χ² = 128.12, p < 0.05).

Central fat distribution was determined by waist size, and the results show that 317 (30.1%) subjects had normal waist circumference, in 287 (27.3%) the increased waist size was found out, and in 449 (42.6%) subjects highly increased waist circumference was associated with an increased risk of metabolic complications of obesity. There is no significant difference in the increased waist circumference in both men and women (χ² = 1.96, p ≥ 0.05). The increased waist circumference was detected in 122 (85.9%) patients with diabetes compared to only 20 (14%) diabetics with normal waist circumference (χ² = 73.26, p < 0.05).

In this sample, the prevalence of smoking was 35.9% (378). Smokers were more frequent in the category of younger patients: 40–49 years 125 (49.4%), 50–59 years 147 (41.2%) compared to

**Table 1. BMI in relation to hypertension and diabetes (N=1,053)**

<table>
<thead>
<tr>
<th>BMI (kg/m²)</th>
<th>Underweight (&lt; 18.4) N=18 (1.7%)</th>
<th>Normal (18.5–24.9) N=310 (29.4%)</th>
<th>Overweight (25–29.9) N=438 (41.6%)</th>
<th>Obesity I (30–34.9) N=225 (21.4%)</th>
<th>Obesity II (35–39.9) N=52 (4.9%)</th>
<th>Obesity III (≥ 40) N=10 (0.9%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without hypertension</td>
<td>12 (66.7%)</td>
<td>134 (43.2%)</td>
<td>91 (20.8%)</td>
<td>42 (18.7%)</td>
<td>9 (17.3%)</td>
<td>1 (10.0%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Well regulated hypertension</td>
<td>4 (22.2%)</td>
<td>106 (34.2%)</td>
<td>210 (47.9%)</td>
<td>92 (40.9%)</td>
<td>19 (36.5%)</td>
<td>5 (50.0%)</td>
<td>0.003</td>
</tr>
<tr>
<td>140–159/90–99 mmHg</td>
<td>0 (0.0%)</td>
<td>15 (4.8%)</td>
<td>28 (6.4%)</td>
<td>17 (7.8%)</td>
<td>5 (9.6%)</td>
<td>1 (10.0%)</td>
<td>0.527</td>
</tr>
<tr>
<td>160–179/100–109 mmHg</td>
<td>1 (5.6%)</td>
<td>23 (7.4%)</td>
<td>53 (12.1%)</td>
<td>35 (15.6%)</td>
<td>12 (23.1%)</td>
<td>2 (20.0%)</td>
<td>0.003</td>
</tr>
<tr>
<td>≥ 180/≥110 mmHg</td>
<td>0 (0.0%)</td>
<td>5 (1.6%)</td>
<td>10 (2.3%)</td>
<td>8 (3.6%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0.513</td>
</tr>
<tr>
<td>≥ 140/≥90 mmHg</td>
<td>1 (5.6%)</td>
<td>27 (8.7%)</td>
<td>46 (10.5%)</td>
<td>31 (13.8%)</td>
<td>7 (13.5%)</td>
<td>1 (10.0%)</td>
<td>0.488</td>
</tr>
<tr>
<td>Without diabetes</td>
<td>18 (2.0%)</td>
<td>283 (31.1%)</td>
<td>382 (41.9%)</td>
<td>186 (20.4%)</td>
<td>35 (3.8%)</td>
<td>7 (0.8%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>With diabetes</td>
<td>0 (0.0%)</td>
<td>27 (19.0%)</td>
<td>56 (39.4%)</td>
<td>39 (27.5%)</td>
<td>17 (12.0%)</td>
<td>3 (2.1%)</td>
<td></td>
</tr>
</tbody>
</table>

196
older patients over 60 years where smoking was reported in 106 (23.9%) patients ($\chi^2 = 6.68, p < 0.05$). The uncontrolled hypertension was more frequent among smokers than non-smokers (47.9% vs. 40.6%, $\chi^2 = 29.240, p < 0.05$).

The reported frequency of diabetes in this sample was 13.5% (142), and the metabolic syndrome prevalence was 44.3% (467). The metabolic syndrome prevalence according to the age groups was as follows: 243 (54.9%) patients aged 60 years and over, 153 (42.9%) patients aged 50–59 years, and a group of 71 (28.1%) patients aged 40–49 years, which was statistically significant ($\chi^2 = 95.07, p < 0.05$). No statistically significant differences were found among genders of the respondents with regard to metabolic syndrome ($\chi^2 = 0.644, p = 0.422$). 56.4% of hypertensive patients had metabolic syndrome compared to 12.5% of the subjects without hypertension. This proved to be statistically significant ($\chi^2 = 334.1, p < 0.05$) (Table 2).

The mean systolic blood pressure in the analyzed sample was 135.39 ± 8,639 mmHg, and the mean diastolic blood pressure was 81.40 ± 8,639 mmHg. The prevalence of hypertension in this sample was 72.6% (764), the number of well-regulated hypertensive patients was 200 (45.1%), and 203 (45.3%) patients aged 60 years and over where smoking was reported in 106 (23.9%), and high-risk level 209 (19.8%) patients. No significant differences in triglyceride levels were shown between genders ($\chi^2 = 3.828, p = 0.05$).

The 10 years assessment of the individual risk of fatal cardiovascular diseases showed a low risk in 596 (56.6%), moderate in 92 (8.7%), high in 207 (19.7%), and very high in 158 (15.0%) patients. We observed a statistically significant risk difference in men ($\chi^2 = 163.974, p < 0.001$) (Table 3), in patients aged 60 years and over ($\chi^2 = 338.799, p < 0.001$). smokers ($\chi^2 = 28.589, p < 0.001$), patients with poorly regulated hypertension ($\chi^2 = 278.881, p < 0.001$), diabetic patients ($\chi^2 = 35.574, p < 0.001$), patients with metabolic syndrome ($\chi^2 = 57.805, p < 0.001$), and patients with increased total cholesterol ($\chi^2 = 17.489, p < 0.001$).

In this sample there were only 32 (3.0%) patients without risk factors for cardiovascular diseases, and 684 (65.0%) patients had three or more risk factors. The number of risk factors was higher in the elderly ($\chi^2 = 67.370, p < 0.001$), while in both men and women there was no statistically significant difference as to the number of risk factors ($\chi^2 = 0.505, p = 0.777$). The presence of risk factors is shown in Figure 1.

**DISCUSSION**

The malnutrition status, as a risk factor for many chronic diseases, is presented in this sample. The malnutrition indicates the increase of overweight people compared to the survey conducted in 2006 by the Institute of Public Health of Serbia (4). The cause is usually an unhealthy diet and physical inactivity, so the obesity and central fat accumulation may be a major risk factor for cardiovascular diseases (5, 6). We are concerned with a fact that overweight was more common in the elderly and in patients with hypertension and diabetes, which further increases the risk of cardiovascular diseases.

The smoking is associated with an increased risk of cardiovascular diseases in many studies (7, 8). The proportion of smokers (33.6%) is similar to the study that was conducted in 2006 (4).
Hypertension, which can be seen as a socio-medical problem, occurs in younger persons due to the mild and scarce symptoms, which often go undetected or discovered accidentally during the physical examination (9). The studies on this subject show that European countries have a higher incidence of this disease in comparison to other continents (10). The higher incidence of hypertension in this sample can be explained by the large number of older patients, smoking habits and malnutrition, while some studies suggest physical inactivity, alcohol consumption and the lack of education about hypertension (11–13). It is worrisome that 42.9% of respondents have a poorly regulated hypertension, which is usually conditioned by irregular treatment and the patient’s lack of information about the disease. A very large number of poorly regulated blood tensions occurs among diabetics, which increases the risk for cardiovascular disease and the development of metabolic syndrome.

The prevalence of metabolic syndrome varies from 13.6% to 46% worldwide and is associated with increased cardiovascular comorbidity (15, 16). The data show that about 50% of hypertensive patients suffer from metabolic syndrome, which is confirmed by our study (9). Type 2 diabetes is a major risk factor for cardiovascular diseases because it causes micro and macrovascular complications that accelerate the process of atherosclerosis, and it is necessary to maintain a normal level of glucose in the blood, prescribed medical treatment and physical activity and proper nutrition (9).

Many epidemiological studies have confirmed the relationship between increased total cholesterol levels and the increased cardiovascular risk (17–19). In a survey conducted in 1996, the prevalence of lipid disorders in our country shows that the raised total cholesterol occurs in an average of 33.7% of patients (20). In our study, the increased levels of total cholesterol depict the trend in the prevalence of this disorder.

Going through the literature on the issue in other countries of the region, we come to the conclusion that there is a high rate of risk factors for cardiovascular diseases in the Balkan Peninsula. Results of the research conducted in Kosovo in 2011, noted that the prevalence rate of diabetes was 17.6% and 19% in Albania, which is a slightly higher rate than the one presented in our research (21, 22). The cause could be the elderly subjects (over 65 years of age) included in this research (23, 24), but also poor socio-economic and educational status. In the continental part of Croatia, among population from the urban areas, the nutritional status is of a similar structure to the one from our research. The same research discovered the presence of metabolic syndrome in 59.6% of patients, which is a slightly higher rate than in our research, while the ten year high risk (over 5%) of fatal cardiovascular diseases appeared in 72.4% of examinees and this is double the results from our research. The ten year high risk occurred in 48.7% of examinees in the research conducted in Bulgaria (25). In the research published in Romania in 2010, the frequency of high blood pressure was 29.74%, and joint high blood pressure and diabetes were found in 23.9% of examinees (26). The reason for such low occurrence of stated factors can be the age of examinees since the research included examinees aged from 14–90. In Croatia, 73.6% of people with high blood pressure had metabolic syndrome and it is a higher rate than the one from our research (27).

It is necessary to evaluate the ten year risk of mortality from cardiovascular events in primary care, in order to identify persons who according to the short-term risk assessments require intensive therapy and therefore the model SCORE must be applied. This system is adapted to our region (1).

Because of the high prevalence of risk factors for cardiovascular diseases and a large number of patients with multiple risk factors, it is necessary to undertake more intensive preventive measures in order to reduce risk factors and promote and preserve health of the general population. These measures can include more frequent examinations of patients, patients’ education and opening prevention centres for cardiovascular diseases.

Conflict of Interests
None declared

Ethical Approval
Health Centre Kragujevac Ethics Committee, No. 01-6391/3

REFERENCES


Fig. 1. Frequency of risk factors among patients.


Received January 29, 2014
Accepted in revised form June 23, 2015