Baština Akademije nauka i umjetnosti Bosne i Hercegovine

# Cardiovascular diseases and oral health – the impact of pregnant women’s oral health on children’s cardiovascular health

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# Chapter III
# RISK FACTORS FOR CARDIOVASCULAR DISEASES AND PUBLIC HEALTH INTERVENTIONS, PREVENTIONS AND CONTROL

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## Introduction

Morbidity and mortality from cardiovascular diseases (CVD) is still the leading public health challenge worldwide. Although WHO data indicate the decline in CVD mortality in the last few decades, there is still a lot of work to be done by national health care systems on the way to a healthier community. How quickly and successfully human lives will be saved from premature death from CVD, and thus improve health and quality of life depends on many internal and external factors in healthcare sector.

Key measures of internal healthcare sector are systematic approach to the implementation of preventive measures on all levels of healthcare, available diagnostics and therapy, and motivating people to adopt healthy lifestyle habits. An integrated approach to prevention and control of CVDs is achieved through combination of efficient pharmacological and non-pharmacological treatments.

According to the professional literature, it has been confirmed that three quarters of CVD cases and deaths are preventable, which is a fact that places a special importance of public healthcare interventions. Cardiovascular disease is most often caused by a combination of several different risk factors that we can control such as diet, physical activity, obesity, smoking, high blood pressure, high cholesterol, and diabetes.

To help member states, the World Health Organization (WHO) has adopted several relevant documents that should be used to develop national strategies and action plans for the prevention and control of cardiovascular disease.

In 2012 the European Society of Cardiology (ECS) drew up guidelines for cardiovascular risk management, which were reviewed in 2016, and in which

recommendations were given to member states on the method for estimating overall cardiovascular risk using SCORE table – the absolute 10-year risk estimation of fatal CVD. With regard to presence of certain risk factors, the 10-year CVD mortality risk can be low, moderate, high and very high.

The European Society of Cardiology (ECS) guidelines on the use of the SCORE method for CVD risk assessment are used and applied in Bosnia and Herzegovina.

During 2017-2018 the project "Developing and Advancing Modern and Sustainable Public Health Strategies, Capacities and Services to Improve Population Health in Bosnia and Herzegovina" was developed and implemented by the Entity Institutes of Public Health (Institute of Public Health of the Federation of BiH, Public Health Institute of the Republic of Srpska), in cooperation with the Ministry of Health of entities and the Department for Health of Brčko District, and in cooperation with the WHO Office in Bosnia and Herzegovina, which was jointly supported by the Swiss Agency for Development and Cooperation (SDC) and World Health Organization (WHO).

Within component 2 of the Project entitled: Adaptation/development of instruments, materials and indicators sets for implementing, monitoring, and evaluating interventions in the field of cardiovascular risk assessment and management (CVRAM), guidelines for prevention and control of CVD risk factors were published, intended for Family Medicine Teams in the Federation of BiH, Republic of Srpska and Brčko District.

Like its neighboring countries, Bosnia and Herzegovina has high CVD morbidity and mortality rate which is closely related to the exposure and combined effects of multiple risk factors related to people's habits and lifestyle and the way they use health services.

In order to reduce CVD mortality rate in Bosnia and Herzegovina it is necessary to further strengthen preventative systemic measures and control risk factors in health sector, which should be supported by intersectoral interventions to promote health and motivate community to change their lifestyle and health-related choices.

## Cardiovascular disease as a global and regional challenge

Cardiovascular diseases are the leading cause of death globally even though research shows that 80% of premature death from CVD is preventable by

controlling leading risk factors such as smoking, unhealthy diet and physical inactivity.

According to the data provided by the World Health Organization (WHO), cardiovascular diseases (CVD) account for 17.9 million deaths annually, which accounts for 31% of the total number of deaths globally. Cardiovascular diseases are equally represented in both sexes which relates to their lifestyle and risk factors. The only difference is recorded between countries in terms of the organization of healthcare system and availability of preventative healthcare, with 80% of CVD mortality occurring in low- and middle-income countries. (1)

According to the WHO, cardiovascular diseases are a group of disorders of the heart and blood vessels including coronary heart disease, cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, congenital heart disease, deep vein thrombosis and pulmonary embolism. (1–3).

## Risk factors for the development of cardiovascular diseases

There are many proven risk factors associated with the development of coronary heart disease and stroke. Most authors distinguish between modifiable, non-modifiable and other CVD risk factors. Cardiovascular diseases are rarely caused by the action of one single risk factor. It is most often caused by the combination of different risk factors, with certain combinations of risk factors increase the overall mortality and morbidity risk more than others.

Exposure to single risk factor does not automatically mean the development of CVD, but presence of several risk factors, which is usually the case, increases the chances of CVD morbidity and mortality if necessary measures are not taken to change patient's behavior followed by interventions of suitable therapy and monitoring. (4,5)

CVD mortality rate could be significantly reduced by a systemic approach to lifestyle changes and proper healthcare use. Reducing the cardiovascular risk of the population by just 1% would prevent approximately 25 000 new cases of cardiovascular diseases. The last three decades have seen a global decline in CVD mortality rate for more than half which is attributed to the shift in population levels of cholesterol, blood pressure and smoking. However, this favorable trend has been partially offset by an increase in other risk factors, mainly obesity and type 2 diabetes mellitus. (4)

American Heart Association (AHA) defines factors for assessing cardiovascular health and determining cardiovascular risk. Risk factors are grouped into modifiable, which you can changed throughout the course of life, and

non-modifiable which one should know and keep under supervision and control. (5)

**Modifiable CVD risk factors:**

- physical inactivity,
- smoking,
- alcohol abuse,
- unhealthy diet,
- high blood cholesterol,
- high blood pressure/hypertension,
- obesity and overweight.

### *Physical inactivity*

Lack of physical activity increases the risk for developing many diseases such as diabetes, malignant neoplasms, osteoporosis, and cardiovascular diseases. In fact, lack of physical activity has a negative effect on the CVD mortality, regardless of age, gender, and the presence of underlying cardiovascular disease or not. Results of recently conducted meta-analysis of 36 prospective studies on over 3 million participants during a period of 12 years showed that implementing WHO recommendations on regular physical activity decreased CVD mortality by 17%. (6)

### *Smoking*

Smoking is the most important preventable cause of death globally and modifiable risk factor for development of CVD. Smoking leads to a wide range of diseases and disorders and is associated with 50% of preventable diseases globally, half of which are CVD. Smokers are at twice the risk of developing CVD than are non-smokers, and that risk increases with the number of cigarettes smoked per day and duration of use. It has been proven that nonsmokers who are exposed to secondhand smoke increase their risk of developing CVD by 30%. (7)

The risk of developing coronary heart disease increases 6-fold in women and 3-fold in men who smoke an average of 20 cigarettes per day compared to people who never smoked. The risk of coronary heart disease increases with the number of cigarettes smoked per day. The risk of recurrent heart attack is reduced by 50% following cessation and is equalized with the risk of a nonsmoker within two years. (8)

Harmful chemicals in cigarette smoke significantly accelerate the development of atherosclerosis. Various studies have found that carbon monoxide (CO) and nicotine effects blood vessels. Hemoglobin binds carbon monoxide 245 times easier than with oxygen, resulting the formation of carboxyhemoglobin. The inability to transport oxygen causes hypotension of vascular endothelium and faster buildup of fatty plaques and atheroma formation. Ingredients of tobacco smoke cause and increase in blood pressure, heart rate, increase in adhesion and platelet aggregation, increase in blood carboxyhemoglobin concentration and atheroma formation, increase in free fatty acids concentration, serum total cholesterol and LDL cholesterol, reduces HDL cholesterol and increase fibrinogen concentration. One year after smoking cessation, CVD risk is reduced by 50%, and within 15 years the risk declines to the level of a non-smokers. (9)

### *Alcohol abuse*

Several studies show that moderate drinking is cardioprotective, based on which the consumption of alcohol should be limited to 20g of alcohol per day for men (2dcl of wine/day), and 10g of alcohol per day for women 1dcl of wine/day). This amount is slightly lower for women due to variations in enzymes involved in alcohol metabolism.

However, it should be emphasized that alcohol use affects cardiovascular system by increasing systolic and diastolic blood pressure, speeds up the pulse, has an arrhythmogenic effect on the heart, and in some people raises HDL cholesterol and triglycerides. When consumed in excess, alcohol contains a lot of calories, approximately 7 kcal/g which are called “empty calories” because of the lack of the essential nutrients (vitamins, minerals, essential amino acids) which is something one should consider in order to prevent and control excessive weight. (10).

### *Unhealthy diet*

Term “faulty diet” implies inadequate energy value intake of food, the incorrect methods of food preparation and meal timing. Especially problematic nowadays are “modern” habits of fast food and energy intensive food consumption. Unhealthy diet contributes to the development of atherosclerosis, arterial hypertension, ischemic heart disease, cerebrovascular stroke, heart failure, obesity, dyslipidemia, type 2 diabetes, and various forms of malignant neoplasms and many other diseases. Unhealthy eating habits including the

excessive intake of salt, fats, sugar, cured meat and red meat, and insufficient intake of vegetables and fruits, white meat, and fish, are responsible for more than 20% of cardiovascular diseases globally. (11, 12)

### *High blood cholesterol*

Increased cholesterol levels are associated with the third of all heart and blood vessel diseases and strokes globally. Cholesterol includes HDL ("good") cholesterol, LDL ("bad") cholesterol and high triglycerides. Lipids, especially cholesterol and triglycerides, are substances that are insoluble in water and are bound to certain big proteins, thus forming lipoproteins that are used to transport them into blood. Protein component is called apolipoproteins or apoprotein.

In dyslipoproteinemia, risk factors for coronary heart disease include level of total and LDL cholesterol in blood, low level of HDL cholesterol, increased total to HDL cholesterol ratio and hypertriglyceridemia. According to some research, dyslipidemia accounts to 49%. (13)

### *High blood pressure – hypertension*

High blood pressure is the most important risk factor for stroke and leading cause of half of all diseases. According to INTERHEART study, high blood pressure represents 18% of attributable risk for development of first myocardial infraction. Systolic and diastolic blood pressure are equally important in the development of coronary heart disease, and isolated systolic hypertension is one of the main risk factors for the development of cardiovascular and cerebrovascular events. Elevated vascular tone, which is a result of hypertension, can lead to endothelial dysfunction, and thus to the release of vasoconstrictive and thrombogenic factors and lead to acute or chronic coronary heart disease.

It is of utmost importance to monitor and control hypertension in patients with pre-existing coronary heart disease. Epidemiological studies show that the risk of developing cardiovascular disease rapidly increases with an increase in pressure above 110/75 mmHg, similar as in patients with already developed coronary heart disease. (14, 15).

### *Obesity and overweight*

Obesity and being overweight raises the risk of high blood pressure, diabetes and blockage of blood vessels.

Regular control of the body mass index (BMI) (the ratio of body weight in kilograms and the square of height in meters, kg/m2) is important A BMI of 18,5–24,9 shows that a person has an average level of health risk for the development of obesity. On the other hand, a BMI of 25 and higher indicates that a person has increased health risk for the development of obesity. (11)

In addition to the increased body weight, a significant risk factor is abdominal obesity, measured by waist circumference. Values greater than 94 cm and 80 cm for men and women respectively represent a health risk, while values greater than 102 cm and 88 cm for men and women respectively represent a very high health risk.

## Non-modifiable risk factors

***Family history*** – if a family member (parents, siblings) develops heart disease before the age of 55 in males and before the age of 65 in females, the risk of developing CVD increases.

***Age*** – the risk of developing CVD every decade after age 55, especially if combined with some of the modifiable risk factors.

***Gender*** – men have a higher risk of developing CVD than women who have not yet entered menopause. After entering menopause, this risk is the same for women. The risk for stroke is the same for both men and women. According to some research, the total cardiovascular risk, both fatal and non-fatal CVD events, is three times higher than the risk of fatal CVD event (SCORE) in men. The risk of fatal CVD event in women is four times higher and in elderly people, who are more likely to die from the first cardiac event, the risk is approximately three times higher. (13).

### *Diabetes*

Insulin resistance, hyperinsulinemia, and elevated glucose levels have been associated with coronary heart disease. People with diabetes are twice as likely to have heart disease than people without diabetes. According to the Copenhagen City Heart Study, relative risk of having an incident myocardial infarction or stroke is increased 2- to 3-fold in persons with diabetes type 2, and the risk of death is increased 2-fold, independent of other known risk factors for cardiovascular diseases. (16) According to the results of INTERHEART study, there is a 10% attributive risk of developing the first myocardial infarction in people with diabetes. Patients with diabetes often have other diseases that are associated risk factors for coronary heart disease,

such as obesity, hypertension, hyperlipoproteinemia, and elevated fibrinogen levels. (16, 17)

## Other risk factors

***Socioeconomic status*** – lower socioeconomic status (poverty) and social exclusion are associated with an increased risk of cardiovascular diseases and stoke. (12, 13)

### *Chronic stress*

Long-term exposure to stressful situations has a negative effect on multiple organ systems (vascular, nervous, immune, etc.). Numerous studies have shown the connection between stress and increased frequency of CVD, but there are differing opinions on the pathogenesis of this process and connection with the development of CVD. Certain research suggests that chronic stress can lead to an increase in blood pressure, heart arrhythmia and an increase in frequency, an increase in fibrinogen and circulating levels of inflammatory cytokines. Stress reduces the blood flow to the heart, which can cause the heart to malfunction, increasing the tendency for blood clots to form. People under chronic stress who have more frequent acute elevated blood pressure have higher risk of developing arterial hypertension, and other CVD. (18)

## Prevention of cardiovascular diseases (CVD)

Prevention is a process aimed at helping people cope with life's necessities in order to avoid behaviors that could lead to negative physical, psychosocial, or social consequences on health, and do so through expansion of knowledge, competencies and skills, and support systems in family, school, workplace and healthy community environment. (19)

Prevention science developed by strengthening the preventive approach in healthcare, which is defined according to various authors as: "Knowledge broadening and interventions on prevention influenced the formulation of prevention as a separate discipline" (*Coie, 1993*), or as: "Multidisciplinary science that encompasses medicine, psychology, sociology, political science, social work, economics, marketing" (*Durlak, 1997*) or "Identification of risk factors that influence prevalence of certain diseases and disorders, and establishing community-based prevention systems" (*Hawkins, 2001*).

Prevention of CVD is defined as a coordinated pool of activity at the population level or individual level with the aim of eliminating or reducing to the lowest level of CVD incidence and their consequences. (20)

Prevention is traditionally divided into primary, secondary, and tertiary prevention which is largely applicable in the case of CVD.

***Primary prevention*** is based on efficient prevention of disease before any significant health damages were done and is based on health promotion and disease prevention. It is a set of activities aimed at eliminating or reducing risk factor exposure at individual and population level, before CVD develops, i.e., reducing the exposure to single and/or combined risk factors by motivating lifestyle change.

Foundation of primary prevention of CVD at individual level should include avoiding risk factors and lifestyle changes by having healthy eating habits and healthy diet, cessation of smoking and alcohol use, and regular physical activity. Primary prevention of CVD at population level should be done by promoting healthy community lifestyle, informing and educating the population. (21)

***Secondary prevention*** is activities aimed at early identification of health problems in individuals and population. It is based on early treatment and prevention of CVD consequences. The aim of these activities is early diagnosis at the presymptomatic stage of disease by focusing on reducing inequalities in access to health care services. (21)

Experience shows that a combination of population-wide and individual approach is the most effective approach for CVD prevention, whereby population-wide approach is aimed at people with low or moderate level of CVD risk, and individual approach is aimed at people with high level of CVD risk.

In the context of CVD, the difference between primary and secondary prevention is not clearly formulated due to the synergistic effect of all measures aimed at the same goal – education on modifiable risk factors has positive effect on disease prevention in healthy population and a milder disease progress in patients with diagnosed CVD. (22)

***Tertiary prevention*** is a set of activities aimed at reducing the effects of CVD, premature death and disability.

Investing in prevention is an investment in the health of the population, which has been confirmed and stated in the literature according to which elimination of risk factors, including unhealthy lifestyle, allows for prevention of at least 80% of CVD mortality and morbidity cases (22-24)

European Society of Cardiology (ESC) defines prevention of cardiovascular disease as: "A coordinated set of actions, at the population level or targeted at an individual, which are aimed at eradicating, eliminating or minimizing the impact of CVDs and their related disabilities." (25, 26)

## Preventative and therapeutic interventions of CVD at individual level

According to European Society of Cardiology ECS, basic guidelines for intervention and prevention goals of CVD should focus on regular control, early diagnosis, monitoring, and treatment of key CVD risk factors. (25, 26) (Table 1)

*Table 1. Prevention guidelines for CVD, ECS, 2016.*

| Risk factor | Recommendation/intervention |
|---|---|
| Smoking | Smoking cessation or using any tobacco products. No exposure to tobacco in any form. |
| Diet | Healthy diet low in saturated fat with a focus on whole grain products, vegetables, fruit, and fish. |
| Physical activity | At least 150 min moderately vigorously physical activity per week (30 min 5 days/per week) or 75 min intensive physical activity per week (15 min 5 day/per week) or combination. |
| Body weight | BMI 20-25 kg/m$^2$. Waist circumference <94 cm (men) and <80 cm (women). |
| Blood pressure | <140/90 mmHg. This BP is general goal. The BP target can be higher in older people, or lower in most patient with type 2 diabetes mellitus and in some high-risk patients without diabetes who can tolerate multiple antihypertensive drugs. |
| Lipids | |
| LDL | Very high-risk: LDL <1,8 mmol/l (70-135mg/dL) or a reduction of at least 50%.<br>High-risk: LDL <2,5 mmol/L (<100mg/dL) or a reduction of at least 50% (2,6–5,2 mmol/L).<br>Low to moderate risk: <3,0 mmol/L (<115 mg/dL). |
| HDL | No target, but >1,0 mmol/L (>40 mg/dL) in men and >1,2 mmol/L (>45mg/dL) in women indicates lower risk. |
| Triglyceride | No target but < 1,7 mmol/L (<150 mg/dL) indicates lower risk and higher levels indicate a need to look for other risk factors. |
| Diabetes | HbA1c < 7%. (< 53 mmol/mol) |

*Source: Adapted according to ECS, 2016.*

Systematic CVD risk assessment is recommended in people with high CVD risk, such as positive family history of sudden and premature death, familial hyperlipidemia, smoking, hypertension, diabetes mellitus or elevated lipid levels, and/or comorbidities that increase CVD risk.

It is recommended to repeat CVD risk assessment every five years, and even more often if the person has very high risk and requires medical treatment.

Systematic CVD risk assessment should be considered in both adult men >40 years of age and in women >50 years of age or postmenopausal without known CVD risk factors. (25,26)

The 2016 ESC Guidelines formulate recommendations and healthy dietary energy balance in relation to diet as one of the most significant risk factors for development of CVD. (Table 2)

*Tabela 2. Preporuke za zdravu ishranu, ECS, 2016. god.*

| Healthy Diet recommendations |
|---|
| Saturated fatty acids to account for <10% of total energy intake, through replacement by unsaturated fatty acids |
| **As little trans unsaturated fatty acids as possible. No intake of processed foods preferable, <1% of total energy intake of natural origin** |
| <5 g of salt per day |
| 30-45 g of fiber per day, from wholegrain products. |
| >200 g of fruit per day (2–3 servings) |
| >200 g of vegetables per day (2–3 servings) |
| 30 g of unsalted nuts per day |
| Fish at least once or twice a week |
| Consumption of alcoholic beverages should be limited to 2 glasses per day (20 g/per day) for men and 1 glass per day (10 g/per day) for women |
| Limited intake/avoid sugary nonalcoholic sodas |

*Source: Adapted according to ECS, 2016*

Regarding the treatment of hypertension as one of the leading risk factors for CVD, the 2016 ESC Guidelines define a therapeutic guidance for all conditions that occur in comorbidity for cardiovascular risk. (25, 26) (Table 3)

*Table 3: Treatment protocol for conditions associated with hypertension, ECS, 2016*

| Condition/disease | Therapy |
|---|---|
| Asymptomatic organ damage | |
| LVH | ACE-I, calcium antagonism, ARB |
| Asymptomatic atherosclerosis | calcium antagonism, ACE-I |
| Microalbuminuria | ACE-I, ARB |
| Renal failure | ACE-I, ARB |
| CVD | |
| Previous stroke | Any effective BP lowering drug |
| Previous MI | β-blockers, ACE-I, ARB |
| Angina pectoris | β-blockers, calcium antagonism, |
| Heart failure | diuretics, β- blockers, ACE-I, ARB, receptor antagonists mineralokortikoida |
| Aortic aneurysm | β-blockers, |
| Atrial fibrillation: prevention | Consider ARB, ACE-I, β- blockers or mineralocorticoid-receptor antagonists |
| Atrial fibrillation: rate control | β-blockers, non-dihydropyridine calcium antagonists (Calcium channel blockers) |
| ESRD/proteinuria | ACE-I, ARB |
| Peripheral arterial disease | ACE-I, calcium antagonism |
| Other conditions | |
| ISH (older) | diuretics, calcium antagonism, |
| Diabetes mellitus | ACE-I, ARB |
| Pregnancy | Methyldopa, β-blockers, calcium antagonism |

*Source: Adapted according to ECS, 2016*

*ACE-I = angiotensin-converting enzyme inhibitor; ARBs = angiotensin receptor blockers; BP =blood pressure; CV = cardiovascular; diuretics = thiazide and thiazide-like diuretics; ESRD = end-stage renal disease; ISH = isolated systolic hypertension; LVH= left ventricular hypertrophy; MI = myocardial infarction*

According to the European Society of Cardiology (ESC), guidelines for interventions and goals of CVD prevention should focus on regular assessment, early diagnosis, monitoring and treatment of serum LDL levels. (25, 26) (Table 4)

*Table 4: Recommendations for treatment of cardiovascular risk (SCORE) with regard to serum concentration of LDL, ECS, 2016.*

| Total CV risk (SCORE) % | Concentration of LDL cholesterol (mmol/L) | | | | |
|---|---|---|---|---|---|
| | < 1,8 | 1,8–2,49 | 2,5–3,99 | 4,0–4,89 | >4,9 |
| <1 | No intervention | No intervention | No intervention | No intervention | Lifestyle change, statin if no progress |
| >1 to <5 | No intervention | No intervention | Lifestyle change, statin if no progress | Lifestyle change, statin if no progress | Lifestyle change, statin if no progress |
| >5 do <10 or very high-risk | No intervention | Lifestyle change, statin if no progress | Lifestyle change, statin at once | Lifestyle change, statin at once | Lifestyle change, statin at once |
| >10 or very high-risk | Lifestyle change, consider statin | Lifestyle change, statin at once | Lifestyle change, statin at once | Lifestyle change, statin at once | Lifestyle change, statin at once |

*Source: Adapted according to ECS, 2016*

The ESC Guidelines for CVD prevention emphasize the importance of achieving and maintaining target LDL cholesterol level according to the following SCORE risk categorization:

- Very high risk: LDL-C goal of <1,8 mmol/L or a reduction of at least 50% if the baseline LDL-C is between 1,8 and 3,5 mmol/L.
- High risk: LDL-C goal of <2,6 mmol/L or a reduction of at least 50% if the baseline LDL-C is between 2,6 and 5,2 mmol/L.
- Moderate or low risk: LDL-C goal of < 3,0 mmol/L.

## Population-level CVD preventive interventions

### *Diet*

Relevant WHO documentation of best practice recommend that governments adopt appropriate legislative measures on food composition in order to reduce amount of salt, saturated fats, added sugars in food and beverages and limit portion sizes. The elimination of industrially produced trans fatty acids is recommended. A systematic approach to the policies and strategies of governments, NGOs, food industry, trade, catering industry, schools, working places and other stakeholders is recommended to promote healthy eating and prevent overweight and obesity.

Legislation restricting child-centered marketing is also recommended - foods high in fat, sugar and/or salt, fast food, alcoholic beverages and non-alcoholic sugar-sweetened beverages (e.g., on television, the Internet, social media and on food packaging).

There are also important recommendations related to regulation of food labeling, according to which mandatory and harmonized labeling of nutrients is recommended.

As for economic measures, food pricing and subsidies are recommended to promote healthier food and beverage choices and to pass laws on taxes on foods and sugar-sweetened beverages and saturated fats, as well as alcoholic beverages. (21–26)

### *Physical activity*

In order to promote physical activity, it is recommended to increase equipment availability and different types of school playgrounds and equipment for exercise and sports, revise curriculum which would include more hours of physical education classes and health education.

Adequate urban planning solutions are recommended in terms of better accessibility of recreational facilities and facilities for physical activity (e.g., construction of parks and playgrounds, after-hours use of school facilities).

Popularization of physical activity through targeted media and educational campaigns using various dissemination channels.

As for economic measures, the increase of gasoline taxes to increase active transport is recommended, tax incentives encouraging tax cuts for individuals to purchase exercise equipment or health club/fitness memberships, as well as tax incentives to employers to offer comprehensive worksite wellness programs and healthy nutrition. (21–26)

### *Smoking*

In order to protect the population from exposure to tobacco smoke, it is recommended to pass laws banning smoking and consumption of all types of tobacco products in enclosed workplaces and public spaces, followed by effective inspections and sanctions.

Reducing the availability of tobacco products should be regulated by enacting laws banning sales and serving of all types of tobacco products to persons under 18 years of age accompanied by effective inspections and sanctions.

In order to eliminate tobacco advertising, it is recommended that a comprehensive ban on all tobacco advertising, promotion and sponsorship by the tobacco industry is introduced.

Media and education campaigns aimed at smoking cessation are of the utmost importance since they prevent smoking and promote quitting and reduce secondhand smoke exposure by promoting smoke-free spaces.

To motivate smoking cessation, it is necessary to increase the availability of efficient and standardized smoking cessation services within the healthcare system, especially at the level of primary healthcare/family medicine and public health. It is also recommended to introduce telephone and internet lines for smoking cessation counseling and support services.

Adopting a law regulating the introduction of graphic and written warnings on the outer packaging of all types of tobacco products.

As for economic measures, raising taxes on all tobacco products is recommended since it is the most cost-effective solution for reducing tobacco use among children and youth. (21–26)

### *Alcohol*

Reduction in the availability of alcoholic beverages should be regulated by a law banning the sale and service of all types of alcoholic beverages to adolescents (under the age of 18), accompanied by effective inspections and sanctions.

In order to eliminate the promotion of alcoholic tobacco products, it is recommended to pass a law that introduces comprehensive ban on alcohol advertising and promotion, as well as sponsorship by alcohol drinks companies.

It is necessary to increase the availability of efficient and standardized alcohol withdrawal services within the healthcare system.

Regarding economic measures, adopting laws and policies that allow raising taxes on all alcoholic products is recommended since it is the most cost-effective solution for reducing alcohol consumption among children and youth. (21–26)

## The WHO global action plan for CVD prevention and control

With the aim of achieving global response to CVD, WHO prepared a “Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020” in 2013 which was approved by WHO’s 194 member countries.

This document is based on nine voluntary global targets, including the reduction of premature mortality attributed to NCD by 25% by 2025. (23)

Within the scope of WHO's aim to reduce premature mortality to CVD by 25%, special attention is paid to individual risk factors. Thus, the sixth goal is to reduce the global prevalence of arterial hypertension as one of the leading risk factors by 25%.

WHO data shows that the global prevalence of hypertension in adult men is 24.1% and 20.1% in women. Total number of adults with hypertension significantly increased from 594 million in 1975 to 1.13 billion in 2015, with the increase seen largely in low- and middle-income countries. (23)

Reducing arterial hypertension incidence is achieved through efficient measures of early diagnosis, monitoring and treatment followed by population-wide approach to reduction of behavioral risk factors such as alcohol consumption, physical inactivity, being overweight and obesity and salt intake.

The eight goal mentioned in the "Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020" predicts that at least 50% of population is eligible to receive drug therapy and counselling (including glycemic control). Prevention of heart attacks and strokes based on an effective unique approach to CVD risk is much more cost-effective than therapeutic measures which are based on individual risk factors and should be covered by primary health care. Achieving this goal is based on strengthening key components of the health care system, which include health care financing, ensuring access to health care services, and an essential medicine list for chronic noncommunicable diseases. (23)

It is significant to mention that in 2012, a European Guidelines on Cardiovascular Disease Prevention in Clinical Practice was published by the European Association for Cardiovascular Prevention and Rehabilitation (EACPR). It is based on the SCORE tables developed by WHO for calculating 10-year CVD morbidity and mortality based on age, sex, systolic blood pressure (mm Hg) and total cholesterol (mmol/L). (24)

In 2016, WHO published ECS Guidelines on Cardiovascular Disease Prevention which contained the updated version of CVD SCORE risk factor tables for certain WHO regions. (25, 26)

With the aim of providing support to governments to implement effective CVD control and prevention measures, the HEARTS Technical package was developed in 2018 by WHO in conjunction with Global Hearts Initiative and

US Centers for Disease Control and Prevention which comprises of six modules and an implementation guide. (27)

HEARTS is technical package provides a set of six recommended and effective interventions for strengthening the management of risk factors for CVDs in primary health care (PHC) as follows:

1. Healthy lifestyle (smoking cessation, healthy diet, physical activity, self-care)
2. Treatment protocols (procedures algorithms)
3. Access to health care (accessibility of health care services)
4. Health services management (diagnostics and control of risk factors)
5. Teamwork (decentralized, community-based care)
6. Systems for monitoring (patient data, medical documentation, program evaluation)

## Cardiovascular disease in Bosnia and Herzegovina

According to the data published by WHO country office for Bosnia and Herzegovina, chronic non-communicable diseases accounted for 94% of all deaths in 2016, out of which cardiovascular diseases accounted for 53%, cancers for 19%, diabetes for 7%, chronic obstructive pulmonary diseases (COPD) for 4%, 4% for injuries and 12% for other NCDs. Total premature mortality rate from NCDs in Bosnia and Herzegovina in 2016 was 36.300, of which 17.800 were men and 18.600 women. (28)

According to the same report, individual risk factors for CVD are significant among population, of which the most common are: hypertension accounts for 37% of the population, of which 38% men and 35% women, smoking accounts for 38% of population aged 15 and over, of which 47% men and 29% women, diabetes in adults accounts for 9%, of which 10% men and 9% women, physical inactivity accounts for 26%, and obesity accounts for 19%, of which 18% men and 21% women. (28)

Exposure to risk factors is related to the continuing trend of increased mortality rate from CVD in Bosnia and Herzegovina. According to the data by WHO, in the period from 2000 to 2016, there was an increase in the number of deaths from cardiovascular diseases, from 17,774 in 2000 to 20,279 in 2016, with a higher mortality rate from CVD recorded in women compared to men in each observed year. (29) (Table 5)

*Table 5. CVD mortality rate in BiH in the period from 2000 to 2016*

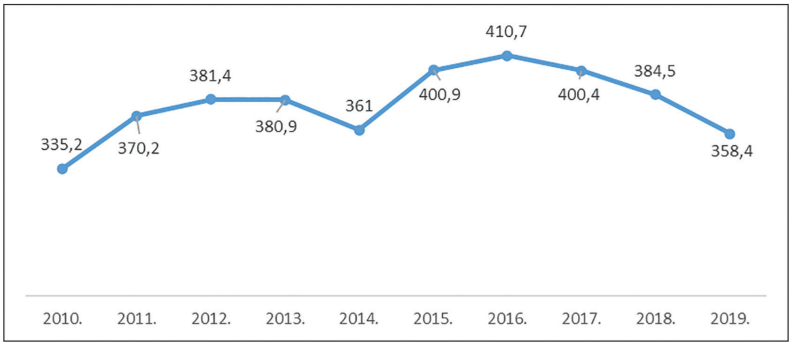
| Year | Total number of deaths | Males | Females |
|---|---|---|---|
| 2000 | 17774 | 8614 | 9160 |
| 2005 | 19965 | 9652 | 10313 |
| 2010 | 20095 | 9318 | 10777 |
| 2015 | 20044 | 9235 | 10809 |
| 2016 | 200279 | 9298 | 10982 |

*Source: WHO, 2017*

## Mortality rate from CVD in the Federation of Bosnia and Herzegovina

Like the neighboring countries, cardiovascular diseases are the leading cause of death in the Federation of Bosnia and Herzegovina, with recorded long-term upward tendency of standardized death rate (SDR) from cardiovascular diseases since 2010, and declining tendency in the period from 2016 to 2019. (30) (Graph 1)

*Graph 1: SDR from CVD per 100,000 persons,*
*Federation of Bosnia and Herzegovina, period from 2010 to 2019*



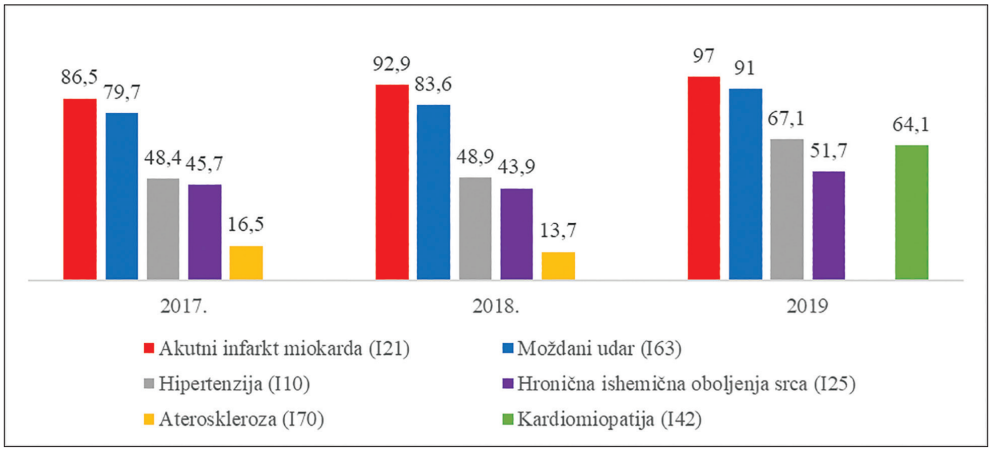

*Source: FBiH Public Health Institute, 2020*

Based on the 2020 Report of the FBiH Public Health Institute on health status of population and organization of healthcare institutions in 2019, the leading cause death in FBiH are circulatory system diseases accounting for 47,9%. (30)

Leading cause of death is acute myocardial infraction (I20) with 97,0 deaths per 100.000 persons. Stroke (I63) is the second leading cause of death with 91,0 deaths per 100.000 persons, and essential hypertension (I10) is on the third place with 67,1 deaths per 100.000 persons, followed by chronic

ischemic heart disease (I25) with 51,7 deaths per 100.000 persons and cardiomyopathy (I42) with 64,1 deaths per 100.000 persons. (30) (Graph 2)

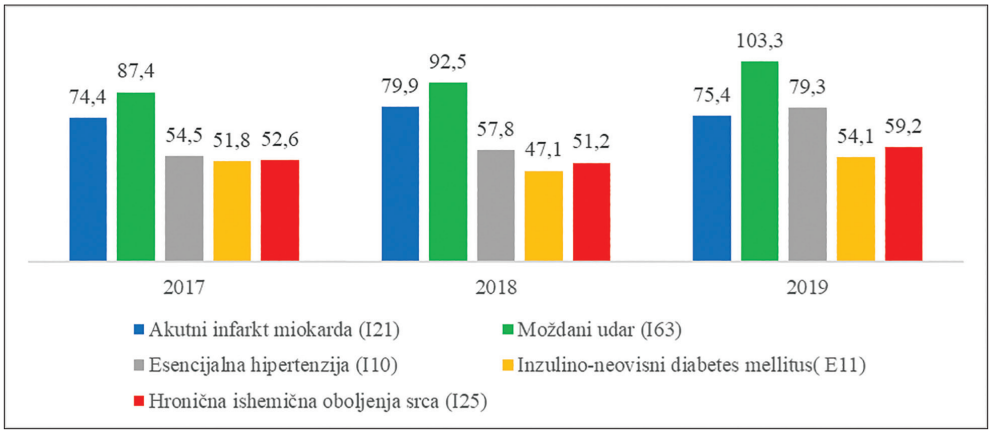
*Graph 2: Mortality rate from CVD per 100.000 persons in BiH, period from 2017 to 2019*




*Source: FBiH Public Health Institute, 2020*

Leading cause of death for women in 2019 was stroke (I63) with 103,3 deaths per 100.000 persons, and the second most common cause of death among women was essential hypertension (I10) with 79,3 deaths per 100.000 persons, followed by acute myocardial infarction (I21) with 75,4 deaths per 100.000 persons and chronic ischemic heart disease (I25) with 59,2 deaths per 100.000 persons. (30) (Graph 3)

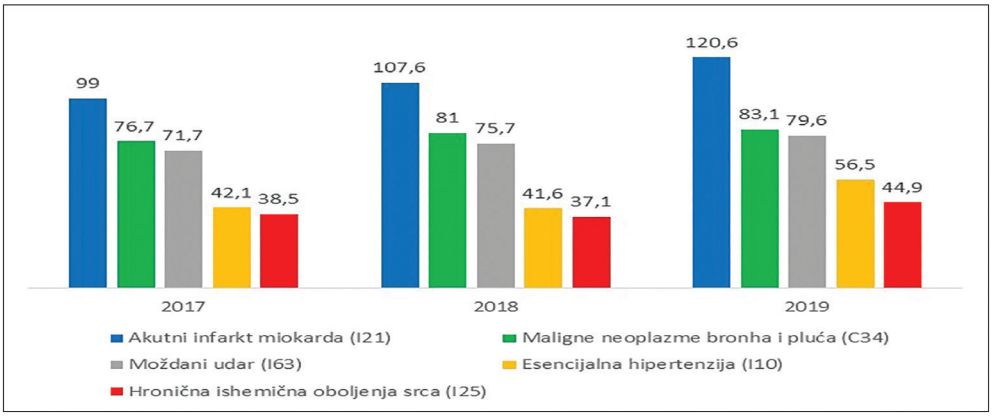
*Graph 3: Five leading causes of death among women in FBiH in the period from 2017 to 2019, mortality rate per 100.000 persons*




*Source: FBiH Public Health Institute, 2020*

The leading cause of death among men is acute myocardial infarction (I21), with 120,6 deaths per 100.000 persons, followed by stroke (I63), with 79,6 deaths per 100.000 persons, essential hypertension (I10), with 56,5 deaths per 100.000 persons and chronic ischemic heart disease (I25), with 44,9 deaths per 100.000 persons. (30) (Graph 4)

*Graph 4: Five leading causes of death among men in FBiH in the period from 2017 to 2019, mortality rate per 100.000 persons*




*Source: Public Health Institute of the FBiH, 2020*

## Risk factors for development of CVD in the FBiH

According to the results of the study on Adult population health status in FBiH implemented by FBiH Public Health Institute, the following risk factors for developing CVD among adults (31) are dominant:

- ***Hypertension***: almost half of adults or 42,1% have hypertension and/or are undergoing treatment in FBiH, of which 45,3% are men and 38,9% are women.
- ***Obesity***: almost a quarter or 21,2% of adults in FBiH is obese, of which 19,1% are men and 23,3% are women.
- ***Physical inactivity***: only quarter of population or 24,6% in FBiH is physically active, of which 28,7% are men and 20,3% are women.
- ***Smoking***: almost half of the adults or 44,1% are smokers in FBiH, of whom 56,3% are men and 31,6 % are women. Over half of the population or 54.1% is exposed to tobacco smoke daily by other smokers in their own home, 44,4% in the workplace and 52,7% in a public place.

Smoking is a significant public health problem among school-aged children and youth in FBiH. According to the results of Global Youth Tobacco Survey (GYTS) implemented by the FBiH Public Health Institute in 2019,

almost quarter of school-aged children or 24,4% currently use some tobacco products, 27,7% of boys, and 21,1% of girls. 13.8% of school-aged children, 15.8% of boys, and 11.7% of girls currently smoke cigarettes. The results of this survey confirmed that smoking waterpipe represents a particular public health challenge. According to this research, 16,1% of children, of which 17,7% are boys and 14,4% are girls currently smoke waterpipe. (32)

It is important to mention that smoking among health care professionals in FBiH is widespread. According to the survey conducted by the FBiH Public Health Institute in 2017, smoking among family medicine doctors and nurses was 35% in FBiH. (33)

## Prevention and control of CVD in Bosnia and Herzegovina

### *Republic of Srpska*

Government of the Republic of Srpska in 2003 adopted Action Plan for the Prevention and Control of Non-communicable Diseases at the proposal of Ministry of Health and Social Welfare of the Republic of Srpska. (34)

Ministry of Health and Social Welfare of the Republic of Srpska also published a significant number of clinical guidelines (34) for addressing cardiovascular diseases.

Clinical guidelines:

- acute myocardial infarction,
- angina pectoris,
- arterial hypertension,
- atrial fibrillation,
- diabetes mellitus,
- diabetes and cardiovascular disease,
- physical activity,
- obesity in children,
- obesity in adults,
- hyperlipoproteinemia,
- smoking cessation

### *Federation of Bosnia and Herzegovina*

According to the Law on Healthcare in Federation of BiH, family medicine team within the primary health care (PHC) offers continuous and

comprehensive protection oriented at prevention, control and early diagnosis of disorders and diseases. (35)

Law on Patient Rights and Responsibilities states rights of patients to be informed and educated by healthcare professionals in terms of disease prevention and health protection, as well as personal health responsibilities. (36)

Disease prevention and health promotion is a significant part of family medicine specialization and additional continuing education training programs /PAT/ (Program for Additional Training) in family medicine. (37)

Agency for Quality and Accreditation in Healthcare (AKAZ) introduced accreditation standards to Community Health Centers and family medicine teams. Chapter 3 of this document lists activities for health promotion and disease prevention. (38)

According to the Law on Healthcare in Federation of BiH, the basic functions of public health are (35):

1) monitoring, evaluation and analysis of population health status;
2) surveillance, research, and control of the risks and threats to public health;
3) health promotion;
4) social participation in health;
5) development of policies and institutional capacity for public health planning and management;
6) strengthening of public health regulation and enforcement capacity;
7) strengthening of public health planning and management capacity;
8) evaluation and promotion of equitable access to necessary health services;
9) human resources development and training;
10) quality assurance in persona and population-based health services;
11) research in public health;
12) reduction of the impact of emergencies and disasters on health of the population.

Regarding control and prevention of chronic non-communicable diseases in FBiH, several strategic documents have been adopted by the Federal Ministry of Health (39–47):

- Strategic Plan for Health Care Development in the Federation of Bosnia and Herzegovina from 2008 to 2018,
- Strategic Plan of PHC Development in FBiH, 2008,
- Strategy for Prevention, Treatment and Control of Malignant Neoplasms in FBiH, 2012–2020,
- Resolution on Diabetes, 2012,
- Policy for Improving Child Nutrition in FBiH, 2013,

- Policy and Strategy for Protection and Promotion of Mental Health in FBiH, 2012–2020,
- Combat Diabetes in FBiH, 2014–2024,
- Law on Restricted Use of Tobacco, Tobacco and other Smoking Products, 2018 (Draft),
- Action Plan for Prevention and Control of Chronic Non-communicable Diseases of FBiH from 2019 to 2025

## Public health interventions in prevention and control of CVD in Bosnia and Herzegovina

During the period from 2016 to 2018, the project "Developing and Advancing Modern and Sustainable Public Health Strategies, Capacities and Services to Improve Population Health in Bosnia and Herzegovina" was developed and implemented by the Entity Institutes of Public Health (FBiH Public Health Institute, Public Health Institute of the Republic of Srpska), in cooperation with the Ministry of Health of entities and in cooperation with WHO country office in Bosnia and Herzegovina, which was jointly supported by the Swiss Agency for Development and Cooperation (SDC) and World Health Organization (WHO). (48)

Within component 2 of the Project entitled: Adaptation/development of instruments, materials and indicators sets for implementing, controlling and evaluating interventions in the field of cardiovascular risk assessment and management (CVRAM), guidelines for prevention and control of CVD risk factors were published in BiH, modeled after European Guidelines on cardiovascular disease prevention in clinical practice (*version 2012*) published by European Society on Cardiovascular Prevention and Rehabilitation (EACPR).

Representatives of the Association of Cardiologists of Bosnia and Herzegovina (member of the European Society of Cardiology ESC) took part in the preparation of the guide.

A two-day CVRAM training program on using guidelines for prevention and control of cardiovascular risk was completed during 2018, having targeted 70% of all family medicine teams in Bosnia and Herzegovina. In total, 2624 family medicine professionals (1022 doctors (39%) and 1602 nurses (61%)) was educated. An estimated 67.6% of the population of Bosnia and Herzegovina (54.6% of the Brcko District of Bosnia and Herzegovina, 64.4% of the Republic of Srpska and 70% of the Federation of Bosnia and Herzegovina) now have access to standardized health care service for prevention, treatment,

and control of cardiovascular disease thanks to CVRAM training program on using guidelines for prevention and control of cardiovascular risks. (48)

Monitoring and evaluation of the usage of guidelines by family medicine teams in BiH included by the CVRAM training program was performed by the entity agencies for accreditation and quality improvement in health care before and after training programs were completed.

Subject of evaluation was agreed minimum set of 13 structure, process and clinical outcomes indicators that are not routinely collected and reported by family medicine teams, with the aim of obtaining information on the need for further revision and improvement of accreditation standards for family medicine teams in Bosnia and Herzegovina. (48)

The following guides and guidelines for family medicine teams have been prepared and published in FBiH as a part of the same Project:

Guides:

- Prevention of cardiovascular disease: guidelines for assessment and management of total cardiovascular risk (SCORE),
- Hypertension Guide,
- Dyslipidemia Guide.

Guidelines:

- Guidelines for prevention and treatment of obesity in children and adolescents,
- Guidelines for prevention and treatment of obesity in adults,
- Physical activity promotion guidelines,
- Guidelines for prevention and treatment of diabetes and cardiovascular diseases,
- Smoking cessation guidelines.

FBiH Public Health Institute organized 61 workshops in community health centers in FBiH which included 430 family medicine teams.

In total, 1122 doctors and nurses/technicians from family medicine teams in FBiH completed the course on the use of guidelines. Educational centers for family medicine teams in community health centers in Sarajevo, Mostar, Tuzla, Zenica, and Bihać were included in training programs. (48)

WHO SCORE tables for calculating 10-year risk of CVD is based on the correlation of age, sex, systolic blood pressure (mm Hg) and total cholesterol (mmol/L).

Increased risk is recorded in patients who are smokers, obese, patients with family history of premature CVD, low HDL cholesterol or high triglyceride levels and patients with diabetes. (Figure 1)

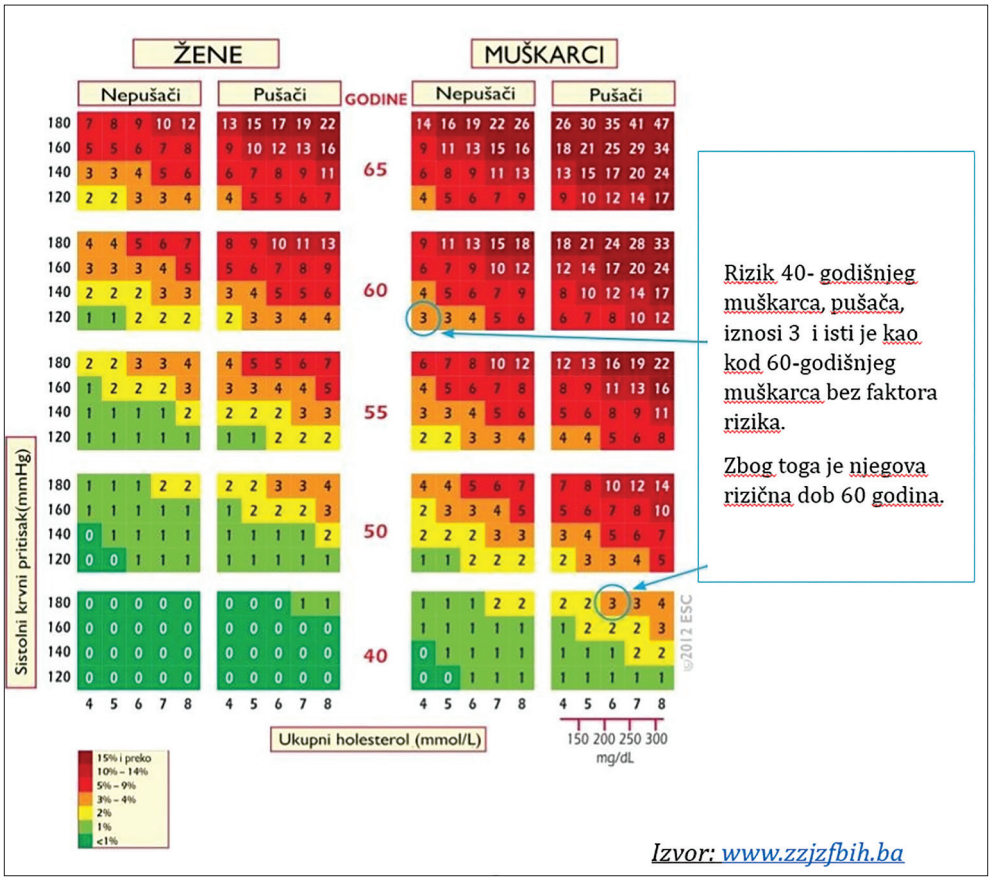



*Figure 1: WHO SCORE table of risk factors for CVD in BiH, 2012*

This table is used to calculate the 10-year risk of fatal CVD for each person in relation to sex, smoking status, age, systolic blood pressure (mm Hg) and total cholesterol (mmol/l or mg/dl).

It represents a good mechanism for advising patients on the necessary behavior changes, with low-risk patients being advised to maintain their low-risk status, while those with a 5% or higher risk, or those who will reach that risk in middle age, require adequate supervision. To define patient's relative risk their risk category should be compared with that of non-smokers of the same age and sex, with blood pressure values below 140/90 mmHg and cholesterol values less than 5 mmol/l. (190 mg/dl).

High-risk patients are those whose 10-year risk exceeds 15%. High-risk groups include patients with pre-existing CVD and diabetics. Women with diabetes have 5 times higher risk, and men with diabetes have 3 times higher risk than the one set in the table. The risk is higher in persons living sedentary lifestyle, as well as in persons with abdominal obesity, a family history of early CVD and in socially disadvantaged persons.

Based on the proven significance of individual risk factors for the development of cardiovascular diseases, a term "cardiovascular risk age" was introduced and it is defined as the age of a person with several CVD risk factors that corresponds to the chronological age of a person with the same level of total risk but ideal levels of CVD risk factors. An example is given of a 40-year-old smoker who has a total cholesterol level of 8 mmol/L, a systolic blood pressure of 160 mmHg and his total cardiovascular risk is 3% according to the SCORE table (absolute risk), which corresponds to the cardiovascular risk age of a 60-year-old who has ideal levels risk factors (non-smoker, normal cholesterol levels) (Figure 1).

Based on the obtained values of individual risk factors from the WHO's SCORE table and the analysis of their interaction, risk level for developing CVD can be determine for each patient. (Figure 2)

| Other risk factors asymptomatic organ damage or disease | Blood pressure | | | |
|---|---|---|---|---|
| | Elevated normal BP | Level I HT | Level II HT | Level III HT |
| Without other RF | x | Low risk | Moderate risk | High risk |
| 1-2 RF | Low risk | Moderate risk | Moderate to high risk | High risk |
| ≥3 RF | Low or moderate risk | Moderate to high risk | High risk | High risk |
| OD, CKD or DM | Moderate to high risk | High risk | High risk | High to very high risk |
| Symptomatic CVD; CKD phase ≥4 or DM with OD/RF | Very high risk | Very high risk | Very high risk | Very high risk |

*Figure 2: Categorization of multiple CVD risk factors*

*BP = blood pressure; CV = cardiovascular; CVD = cardiovascular diseases; CKD = chronic kidney disease; DBP = diastolic blood pressure; HT=hypertension; OD = organ damage; RF = risk factor; SBP = systolic blood pressure.*

Depending on patient's CVD risk level, the type of necessary intervention is determined: treatment or behavioral change. (Figure 3)

| Recommendations | Class I[a] | Level[b,c] | Level[b,d] |
|---|---|---|---|
| Reducing salt intake to 5-6g per day | I | A | B |
| Moderate alcohol consumption of no more than 20-30 g of ethanol per day for men and no more than 10-20 g of ethanol per day for women | I | A | B |
| Increased consumption of vegetables, fruits and dairy products with reduced fat content | I | A | B |
| Weight reduction so that BMI <25 kg / $m^2$ and waist circumference <102 cm in men and <88 cm in women, unless contraindicated. | I | A | B |
| Physical activity, i.e., at least 30 minutes, moderately dynamic exercises 5-7 days a week | I | A | B |
| Advice to all smokers to quit smoking and offer them professional help. | I | A | B |

*Figure 3: Recommended behavior changes according to the categorization of evidence of CVD risk factors*

*[a]Class of recommendation; [b]Level of evidence; [c]Based on the effects of BP and/or CV risk profile, [d]Based on outcome studies*

ESC European Guidelines on CVD prevention in clinical practice were published in 2016 by WHO in which a revised SCORE table for CVD risk factors for certain parts of WHO region was done. In this revised version, Bosnia and Herzegovina was placed among Central European countries. (25, 26)

To assess the overall cardiovascular risk, this document recommends SCORE tables for population with low and/or high cardiovascular risk, estimating the 10-year risk of fatal CVD in relation to the values of the following risk factors: age, sex, smoking status, systolic blood pressure, total cholesterol and HDL cholesterol levels. Bosnia and Herzegovina was classified as high-risk country. (Figure 4)

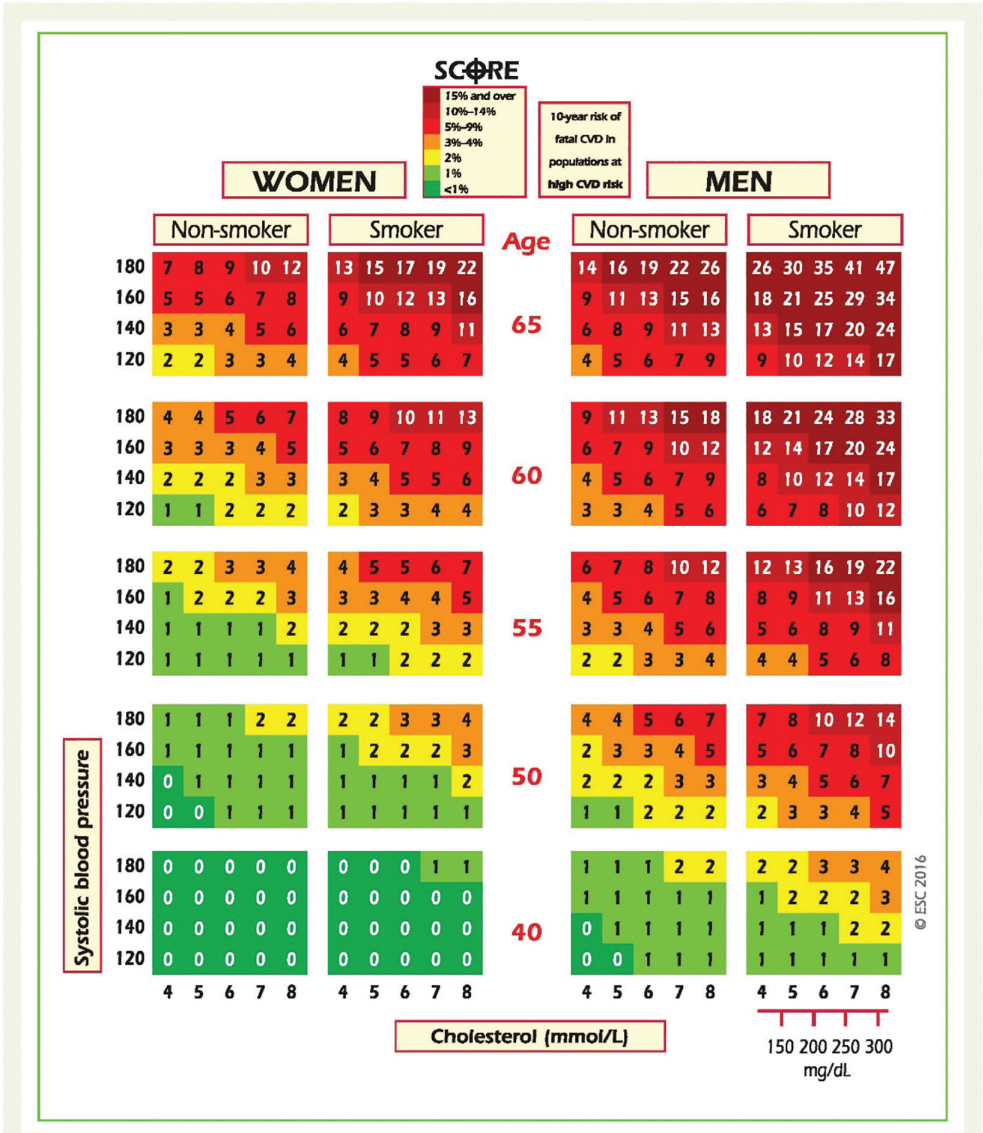



**Figure 1** SCORE chart: 10-year risk of fatal cardiovascular disease in populations of countries at high cardiovascular risk based on the following risk factors: age, sex, smoking, systolic blood pressure, total cholesterol. CVD = cardiovascular disease; SCORE = Systematic Coronary Risk Estimation.

*Figure 4: WHO SCORE table for CVD risk factor, ECS 2016*

SCORE table from the 2012 ESC European Guidelines on cardiovascular disease has been modified to consider the HDL cholesterol level, which made it more accurate. The advantage of 2016 risk assessment SCORE table is multifactorial scope of CVD risk factors, and the disadvantage is small age range (40–65) and lack of adaptability to other ethnic groups within low and high-risk population. (Figure 5)

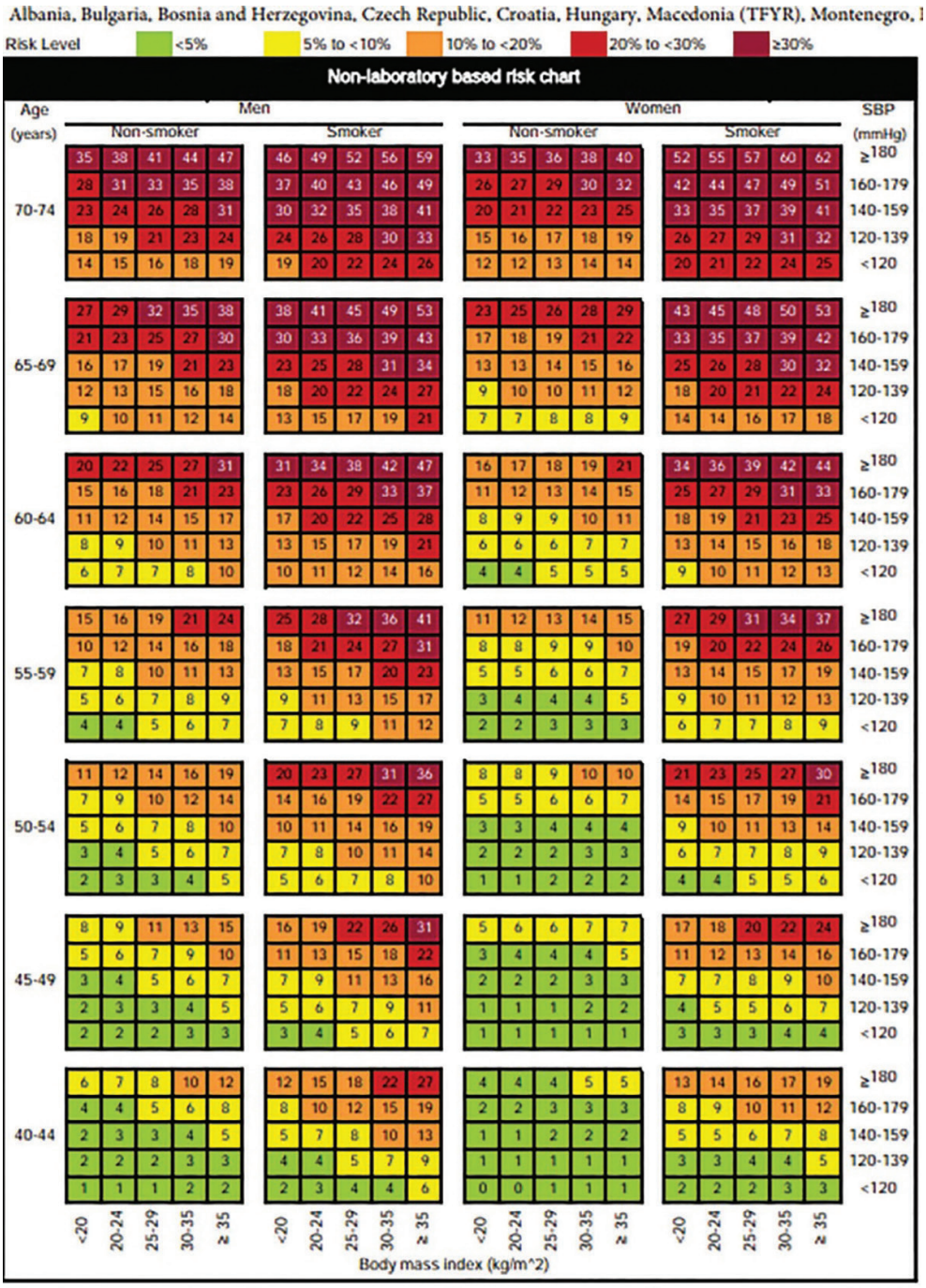



*Figure 5: CVD risk non-laboratory-based SCORE table, ECS 2016*
*Source: https://www.who.int/docs/default-source/cardiovascular-diseases/central-europe.pdf?sfvrsn=5d127541_2*

The risk for developing CVD can be categorized into four levels: low, moderate, high and very high risk, and it depends on the number and severity of risk factors, prior cardiovascular and blood vessel diseases, target organ damage in diabetes and values from SCORE table. (25, 26). (Table 6)

*Table 6. Cardiovascular risk categories, ECS, 2016*

| Level of risk | SCORE value |
|---|---|
| Very high-risk | SCORE ≥10%<br>• Documented CVD<br>• Diabetes mellitus type 1 or 2 with one or more CVD risk factors and/or target organ damage<br>• Chronic kidney disease (Glomerular filtration rate <30 mL/min/1,73 $m^2$) |
| High-risk | SCORE ≥ 5 < 10%<br>• Elevated values of single risk factors<br>• Diabetes mellitus type 1 or 2 without CVD risk factors or target organ damage |
| Moderate risk | SCORE ≥ 1 < 5% |
| Low-risk | SCORE < 1% |

*Source: ECS, 2016. god.*

Interpretation of SCORE results:

- Low- to moderate-risk persons (calculated SCORE <5%) should be offered lifestyle advice to keep their low- to moderate-risk status.
- High-risk persons (calculated SCORE ≥5% and <10%) qualify for intensive lifestyle advice and may be candidates for drug treatment.
- Very-high-risk persons (calculated SCORE ≥10%) drug treatment is more frequently required.

Total absolute risk estimation using SCORE tables is recommended for all men over the age of 40 and women over the age of 50 (or earlier if they entered postmenopausal period before that age) to be repeated every 4 to 5 years. Risk estimation is not recommended for people with high and very high cardiovascular risk, but an immediate intervention is required.

Using SCORE tables to estimate total cardiovascular risk for younger individuals (under 40 years of age) may "downplay" the effect of individual risk factors for cardiovascular disease, so younger people are advised to use special relative risk table. (Figure 6).

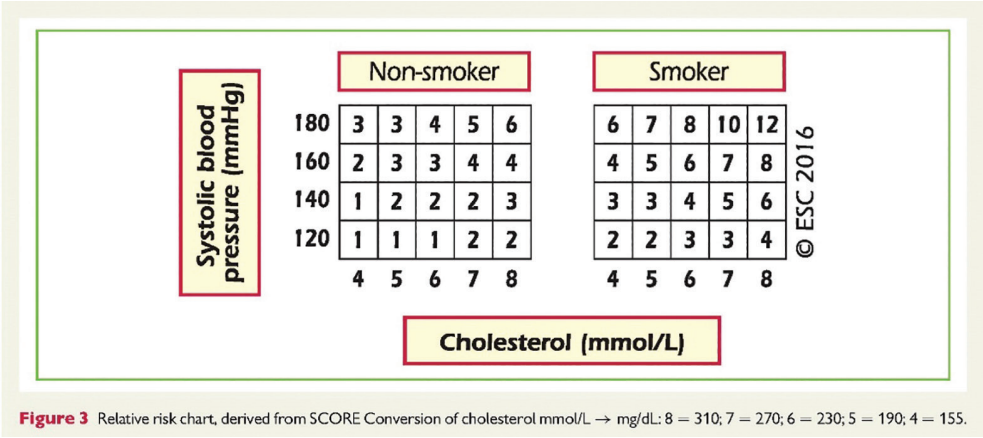



*Figure 6: 10-year relative risk of fatal CVD ECS, 2016*
*Source: ECS, 2016*

## Conclusions

Since Bosnia and Herzegovina does not have a single register for CVD, monitoring is done by analyzing data collected through regular statistical evidence and periodic population surveys.

According to available data, leading cause of death in Bosnia and Herzegovina are circulatory system diseases, dominated by acute myocardial infarction (I20), stroke (I63), essential hypertension (I10), chronic ischemic heart disease (I25) and cardiomyopathy (I42).

High CVD mortality rate in Bosnia and Herzegovina is associated with an unfavorable trend of exposure to various risk factors, among which hypertension, smoking, alcohol use, poor-quality diet and physical inactivity dominate.

Relevant sources of good practice indicate that the most effective form of preventive action in relation to CVD is a combination of population-wide and individual approach. Population-wide approach target people with low or medium CVD risk, while the individual approach target people with high CVD risk.

Combining individual and population-wide interventions to prevent and control risk factors for CVD should be a lifelong approach, from the very beginning throughout the life cycle, because both risks and development of CVD is a dynamic phenomenon associated with changeable and unchangeable risk factors and/or accumulation of multiple diseases or comorbidities.

In the period from 2016 to 2017, the project "Strengthening and Improving Modern and Sustainable Public Health Strategies, Capacities and Services for Improving the Health of the Population in Bosnia and Herzegovina" was launched in partnership with the Swiss Agency for Development and Cooperation (SDC) and World Health Organization (WHO).

Through component 2 of this Project, titled: "Adjustment/ development of instruments, materials and sets of indicators for implementation, monitoring and evaluation of interventions from the domain of risk assessment and CVD management (CVRAM), guidelines for prevention and control of CVD risk factors were published in BiH by Public Health Institutes of both entities with the support of Ministries of Health of both entities and modeled after European Guidelines on cardiovascular disease prevention in clinical practice (version 2012) published by European Society on Cardiovascular Prevention and Rehabilitation (EACPR).

It is estimated that thanks to CVRAM training on the use of guidelines for CVD prevention and control, around 67.6% of the population of Bosnia and Herzegovina has access to standardized health services for prevention, treatment and control of cardiovascular disease, of which 70% are citizens of the Federation of BiH, 64.4 % citizens of Republic of Srpska and 54.6% citizens of Brčko District.

Since WHO published ECS European Guidelines on cardiovascular disease prevention in clinical practice in 2016 in which a revised SCORE table for CVD risk factors for certain parts of WHO region from 2012 was done, it is necessary to do the correction of the CVD guidelines in Bosnia and Herzegovina in accordance with this document.

CVD risk factors prevention must be an integral part of every health service at all levels of health care. Special importance should be given to the extensive use of standardized ESC guidelines on good practice which provide the basis for systematic monitoring of risk factors, categorization of patients according to SCORE risk level and selection of adequate medication and other interventions.

With the aim of reducing incidence and mortality of CVD in Bosnia and Herzegovina, systematic support to the long-term public health intervention to prevent CVD at the population level is needed through various long-term intersectoral measures such as: promotion of healthy diet tailored to the needs of population groups, promotion of smoke-free areas, promotion of physical activity, adequate tax and price policies for tobacco and alcohol products in Bosnia and Herzegovina and directing part of the funds collected from the tax

to finance interventions for prevention of CVD risk factors and promotion of health, setting health warnings on food items and reaching an agreement with the industry on reducing salt, fat and sugar intake, banning advertisement and promotion of tobacco and alcohol products, and revising curriculum of all educational institutions in Bosnia and Herzegovina to include more hours of physical and health education classes.

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