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## Risk factors for women's cardiovascular disease

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## Фактори ризику серцево-судинних захворювань у жінок

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### Introduction

In the past, the risk of cardiovascular diseases (CVD) in women was underestimated, mainly due to the distorted perception and description of women's risk factors. Women of childbearing age considered themselves protected and CVDs were considered male diseases. In recent years, progress in awareness and research have helped to break this traditional view, proving that CVDs are the main cause of morbidity and mortality in women. CVD is the leading cause of death worldwide in both men and women. CVDs account for 40% of all deaths in men and 49% in women in Europe. In Slovakia in 2018, the CVD mortality rate per 100,000 inhabitants was 449.7 for women and 429.9 for men. Ischemic heart diseases and cerebrovascular diseases, the cause of which are risk factors, prevailed. It is generally known that more than 90% of the risk of acute myocardial infarction can be attributed to nine measurable risk factors described by the INTERHEART study, which include smoking, hypertension, dyslipidemia, diabetes mellitus, physical inactivity, improper nutrition, obesity, alcohol and psychosocial factors [11]. In recent years, it has been shown that young women smoke more and more often than men, and women have a higher incidence of hypertension and diabetes mellitus. The co-occurrence of elevated cholesterol levels and blood pressure after menopause in women causes twice the incidence of stroke in middle-aged women compared to men. Women-specific risk factors such as hypertension in pregnancy, preterm birth, gestational diabetes, and menopause are among the unique aspects of cardiovascular health in women. A report from the European Heart Health Strategy (EuroHeart) shows that women are less likely to receive the same preventive advice as men and that women are still underrepresented in cardiovascular research [1]. In order to improve the care of women with cardiovascular disease, it is necessary to realize that the diagnosis of acute coronary syndromes can be problematic in women because of differences in signs and symptoms at presentation. At the same time, it is necessary to understand the importance of specific approaches in the diagnosis, treatment and prevention of CVD in women.

### Risk factors for cardiovascular disease in women and men

A risk factor is a statically significant indicator that leads to the manifestation of the disease. We currently know several hundred better or worse defined risk factors for cardiovascular disease. Responsibility for 90% of cardiovascular diseases in both men and women have 8 modifiable risk factors highlighted by the INTERHEART study [8].

Table 1. Risk factors of cardiovascular diseases  
(Source: Sovová, 2014)

Controllable factors	Non-controllable factors
Smoking, Stress	Age
Dyslipidemia, Diabetes, Abdominal obesity, Lack of physical activity	Genetic factors
Diet poor in fruits and vegetables	Personal history
Hypertension	

Risk factors are important for both men and women, but the impact and strength of individual factors differ between men and women. Especially in women, the presence of diabetes, hypertension and smoking is associated with a higher risk than in men.

Tobacco smoking has decreased in recent years, but the number of male smokers has decreased more significantly than the number of female smokers. In some countries, the number of young women who smoke has even increased, although they tend to smoke e-cigarettes more often. In a large meta-analysis focusing on the risk of smoking in men and women, it was shown that women have up to 25% higher risk of coronary heart disease caused by smoking than men [5]. Both cigarette smoking and e-cigarette smoking are equally harmful and have comparable negative effects on the cardiovascular system, which must be emphasized when communicating in the area of cardiovascular prevention.

Hypertension occurs less frequently in premenopausal women than in men of the same age. However, after

menopause, the incidence of arterial hypertension significantly increases. It rises in women. Data from the National Health and Nutrition Examination Survey (NHANES 2011-2014) show that 81.2% of women aged  $\geq 75$  years have arterial hypertension compared to 73.4% of men of the same age.

Among the consequences of arterial hypertension are:

- Progression of atherosclerosis with all the subsequent complications
- Development of chronic heart failure
- Development of chronic renal insufficiency
- Dissecting aneurysm of the aorta
- Hemorrhagic stroke
- Increased risk of developing atrial fibrillation [10].

Today, obesity is clearly assessed as a metabolic disease, one of the most common civilizational diseases in the world. The explosive increase in the prevalence of obesity in the population of the whole world is more than alarming. 60% of the adult population in Slovakia is overweight, 25% is obese, and about 1% of the adult population (33,000 people) has grade 3 obesity ( $BMI \geq 40 \text{ kg/m}^2$ ). While in 2016 there were about 650 million obese people in the world, today it is more than 800 million. The increased incidence of serious complications, socioeconomic contexts, reduced quality of life and, last but not least, increased mortality in the obese population make this disease one of the serious global health problems of the civilized society of the whole world [3]. In Europe, 44.7% of men and 30.5% of women are overweight or obese, but the incidence of obesity in women increases after menopause. Obesity in women significantly increases the risk of cardiovascular diseases. Body fat distribution also differs between men and women. Visceral obesity predominates in men, abdominal obesity develops more often in women, although some works show that chronic psychosocial stress and drinking alcoholic beverages cause visceral obesity in women.

Dyslipidemia – high levels of low-density lipoprotein and high cholesterol levels have a negative impact on cardiovascular disease equally in both sexes. They increase the same for men and women after the age of 20, but men have lower values than women at a younger age, and women's cholesterol levels increase after menopause. In postmenopausal women, higher levels of low-density lipoprotein cholesterol are associated with a shift to more atherogenic, smaller, and denser particles and are therefore considered a more serious risk factor than in men. Dyslipidemia represents one of the most serious risk factors for cardiovascular disease. The risk of ischemic heart disease increases continuously with increasing cholesterol concentration. Already from a total cholesterol concentration of 3.9 mmol/l, at a cholesterol concentration [10].

Diabetes mellitus is a heterogeneous group of metabolic diseases characterized by hyperglycemia and a high risk of developing chronic micro- and macro-vascular complications. Type 2 diabetes mellitus is one of the first manifestations of the metabolic syndrome, and its prevalence and incidence is increasing globally, among other factors, due to obesity, physical inactivity and aging, hand in hand with genetic predisposition. According to a meta-analysis [4], pooled estimates of the relative risk of death from coronary heart disease associated with diabetes increased threefold to fivefold in women compared with men. Women with type 1 diabetes mellitus have up to a 40% greater risk of mortality than men with type 1 diabetes mellitus from all causes and twice the risk of both fatal and nonfatal vascular events. Women with type 2 diabetes have poorer glycemic control and higher mortality than men. They develop type 2 diabetes is usually preceded by prediabetes, which manifests itself as increased fasting blood glucose or impaired glucose tolerance. Prediabetes is considered a disease that significantly increases the risk of cardiovascular complications and requires treatment [9].

Table 2. Criteria for establishing the diagnosis of diabetes and other disorders of glucose tolerance (Source: Tuka, 2018)

Disorder of glucose homeostasis	Glycemia in venous plasma	Mmol/L
<b>Diabetes mellitus</b>	Fasting glycemia – eight hours without eating	$\geq 7.0$
	Glycemia after two hours during oGTT	$\geq 11.1$
	Random glycemia detected at any time during the day	$\geq 11.1$ – thirst, polyuria, polydipsia
<b>Prediabetes</b> Impaired glucose tolerance Increased fasting glucose	Glycemia two hours after glucose administration during oGTTG	7.8–11.0
	Fasting glycemia	5.6–6.9

Lack of physical activity is one of the main risk factors for mortality worldwide, responsible for 3.2 million deaths each year. It is a key risk factor in the development of cardiovascular diseases, cancer and diabetes. People who engage in sufficient physical activity have a 20-30% lower risk of death compared to people who do not exercise enough. A large prospective study in women and men showed that a lower level of physical fitness is associated with a 4.7-fold increased risk of myocardial infarction and stroke, independent of other cardiovascular risk factors [2]. In a study of nurses [7], two aspects were particularly important: brisk walking

provided the same benefit as vigorous exercise, and women with a sedentary lifestyle who became active later had the same benefits as those who remained active throughout life.

#### Psychosocial factors

Depression doubles the risk cardiovascular diseases. Possible mechanisms are an imbalance in the autonomic nervous system, activation of platelets and the coagulation system. In addition, patients with depression have a worse adherence to treatment and to medical interventions in general have a less healthy lifestyle.

Anxiety is very common in patients with cardiovascular disease. The presence of anxiety after an acute coronary event leads to the development of depression in the following months.

Work stress is common for every person. Workers who are exposed to high stress at work have a 23% higher cardiovascular morbidity. With higher work stress, higher average systolic blood pressure by 1.8-11 mm Hg and higher diastolic blood pressure by 0.8-17.9 mm Hg are documented, which normalize when work stress is reduced. 3-4 hours of overtime work, working 11-12 hours a day is associated with an increase in the risk of fatal and non-fatal cardiovascular events by 67% [10]. Psychosocial factors, stress management, anxiety and depression are more closely associated with cardiovascular diseases in women than in men. Depression acts as both a cause and a consequence of cardiovascular causes and is often present in women during menopause. Marital and family stress negatively affect mortality and ischemic heart disease in women [6].

#### **Specific risk factors for cardiovascular disease in women**

Gender-specific risk factors related to hormonal and reproductive status that influence the risk of cardiovascular disease in women. These risk factors are related to hormonal status, pregnancy, some non-cardiac diseases with a higher prevalence in women and their treatment.

Negative consequences of pregnancy. Hypertension occurs in 10% of all pregnancies and is involved in a significant number of maternal deaths. Hypertension occurring during pregnancy causes a double risk of cardiovascular disease in women in the future, depending on the severity of hypertension during pregnancy [4]. Up to 40% of preeclamptic women develop hypertension before age 40, an average of 7.7 years earlier than women with normal pregnancies. Preeclampsia accepted as a specific risk factor for women in the European Society of Cardiology prevention in 2016. More than 75% of women with preeclampsia have a positive family history of cardiovascular disease. In several population studies, repeated abortions have also been shown to increase the risk of ischemic heart disease and other manifestations of cardiovascular disease. Gestational diabetes is up to a seven-fold higher risk of future diabetes and the development of metabolic syndrome.

Premature menopause, natural or surgical, at the age of less than 40 years it is associated with an increased risk

of cardiovascular diseases. Each year of delay in menopause reduces the risk of death from cardiovascular disease by 2%. 1% of women at the age of 40 are diagnosed with spontaneous ovarian insufficiency, which is associated with an earlier onset of endothelial dysfunction and ischemic heart disease.

Breast cancer treatment – cardiotoxicity. Over the past decades, the survival of breast cancer patients has improved dramatically. The negative side of this success is the late cardiotoxicity of current therapeutic procedures. Preexisting cardiovascular risk factors and cardiovascular disease increase susceptibility to cardiotoxicity during chemotherapy and radiation. Cardiotoxic effects of antineoplastic agents may be related to irreversible loss of cardiomyocytes and/or reversible myocardial damage [9].

#### **Conclusions**

Cardiovascular diseases and ischemic heart disease represent a number of manifestations and stages of these diseases. An important role is played by the time factors of the onset of the disease, the method of therapy and the transition to chronicity. The condition in the acute phase of a myocardial infarction is assessed differently and the long-term unfavorable condition in the chronic stage of the disease. It should be remembered that typical symptoms of ischemia and myocardial infarction in the sense of typical symptoms – angina pectoris occur in both sexes. However, more women than men report symptoms that are classified as atypical. In many women, the symptoms of ischemia are quite often milder and they may lack any chest-related symptoms, or their symptoms may be misdiagnosed as chest discomfort. Symptoms can be less noticeable or specific. Shortness of breath, indigestion, nausea, vomiting, sweating, dizziness or general weakness can dominate.

Behind the differences in the clinical manifestation and prognosis of women with ischemic heart disease are numerous anatomical and physiological factors that are different in men and women. Currently used risk scoring systems and discriminatory values of various biomarkers are derived from the study of a population with a predominance of the male gender. Women face discrimination in a certain way in fulfilling their specific needs for the prevention and treatment of cardiovascular diseases.

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Дата надходження рукопису до редакції: 28.07.2022 р.

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Risk factors specific to women such as hypertension in pregnancy, premature births, gestational diabetes and menopause are among the unique aspects of cardiovascular health in women.

**Objective:** Women of childbearing age were considered protected and CVD were considered male diseases. A report from the European Heart Health Strategy (EuroHeart) finds that women are less likely to receive the same preventive advice as men and that women are still underrepresented in cardiovascular research

Risk factors are important for both men and women, but differ their impact was stronger in men and women. Especially in women, the presence of diabetes, hypertension and smoking is associated with a higher risk than in men. Female sex-specific risk factors related to hormonal and reproductive status that affect the risk of cardiovascular disease in women. These risk factors are related to hormonal status, pregnancy, some non-cardiac diseases with a higher prevalence in women and their treatment.

**Conclusions.** To improve the care of women with cardiovascular disease, it is necessary to realize that the diagnosis of acute coronary syndromes can be problematic in women due to differences in symptoms. and presenting symptoms. At the same time, it is necessary to understand the importance of specific approaches in the diagnosis, treatment and prevention of CVD in women.

**Key words:** cardiovascular diseases, risk, women, prevention.

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Фактори ризику, характерні для жінок, такі як гіпертонія під час вагітності, передчасні пологи, гестаційний діабет і менопауза, є одними з унікальних аспектів здоров'я серцево-судинної системи у жінок.

**Мета:** жінки дітородного віку вважалися захищеними, а серцево-судинні захворювання – характерними для чоловіків. У звіті Європейської стратегії здоров'я серця (EuroHeart) показано, що жінки рідше отримують ті ж профілактичні поради, що й чоловіки, і що жінки все ще недостатньо представлені в дослідженнях серцево-судинної системи.

Фактори ризику важливі як для чоловіків, так і для жінок, але відрізняються тим, що їхній вплив був сильнішим у чоловіків і жінок. Особливо у жінок наявність діабету, гіпертонії та куріння пов'язані з вищим ризиком, ніж у чоловіків. Фактори ризику жіночої статі, пов'язані з гормональним і репродуктивним статусом, які впливають на ризик серцево-судинних захворювань у жінок. Ці фактори ризику пов'язані з гормональним статусом, вагітністю, деякими несерцевими захворюваннями, які частіше зустрічаються у жінок, та їх лікуванням.

**Висновки.** Щоб покращити допомогу жінкам із серцево-судинними захворюваннями, необхідно усвідомлювати, що діагностика гострих коронарних синдромів може бути проблематичною у жінок через різницю в симптомах і прояві цих симптомів. Водночас необхідно розуміти важливість специфічних підходів у діагностиці, лікуванні та профілактиці ССЗ у жінок.

**Ключові слова:** серцево-судинні захворювання, ризик, жінки, профілактика.

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**Конфлікт інтересів:** відсутній.

**Conflicts of interest:** absent.

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