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# The Prevalence of Cardiovascular Disease Risk Factors in Patients from Croatian Zagorje County Treated at Department of Medicine, Zabok General Hospital from 2000 to 2006

Ksenija Pešek<sup>1</sup>, Tomislav Pešek<sup>2</sup>, Marko Radoš<sup>3</sup>, Damir Buković<sup>5</sup>, Rajko Fureš<sup>4</sup> and Višeslav Čuk<sup>6</sup>

<sup>1</sup> Department of Internal Medicine, General Hospital »Zabok«, Zabok, Croatia

<sup>2</sup> Department of Surgery, General Hospital »Zabok«, Zabok, Croatia

<sup>3</sup> Department of Clinical Diagnostic and Interventional Radiology, University Hospital Center »Zagreb«, University of Zagreb, Zagreb, Croatia

<sup>4</sup> Department of Gynecology, General Hospital »Zabok«, Zabok, Croatia

<sup>5</sup> Department of Obstetric and Gynecology, School of Medicine, University of Zagreb, Zagreb, Croatia

<sup>6</sup> Department of Otorhinolaryngology, General Hospital Zabok, Zabok, Croatia

## ABSTRACT

*The aim of the study was to assess the prevalence of risk factors for cardiovascular disease in patients treated for coronary heart disease (CHD) at Department of Medicine, Zabok General Hospital during the 2000–2006 period. Cardiovascular diseases are a group of diseases that occur due to arterial. The risk factors that lead to the development and occurrence of cardiovascular disease are hypertension, cigarette smoking, hypercholesterolemia, hypertriglyceridemia, diabetes mellitus and positive family history. Additional factors favoring the occurrence of cardiovascular disease include overweight, inadequate physical activity, and emotional stress. Data on all patients hospitalized and diagnosed with CHD at Department of Medicine, Zabok General Hospital during the 2000–2006 period were analyzed for the prevalence of risk factors for CHD, i.e. hypertension, cigarette smoking, hypercholesterolemia, hypertriglyceridemia, diabetes mellitus and positive family history of cardiovascular disease. Hypercholesterolemia was defined by a cholesterol level higher than 5.1 mmol/L, hypertension from history data and blood pressure measurement on admission greater than 140/90 mmHg, diabetes mellitus from history data, and hypertriglyceridemia by a triglyceride level greater than 1.7 mmol/L. Information on heredity and cigarette smoking was collected from history and a questionnaire filled out on admission. All laboratory values were determined on patient admission to the hospital. Analysis of the risk factors for CHD recorded in patients from Zagorje County during the 2000–2006 period revealed hypertension to be the most common risk factor in our patients. According to sex, CHD was found to show a male preponderance. According to age at admission, CHD predominated in the > 70 age group, which accounted for one third of all patients, followed by a comparable proportion of the 50–60 and 60–70 age groups, i.e. still active population groups. As CHD is one of the leading health threats worldwide, estimated to remain so at least by 2020, it is fully justified to invest all efforts in the study of cardiovascular disease. New research projects should be focused on the prevention and early detection of the disease, improvement of diagnosis procedures, introduction of novel therapeutic options, use of new concepts, and due survey of the measures taken. CHD poses great socioeconomic burden upon every community in industrialized societies because of the ever younger age at onset. Actions should be taken to improve awareness of the CHD risks and morbidity in the population at large, stimulating favorable lifestyle and dietary modifications, and one's own health awareness, in order to upgrade the control of risk factors for and morbidity of cardiovascular disease.*

**Key words:** prevalence of risk factors, cardiovascular disease, coronary heart disease

## Introduction

The aim of the study was to assess the prevalence of risk factors for cardiovascular disease in patients treated for coronary heart disease (CHD) at Department of Medicine, Zabok General Hospital during the period of 2000–2006.

**Definition:** Cardiovascular diseases are a group of diseases that occur due to arterial lesions characterized by local intima thickening, consisting of proliferating and altered smooth muscle cells, macrophages, lipids from intra- and extracellular serum lipoprotein deposits, and proliferating connective tissue (collagen, elastin, mucopolysaccharides). This group of diseases includes CHD, stroke, and obstruction of peripheral vasculature.

The risk factors that lead to the development and occurrence of cardiovascular disease are hypertension, cigarette smoking, hypercholesterolemia, hypertriglyceridemia, diabetes mellitus, and positive family history. Additional factors favoring the occurrence of cardiovascular disease include overweight, inadequate physical activity, and emotional stress<sup>1,2,3</sup>.

Cardiovascular diseases are associated with high morbidity and mortality rates, thus posing a major health and socioeconomic problem in modern society<sup>4,5,6</sup>. CHD is the leading cause of death and severe disability in Europe as well as in Croatia<sup>7</sup>. CHD or ischemic heart disease occurs because of reduced coronary blood flow or complete circulatory obstruction in a part of the myocardium. This leads to myocardial lesions, which determine the symptomatology, clinical course and outcome of the disease. According to symptomatology and clinical course, ischemic heart disease is categorized into acute coronary syndrome, non-Q wave ST-segment elevation myocardial infarction (STEMI), non-Q wave non-ST-segment elevation myocardial infarction (NSTEMI), unstable angina, and stable angina. In almost 99% of cases, CHD is caused by atherosclerosis, and less frequently by spasm that is usually idiopathic, or by a drug such as cocaine. Atherosclerosis is characterized by subintimal plaques that can reduce or obstruct blood flow through the vessel. The risk factors that lead to atherosclerosis include serum lipid impairment, hypertension, cigarette smoking, diabetes mellitus, overweight, physical inactivity, and hereditary factor, i.e. positive family history of cardiovascular disorders. Elevated level of low-density lipoprotein (LDL) and decreased level of high-density lipoprotein (HDL) predispose the development of atherosclerosis. HDL is inversely proportional to the risk of CHD. The main causes of HDL decrease are cigarette smoking, overweight and inadequate physical activity. The level of cholesterol and the incidence of CHD are influenced by environmental factors including diet.

Besides hyperlipoproteinemia, hypertension is a major risk factor for the occurrence of atherosclerotic lesions. The main mechanism of action through which hypertension leads to the development of atherosclerosis is mechanical damage to endothelial cells due to altered

hemodynamics, i.e. enhanced force of the blood flow, or to the formation of whirls at vascular bifurcations.

Cigarette smoking increases LDL and decreases HDL, also increasing carbon monoxide in serum, thus leading to endothelial hypoxia and potentially to vasoconstriction of the arteries that are already narrowed due to atherosclerosis. Cigarette smoking can also enhance platelet activity, which in turn may lead to the formation of thrombi, and an increase in plasma fibrin and hematocrit, thus contributing to blood viscosity.

Diabetes mellitus, both insulin dependent and non-insulin dependent type, is also a major risk factor for cardiovascular disease. Hyperlipoproteinemia, hypertriglyceridemia in particular, i.e. elevated levels of very-low-density lipoprotein (VLDL) particles and atherogenic LDL deriving from VLDL, with concurrent decrease in the level of protective HDL particles, are quite common in diabetic patients. LDL particles that undergo non-enzymatic glycosylation due to elevated blood glucose are fast and intensively phagocytosed by macrophages, thus stimulating atherogenesis. Hyperinsulinemia causes damage to vascular endothelium.

Hereditry is considered a risk factor based on the observation of a particular family predisposition to atherosclerosis.

Inadequate physical activity decreases the concentration of HDL, whereas obesity is associated with hyperglycemia and hyperinsulinemia.

CHD is the major threat to modern society and, according to estimate, it will remain so at least by 2020. Therefore, all efforts invested in the study of cardiovascular disease are fully justified. In line with this, recording and analysis of the prevalence of risk factors for cardiovascular disease as the most common cause of CHD were initiated in 2000. During the 2000–2006 period, the following risk factors for CHD were recorded in patients hospitalized for this disease: hypertension, hypercholesterolemia, diabetes mellitus, hypertriglyceridemia, cigarette smoking, and positive family history of cardiovascular disease<sup>2,8</sup>.

Zabok General Hospital has a catchment population of some 90,000, with about 3600 patients treated at Department of Medicine *per year*, 186 of them for CHD.

## Subjects and Methods

Data on all patients hospitalized and diagnosed with CHD at Department of Medicine, Zabok General Hospital during the period of 2000–2006 were analyzed for the prevalence of risk factors for CHD, i.e. hypertension, cigarette smoking, hypercholesterolemia, hypertriglyceridemia, diabetes mellitus and positive family history of cardiovascular disease. Hypercholesterolemia was defined by a cholesterol level higher than 5.1 mmol/L, hypertension from history data and blood pressure measurement on admission greater than 140/90 mm Hg, diabetes mellitus from history data, and hypertriglyceridemia by a triglyceride level greater than 1.7 mmol/L. Information

on heredity and cigarette smoking was collected from history and a questionnaire filled out on admission. All laboratory values were determined on patient admission to the hospital.

### Results

Data on all patients hospitalized and diagnosed with CHD at Department of Medicine, Zabok General Hospital during the 2000–2006 period were analyzed for the prevalence of risk factors for CHD, i.e. hypertension, cigarette smoking, hypercholesterolemia, hypertriglyceridemia, diabetes mellitus and positive family history of cardiovascular disease. Hypercholesterolemia was defined by a cholesterol level higher than 5.1 mmol/L, hypertension from history data and blood pressure measurement on admission greater than 140/90 mmHg, diabetes mellitus from history data, and hypertriglyceridemia by a triglyceride level greater than 1.7 mmol/L. Information on heredity and cigarette smoking was collected from history and a questionnaire filled out on admission. All laboratory values were determined on patient admission to the hospital. Analysis of the risk factors for CHD recorded in patients from Zagorje County during the 2000–2006 period revealed hypertension to be the most common risk factor in our patients. According to sex, CHD was found to show a male preponderance. According to age at admission, CHD predominated in the >70 age group, which accounted for one third of all patients, followed by a comparable proportion of the 50–60 and 60–70 age groups, i.e. still active population groups. As CHD is one of the leading health threats worldwide, estimated to remain so at least by 2020, it is fully justified to invest all efforts in the study of cardiovascular disease. New research projects should be focused on the prevention and early detection of the disease, improvement of diagnosis procedures, introduction of novel therapeutic options, use of new concepts, and due survey of the measures taken. CHD poses great socioeconomic burden

upon every community in industrialized societies because of the ever younger age at onset. Actions should be taken to improve awareness of the CHD risks and morbidity in the population at large, stimulating favorable lifestyle and dietary modifications, and one's own health awareness, in order to upgrade the control of risk factors for and morbidity of cardiovascular disease.

Data are presented in figures: Graphic presentation of patient distribution according to gender and time of study was shown on Figure 1. Distribution of patients according to age groups was shown on Figure 2. Figure 3 presents prevalence of risk factors during 2000. Prevalence of risk factors during 2001 was shown on Figure 4. Prevalence of risk factors during 2002 was presented on Figure 5. Prevalence of risk factors during 2003 was presented on Figure 6. Figure 7 presents prevalence of risk factors during 2004. Prevalence of risk factors during 2005 was presented on Figure 8. Figure 9 presents prevalence of risk factors during 2006.

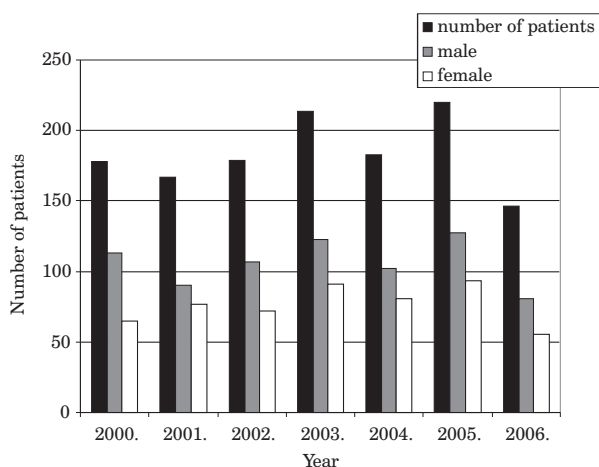


Fig. 1. Graphic presentation of patient distribution according to gender and time of study.

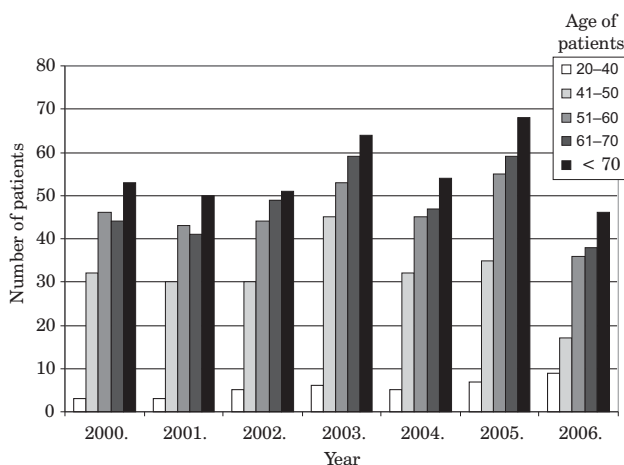


Fig. 2. Distribution of patients according to age groups.

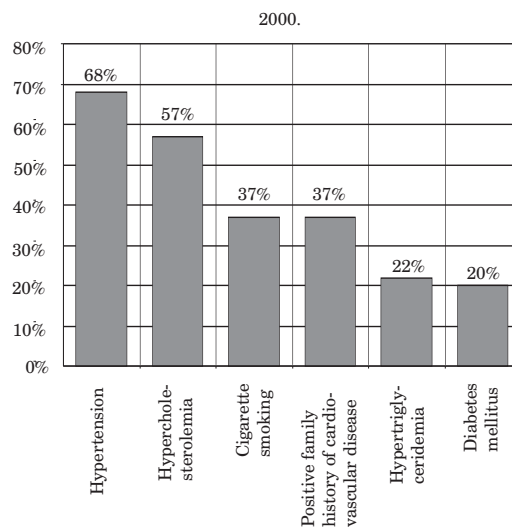


Fig. 3. Presents prevalence of risk factors during 2000.

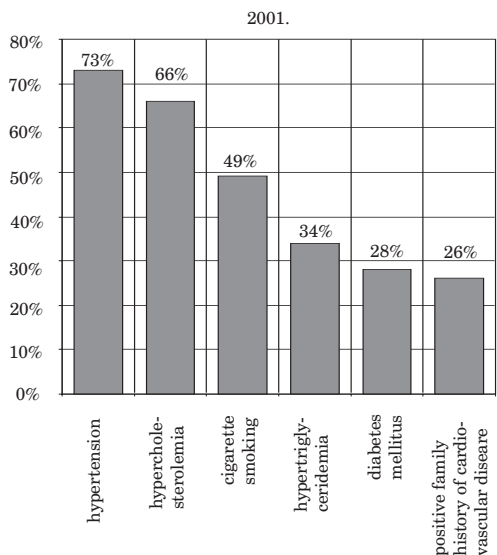


Fig. 4. Presents prevalence of risk factors during 2001.

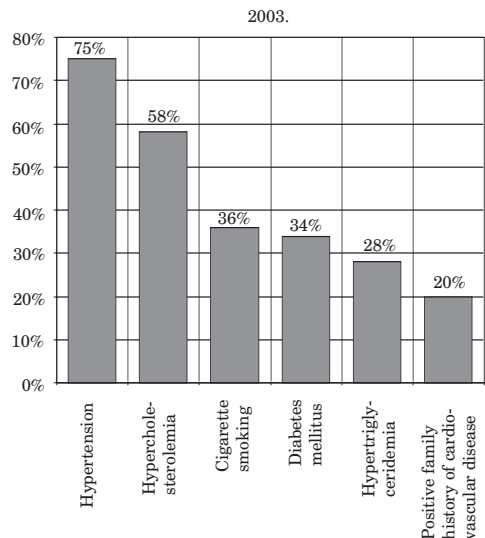


Fig. 6. Presents prevalence of risk factors during 2003.

During the study period (2000–2006), a total of 1287 patients were treated for CHD at Department of Medicine, Zabok General Hospital. Systematic recording of patients treated for CHD was initiated on January 1, 2000 and was terminated on December 31 each year thereof. The highest and lowest number of new patients admitted for CHD was recorded in 2005 (n=220) and 2006 (n=146), respectively. A rise in the number of patients treated for CHD was also observed in 2003 (n=214). In other study years, there were no significant differences in the number of patients admitted for CHD.

The population of patients admitted for CHD showed a male predominance throughout the study period. This could probably be explained by the lower prevalence of cigarette smoking and occupational stress in women,

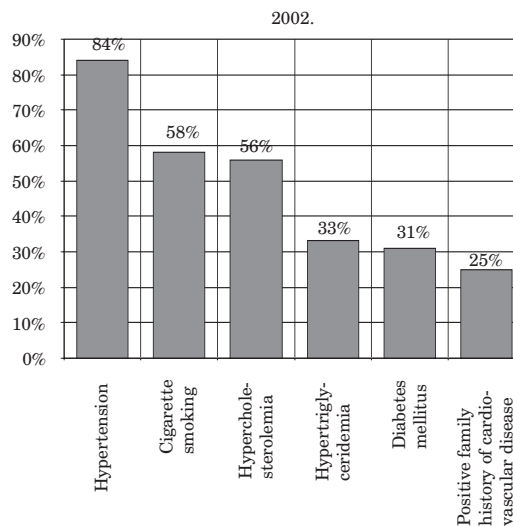


Fig. 5. Presents prevalence of risk factors during 2002.

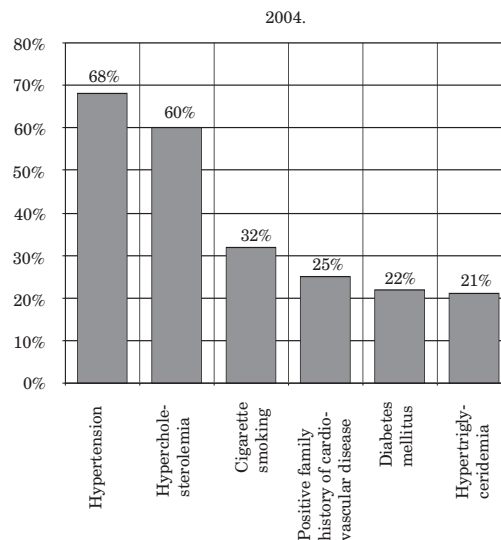


Fig. 7. Presents prevalence of risk factors during 2004.

however, the risk increases in menopausal women. In men, atherosclerosis as the most common cause of CHD develops at a younger age. The protective role of sex hormones has not yet been fully verified. The higher rate of CHD in male population was therefore attributed to the earlier development of atherosclerosis, greater occupational stress exposure, and higher prevalence of cigarette smoking in men. The number of cigarettes *per day* is proportionally related to the risk of CHD due to atherosclerosis. Analysis of patient age at admission yielded no major age differences during the study period. The highest number of patients were in the 70 age group, followed by the 50–60 and 60–70 age groups, as expected considering the presence of risk factors for atherosclerosis and CHD that begin to develop at middle age to increase with advancing age. The lowest proportion of patients were aged 20–40, however, their percentage was found to grad-

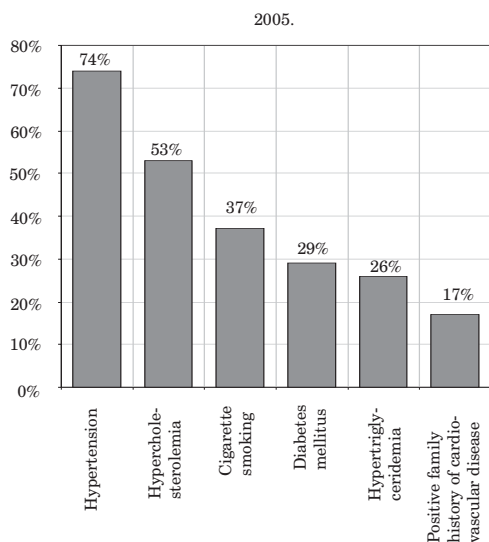


Fig. 8. Presents prevalence of risk factors during 2005.

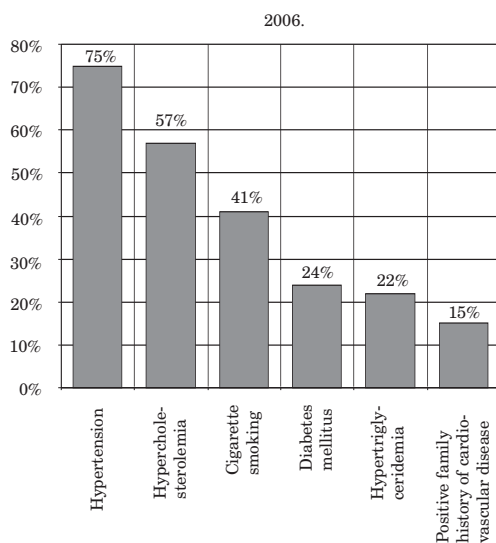


Fig. 9. Presents prevalence of risk factors during 2006.

usually increase during the study period; in 2006, the number of patients in the 20–40 age group admitted for CHD was threefold that recorded in 2000.

## Discussion

An increase in the occurrence of hypertension, atherosclerosis and CHD in ever younger age groups has been reported from many countries, including Croatia. Such an unfavorable pattern has primarily been recorded in industrialized countries, where the lifestyle has undergone substantial changes with fast living, daily pressure exposure, inadequate physical activity and unhealthy dietary habits. In Croatia, the same lifestyle modifications are also taking place. Fast industrial devel-

opment and lifestyle changes are accompanied by an increase in the prevalence of CHD in ever younger age groups.

In our study, hypertension was the leading risk factor throughout the study period, present in 68% of all patients admitted and hospitalized for cardiovascular disease at Department of Medicine, Zabok General Hospital. The highest rate of hypertension as a risk factor for CHD was recorded in 2002 (84%).

In 2000, hypertension was also the most common risk factor in our patients (68%). The second most common risk factor present in the study population was hypercholesterolemia (57%), followed by cigarette smoking and positive family history (37% each), hypertriglyceridemia (22%) and diabetes mellitus (20%).

In 2001, hypertension was again the most common risk factor in patients admitted for CHD (73%), followed by hypercholesterolemia (66%), with no difference from the previous year. Cigarette smoking as a risk factor was recorded in 49% of cases, yielding an increase in comparison with 2000. Hypertriglyceridemia was present in 34% and diabetes mellitus in 28% of patients. The comparable proportion of patients with diabetes mellitus and those with hypertriglyceridemia could be attributed to the fact that, unlike the rest of the population, diabetic patients generally have elevated triglycerides rather than elevated cholesterol. Positive family history was recorded in one fourth of study patients (26%).

In 2002, hypertension was the most common risk factor, found in more than four fifths of study patients (84%), followed by cigarette smoking (58%) and hypercholesterolemia (56%). Now hypercholesterolemia ranked third, whereas in previous years it was the second most common risk factor for CHD. Diabetes mellitus and hypertriglyceridemia as risk factors were recorded in one third each, and positive family history of CHD in one fourth of study patients.

In 2003, hypertension persisted as the most common risk factor for CHD (75%), followed by hypercholesterolemia (58%), cigarette smoking (36%), diabetes mellitus (34%), hypertriglyceridemia (28%), and positive family history (20%).

In 2004, hypertension accounted for 68% and hypercholesterolemia for 60% all risk factors for CHD in patients admitted to our Department, followed by quite a comparable prevalence of positive family history, diabetes mellitus and hypertriglyceridemia (25%, 22% and 21%, respectively). Cigarette smoking was recorded in 32% of study patients.

In 2005, hypertension was the most common risk factor again (74%), followed by hypercholesterolemia (53%), cigarette smoking (37%), diabetes mellitus (29%), hypertriglyceridemia (26%), and positive family history of CHD (17%).

The year 2006 was characterized by the lowest number of patients hospitalized for CHD; however, hypertension was still the most common risk factor (57%), followed by cigarette smoking (41%), diabetes mellitus (24%), hypertriglyceridemia (22%), and positive family history (15%).

Hypercholesterolemia was the second most common risk factor recorded in patients hospitalized for CHD throughout the study period, accounting for 58.1% of all study cases. Only in 2002, cigarette smoking as a risk factor showed a higher prevalence than hypercholesterolemia. The lower number of patients treated in 2006 could be attributed to the improved public awareness of cardiovascular disease through intensive population education actions and upgraded prevention through specialist outpatient offices. There was no major variation in the prevalence of risk factors for CHD relative to the number of patients admitted during the study period.

Cigarette smoking was the third most common risk factor throughout the study period (41%), followed by hypertriglyceridemia (29%), diabetes mellitus (24%), and positive family history of CHD (23%).

Epidemiological studies show hypertension to be the major risk factor in the populations with an average prevalence of atherosclerosis. It is one of the most common chronic diseases in all age groups including young age groups. Most patients are free from subjective discomforts, therefore the disease can proceed undiagnosed for quite a long time. Many individuals are unaware of having elevated blood pressure, while those diagnosed with hypertension but being free from symptoms frequently fail to pay due attention to their treatment, receive inadequate or irregular therapy or no therapy at all. Another problem is that many drugs used in the treatment of hypertension, such as beta-blockers and thiazide diuretics, have an adverse effect on hyperlipidemia, thus posing the patient at an additional risk of

CHD. It should be noted that the association of elevated blood pressure and CHD shows no sex variation.

## Conclusion

Analysis of the risk factors for CHD recorded in patients treated at Department of Medicine, Zabok General Hospital during the 2000–2006 period revealed hypertension to be the most common risk factor in our patients. According to sex, CHD was found to show a male preponderance. According to age at admission, CHD predominated in the 70 age group, which accounted for one third of all patients, followed by a comparable proportion of the 50–60 and 60–70 age groups, i.e. still active population groups.

As CHD is one of the leading health threats worldwide, estimated to remain so at least by 2020, it is fully justified to invest all efforts in the study of cardiovascular disease. New research projects should be focused on the prevention and early detection of the disease, improvement of diagnostic procedures, introduction of novel therapeutic options, use of new concepts, and due survey of the measures taken. CHD poses great socioeconomic burden upon every community in industrialized societies because of the ever younger age at onset. Actions should be taken to improve awareness of the CHD risks and morbidity in the population at large, stimulating favorable lifestyle and dietary modifications, and one's own health awareness, in order to upgrade the control of risk factors for and morbidity of cardiovascular disease.

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K. Pešek

*Department of Medicine, General Hospital Zabok, Trg Dragutina Domjanića 6, HR-49210 Zabok, Croatia*  
*e-mail: ksenija.pesek@krt-com.hr*

## PREVALENCIJA RIZIČNIH ČIMBENIKA ZA KARDIOVASKULARNE BOLESTI U BOLESNIKA IZ HRVATSKOG ZAGORJA LIJEČENIH NA ODJELU INTERNE MEDICINE OPĆE BOLNICE ZABOK U PERIODU OD 2000–2006. GODINE

### SAŽETAK

Utvrđiti prevalenciju pojedinih čimbenika rizika za kardiovaskularne bolesti kod bolesnika liječenih zbog koronarne bolesti srca u Općoj bolnici Zabok na internom odjelu u razdoblju od 2000. godine do 2006. godine. Kardiovaskularne bolesti su skupina bolesti koje nastaju zbog oštećenja arterija. Čimbenici rizika koji dovode do razvoja i nastanka kar-

diovaskularnih bolesti su hipertenzija, pušenje, hiperholesteremija, hipertrigliceridemija, dijabetes i pozitivna obiteljska anamneza. Dodatni uzroci pogoduju nastanku kardiovaskularnih bolesti su prekomjerna tjelesna težina, smanjena fizička aktivnost te emocionalno stresno stanje. Od 2000. do 2006. praćeni su svi bolesnici hospitalizirani u Općoj bolnici Zabok na internom odjelu kojima je dijagnosticirana koronarna bolest. Analizirana je učestalost hipertenzije kao rizičnog čimbenika, pušenje, hiperholesteremija i hipertrigliceridemija te dijabetes i pozitivna obiteljska anamneza ukupno kod svih registriranih bolesnika. Hiperholesteremija definirana je razinom holesterola većom od 5,1mmol/L, hipertenzija je utvrđena anamnestički i mjerenjem tlaka kod prijema vrijednosti veće od 140/90 mmHg, dijabetes je utvrđen anamnestičkim podatkom, hipertrigliceridemija je utvrđena razinom većom od 1,7 mmol/L. Podaci o nasljeđu i pušenju dobiveni su anamnezom i ispunjavanjem upitnika kod prijema. Analizom praćenih čimbenika rizika za nastanak koronarne bolesti kod bolesnika liječenih na internom odjelu Opće bolnice Zabok dobili smo podatak da je hipertenzija najzastupljeniji rizični čimbenik za nastanak koronarne bolesti. Muškarci obolijevaju češće nego žene a najviše je zastupljena dob od 70 godina na više i čine trećinu ispitivanih bolesnika, a četvrtinu ispitanih bolesnika zastupa podjednako dob od 50 do 60 godina te dob od 60 do 70 godina što je još uvijek radno sposobna populacija. Radi se o velikom socijalno-ekonomskom problemu za svaku zajednicu u visokorazvijenim i razvijenim zemljama jer se dobna granica za nastanak koronarne bolesti približava mlađim dobnim skupinama. Širokom akcijom upoznavanja populacije s problemima rizika i pobola od kardiovaskularnih bolesti, utjecajem na promjenu načina života, prehrane i podizanja samosvijesti o vlastitom zdravlju, mogao bi se očekivati napredak u suzbijanju rizičnih čimbenika za nastanak i smanjenje kardiovaskularnih bolesti.