Frequency and changes in trends of leading risk factors of coronary heart disease in women in the city of Novi Sad during a 20-year period

Promene učestalosti i tendencije kretanja vodećih faktora rizika od koronarne bolesti srca kod žena Novog Sada tokom 20-godišnjeg perioda

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Abstract

Background/Aim. From 1984 to 2004 the city of Novi Sad participated through its Health Center “Novi Sad” in the international Multinational MONItoring of Trends and Determinants in CArdiovascular Disease (MONICA) project, as one of the 38 research centers in 21 countries around the world. The aim of this study was to determine frequency and changes of trends in leading risk factors of coronary heart disease (CHD) and to analyze the previous trend of movement of coronary event in women in Novi Sad during a 20-year period. Methods. In 2004, the fourth survey within MONICA project was conducted in the city of Novi Sad. The representative sample included 1,041 women between the age of 25 and 74. The prevalence of risk factors in CHD such as smoking, high blood pressure, elevated blood cholesterol, elevated blood glucose and obesity was determined. Also, indicators of risk factors and rates of coronary events in women were compared with the results from MONICA project obtained in previous three screens, as well as with the results from other research centres. χ²-test, linear trend and correlation coefficient were used in statistical analysis of results obtained. Results. It was observed that during a 20-year period covered by the study, the prevalence of the leading risk factors for the development of CHD in the surveyed women was significantly increasing and in positive correlation with the values of linear trend. Also, the increase of morbidity rates and mortality rates of coronary event were in positive correlation. The decrease was only recorded in the period covered by the study, the prevalence of the leading risk factors for the development of CHD and significant increase in the rates of coronary event, we can conclude that health status of women in Novi Sad during a 20-year period was deteriorating.

Key words: coronary disease; risk factors; women.


Ključne reči: koronarna bolest; faktori rizika; žene.

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Introduction

Cardiovascular diseases (CVDs) are the leading cause of death among women in the modern world. Coronary heart disease (CHD) is among the major CVDs. Basically, CHD as a consequence of an accelerated process of atherosclerosis is caused by a number of risk factors. Some of them cannot be changed (age, gender, heredity), while the majority of risk factors can be modified by changing the life style. Among the factors mentioned in the first place are: smoking, obesity, high blood pressure, elevated blood cholesterol, elevated blood sugar level. Coronary risk is known to be multi-factorial, so that the effect of one risk factor will be combined and modified by the effect of the others.

The intensive implementation of an integrated program of prevention and control of CVDs in Finland in the period from 1975 to 2000 significantly reduced CHD morbidity and mortality due to a significant reduction of leading risk factors.

The project Monitoring of Trends and Determinants in Cardiovascular Disease (MONICA) was the largest World Health Organisation (WHO) research study which included 21 countries and 38 research centers. Health Center in Novi Sad was nominated as a research centre and participated in this project from 1984 until 2003.

The aim of this study was to determine frequency and changes of trends in leading risk factors of CHD and to analyze the previous trend of coronary event in women in Novi Sad during a 20-year period.

Methods

The study of the project MONICA included the entire population of Novi Sad aged between 25 and 74 years, but a separate analysis was done only for women after the fourth screening in 2004. The fourth screening was conducted on a representative sample consisting of women aged between 25 and 74 years. The number of women in the sample was 1,222 divided into five age groups. The response rate was 85.2%. A total number of responding women was 1,041.

The prevalence of smoking among women was 41.7% (35.7% smoked daily and 6.0% occasionally). On average, women started to smoke at the age of 21. The highest percentage of women smokers was in the age group between 25 and 34 years (48.7%) and the lowest in the age group between 65 and 74 years (15.7%). The difference in age was statistically significant. Smoking indicators are daily smokers and average number of cigarettes smoked per day.

Risk factors included in the screening were: smoking, high blood pressure, elevated blood cholesterol, elevated blood sugar and obesity. All indicators of risk factors, measurements (WHO-ISH, 1999) or blood pressure of a person already been under treatment for hypertension.

Obesity is estimated on the basis of the values of body mass index (BMI), taken as the value ≥ 30 kg/m².

Hypercholesterolemia is considered to exist for the values ≥ 5.0 mmol/L recommended by EHRM.

Elevated blood glucosa values are considered to be values ≥ 6.1 mmol/L, while a value of 7.0 mmol/L or more are considered as a preliminary diagnosis of diabetes.

Smoking indicators are daily smokers and average number of cigarettes smoked per day.

Risk factors found in women in 2004 (smoking, high blood pressure, elevated cholesterol levels and obesity) were compared with the results obtained in earlier studies in the project MONICA (1984/85, 1988/89, 1994/95).

Fatal and nonfatal coronary events were monitored through population-based Registers. The data source was the Register that operated from 1983 until 2004 with the break between 2000 and 2002. Coronary event represents confirmed myocardial infarction and confirmed death from CHD.

The results of other MONICA centers were also compared.

In the statistical data processing the descriptive statistical method was used: mean value ($\bar{x}$) and the standard deviation (SD). The statistical significance of the analyzed data was determined by using $\chi^2$-test (for the level of significance either $p < 0.05$ or $p < 0.01$ was taken), linear trend and correlation coefficient.

Results

The prevalence of smoking among women was 41.7% (35.7% smoked daily and 6.0% occasionally). On average, women started to smoke at the age of 21. The highest percentage of women smokers was in the age group between 25 and 34 years (48.7%) and the lowest in the age group between 65 and 74 years (15.7%). The difference in age was statistically significant ($\chi^2 = 20.06, p < 0.001$). There was a high level of correlation between smoking and age of the women ($R^2 = 0.87$). The average number of cigarettes smoked per day per woman was 15.8 (Table 1). A total of 34.1% of the women stopped smoking during the last five years before 2004 and 47.8% more than five years before 2004.

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<tr>
<th>The average value of risk factors for coronary heart disease (CHD) in women in Novi Sad</th>
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<td>Risk factors for CHD</td>
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<td>Number of cigarettes smoked per day</td>
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<td>Total cholesterol (mmol/L)</td>
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<td>Glucose (mmol/L)</td>
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$\bar{x}$ – mean value; SD – standard deviation; Min. – minimum value; Max. – maximum value.

and laboratory tests were expressed in accordance with the recommendation European Health Risk Monitoring (EHRM).

High systolic blood pressure is a systolic blood pressure 140 mmHg and higher, or diastolic 90 mmHg and higher.

The prevalence of hypertension (140/90 mmHg or more) in women was 34.0%. The average value of systolic pressure was 129 mmHg systolic and 81 mmHg diastolic (Table 1).
The prevalence of high blood cholesterol (5.0 mmol/L or more) in women was 81.8%. The average value of cholesterol was 6.06 mmol/L (Table 1).

The prevalence of obesity in women (BMI ≥ 30 kg/m² and over) was 24.1%. The percentage of those with BMI between 25 kg/m² and 30 kg/m² was 34.5%. The average BMI of women was 26.7 kg/m².

The prevalence of women with elevated blood glucose (value ≥ 6.1 mmol/L) was 19.8%, of which the prevalence of women with blood sugar level of ≥ 7 mmol/L was 9.5%, and they were recognised as potential diabetics.

The average number of risk factors in women ranged from 0 to 5. The percentage of women with 2 risk factors was 35.1% and without risk factors was 7.7% of the surveyed women (Figure 1). The average number of risk factors in women was 1.92.

In comparison with the earlier screenings in 1984/85, 1988/89 and 1994/95 the prevalence of smoking among women of Novi Sad had significantly increased (from 30.8% to max 41.7%). The prevalence of hypertension had also increased from 27.9% to 34%. The prevalence of hypercholesterolemia had increased from 29.6% to 81.8%. The prevalence of obesity had increased from 46.7% to 58.6%. During a 20-year follow-up, the prevalence of risk factors was in a significant increase. The prevalence of the studied risk factors showed a positive correlation with the values of the linear trend (Figure 2).

Coronary events in the women showed a statistically significant increase from values close to the linear trend line ($R^2 = 0.80$). At the beginning of the study, in 1983, there were 154 coronary events per year and at the end, in 2004, there were 340 coronary events per year. The fall was recorded in 1987 and reduced by 15%. In the subsequent period, the coronary events among women were increased by 120% (Figure 3).

Mortality from CHD in women also showed a statistically significant increase from the values close to the linear trend line ($R^2 = 0.74$). The fall was recorded in 1987 (Figure 4).

Lethality from coronary ischemic events declined until 1987, and then increased until 1999, and then declined again until 2003, and then increased again until 2004 (Figure 4).

The authors also made comparison of indicators of risk factors in women, with results from the project MONICA obtained in other research centers. The prevalence of female daily smokers increased in Novi Sad. It was in the 11th place in the beginning of the study, and in the 6th place at the end the study in comparison with other centers. In terms of the average systolic blood pressure Novi Sad was in the 15th place in the begin-
ning, and in the 4th place at the end of the study. By the amount of total cholesterol in women Novi Sad was in the 31st place in the beginning and in the 3rd place at the end of the study. This makes Novi Sad a center of the highest increase in cholesterol levels in comparison with other centers. The average total cholesterol in the blood of women was in the range of 4.5 mmol/L (Beijing, China) and 6.3 mmol/L (Kaunas, Lithuania).

With a total number of risk factors in women Novi Sad was in the 17th place in the beginning of the study, but in the first place in the end. Thus, Novi Sad was among 8% of the centers with the largest increase of number of risk factors in women (Novi Sad, China, Switzerland and Poland). In 60% of research centers there was a statistically significant decrease in the total average number of risk factors (Russia, Poland, United Kingdom, Germany, Italy, Finland, France, Australia), while in 20% there were no significant changes (Figure 5).

Fig. 5 – Changes in trends of coronary events in women included in the MONICA study compared with the number of risk factors

By analysing the average annual change rates of coronary events it can be observed that in 42% of the 38 research centers there was a reduction in coronary events during the decade, and in 16% of the centers there was a significant increase in the rate of coronary events. Novi Sad belongs to a group of centers with a significant increase. In 50% of research centers, there was a significant decrease in the average systolic blood pressure (Poland, Germany, Russia, France), and in 50% of them, there was a statistically significant decrease in the average cholesterol in blood (Sweden, Russia, France, Finland, Italy).

There was a significant reduction in morbidity from CHD in 63% centers (Russia, France, Australia, Finland, Sweden, Iceland), and a significant decrease of mortality in 60% centres (Australia, France Italy, Sweden, USA).

At the beginning of the study, Novi Sad was among the best research centres up to 1991, when a significant decrease in morbidity and mortality from CHD was registered. The mortality from CHD was reduced by 15%. It was the time of intensive implementation of the intervention programme. In the subsequent period, after 1992, risk factors, morbidity and mortality from CHD among women significantly increased. This situation can be explained by the presence of new risk factors, stress, due to the difficult economic situation, state of war, sanctions placed by the United Nations, the deficiency in food (fewer vitamins, especially antioxidants) and deficiency of medication, especially for treatment of hypertension.

The situation did not change even after the end of the war and lifting sanctions placed by the United Nations. In this period Serbia was in a difficult economic situation, and began to reform the health care system.

Discussion

Cardiovascular diseases in women in modern world are characterized, in the first place, by incidence and mortality in relation to other diseases. Coronary heart disease is among the leading CVDs and prevention of this disease is necessary in the shortest possible time. Due to reduced production of estrogen after menopause in women, there is an increase in risk of developing CVDs, so preventive measures for women in the period after menopause are especially important, since the incidence of diseases of CVD increases with age.

The results of our screening show that prevalence of risk factors significantly increased during a 20-year period. Novi Sad is among a few centres in which the average number of risk factors in women increased (China, Switzerland, Poland).

In most of research centres there was a significant reduction in risk factors, and a significant reduction of daily smokers in 50% of research centers (USA, Great Britain, Iceland, China, Australia). In 45% of research centers, there was a significant decrease in the average systolic blood pressure (Poland, Germany, Russia, France), and in 50% of them, there was a statistically significant decrease in the average cholesterol in blood (Sweden, Russia, France, Finland, Italy).

There was a significant reduction in morbidity from CHD in 63% centers (Russia, France, Australia, Finland, Sweden, Iceland), and a significant decrease of mortality in 60% centres (Australia, France Italy, Sweden, USA).

At the beginning of the study, Novi Sad was among the best research centres up to 1991, when a significant decrease in morbidity and mortality from CHD was registered. The mortality from CHD was reduced by 15%. It was the time of intensive implementation of the intervention programme. In the subsequent period, after 1992, risk factors, morbidity and mortality from CHD among women significantly increased. This situation can be explained by the presence of new risk factors, stress, due to the difficult economic situation, state of war, sanctions placed by the United Nations, the deficiency in food (fewer vitamins, especially antioxidants) and deficiency of medication, especially for treatment of hypertension.

The situation did not change even after the end of the war and lifting sanctions placed by the United Nations. In this period Serbia was in a difficult economic situation, and began to reform the health care system.

Conclusion

Upon analysing the increase in prevalence of leading risk factors of CHD and significant increase in rates of coronary event, we can conclude that health status of women in Novi Sad during a 20-year period was deteriorating.
We hope that a recently adopted National Programme for Prevention and Control of CVDs will open new perspectives for more efficient work in this field. A special place and importance would be given to the specific prevention measures related to women.

The results of the research also show that female population is increasingly affected by leading risk factors of CHD in Novi Sad. Most effective measure is the reduction of risk factors which could be achieved at the primary health care level using available cost-effective measure. Experience from the period of intensive implementation of the intervention programme is a very strong evidence that even in the present conditions it is possible to improve the situation.

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