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PREVENCIJA ISHEMIJSKE BOLESTI SRCA

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SAŽETAK

Ishemijska bolest srca (IBS) globalno je vodeći uzrok smrtnosti, a u Srbiji je odgovorna za više od 45% svih smrtnih slučajeva, što je znatno iznad proseka Evropske unije. Nastaje kao posledica ateroskleroze koronarnih arterija, a glavni faktori rizika uključuju pušenje, hipertenziju, dislipidemiju, dijabetes, gojaznost, fizičku neaktivnost, nezdravu ishranu i stres. Prevencija kao osnov javnog zdravlja i zdravstvene politike svake zemlje predstavlja skup mera i aktivnosti usmerenih na očuvanje i unapređenje zdravlja, sprečavanje nastanka bolesti i komplikacija, kao i smanjenje smrtnosti i invaliditeta u populaciji i obuhvata primordijalni, primarni, sekundarni i tercijarni nivo. Ključne mere su usvajanje zdravih životnih navika: pravilna mediteranska ishrana, redovna fizička aktivnost (najmanje 150 minuta umerenog vežbanja nedeljno), održavanje zdrave telesne mase i prestanak pušenja. Kontrola bioloških faktora rizika, poput hipertenzije, dijabetesa i povišenog holesterola, takođe je esencijalna. Skrining program u okviru primarne prevencije igra važnu ulogu u ranom otkrivanju lica sa povećanim rizikom od IBS. Sekundarna prevencija obuhvata adekvatno lečenje i mere za sprečavanje daljih komplikacija kod pacijenata koji već boluju od IBS-a. Ovo uključuje farmakološku terapiju (antiagregacioni lekovi, beta-blokatori, statini), invazivne procedure poput koronarnih intervencija ili bajpas hirurgije i promenu loših životnih navika. Tercijarna prevencija usmerena je na rehabilitaciju pacijenata, smanjenje komplikacija i poboljšanje kvaliteta života. Iako su preporuke za prevenciju jasno definisane, njihova primena u Srbiji se suočava s izazovima. Neophodna je bolja koordinacija, kontinuirana edukacija stanovništva i unapređenje sistema zdravstvene zaštite, posebno u oblasti posthospitalne rehabilitacije. Sveobuhvatan, integrisan pristup koji uključuje javnozdravstvene i medicinske intervencije ključan je za dugoročno smanjenje tereta IBS u Srbiji.

Ključne reči: kardiovaskularne bolesti, ishemijska bolest srca, akutni koronarni sindrom, prevencija, faktori rizika

Uvod

Ishemijska bolest srca (IBS) predstavlja jedan od vodećih uzroka smrtnosti širom sveta, a njena prevencija je od suštinskog značaja za očuvanje zdravlja populacije (1). Ona nastaje kao posledica ateroskleroze koronarnih arterija, što dovodi do smanjenog protoka krvi u srčanom mišiću i može rezultirati anginom pektoris, infarktom miokarda ili iznenadnom srčanom smrću (2).

Glavni modifikabilni faktori rizika za razvoj IBS uključuju pušenje, hipertenziju, hiperlipidemiju, dijabetes melitus, gojaznost, fizičku neaktivnost i stres (3). Budući da su ovi faktori podložni promenama kroz zdrav način života i medicinske intervencije, prevencija se deli na primarnu (sprečavanje nastanka bolesti), sekundarnu (rano otkrivanje i sprečavanje komplikacija kod obolelih) i tercijarnu (rehabilitacija i smanjenje invaliditeta) (4-7). Razumevanje i primena strategija prevencije IBS ima ključnu ulogu u smanjenju incidencije i mortaliteta povezanih sa ovom bolešću.

Cilj ovog preglednog rada je da analizira epidemiološku situaciju IBS u Republici Srbiji i predloži sveobuhvatne preventivne mere.

REVIEW ARTICLE

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PREVENTION OF ISCHEMIC HEART DISEASE

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ABSTRACT

Ischemic heart disease (IHD) is the leading cause of death globally, while in Serbia, it is responsible for more than 45% of all deaths, which is significantly above the average in the European Union. It occurs as a result of atherosclerosis of coronary arteries, and the main risk factors include smoking, hypertension, dyslipidemia, diabetes, obesity, physical inactivity, unhealthy diet and stress. Prevention as the foundation of public health and health policies of each country includes a range of measures and activities aimed at preserving and improving health, preventing the occurrence of diseases and complications, as well as reducing mortality and disability in the population at the primordial, primary, secondary and tertiary level. Key measures include the adoption of healthy lifestyle habits: balanced Mediterranean diet, regular physical activity (at least 150 minutes of moderate exercise per week), maintaining a healthy weight and quitting smoking. Controlling biological risk factors, such as hypertension, diabetes and high cholesterol, is also essential. A screening program within primary prevention plays an important role in the early detection of individuals at increased risk for IHD. Secondary prevention includes adequate treatment and measures to prevent further complications in patients who already suffer from IHD. This includes pharmacological therapy (antiaggregation drugs, beta-blockers, statins), invasive procedures such as coronary interventions or bypass surgery, as well as changing unhealthy habits. Tertiary prevention is aimed at patient rehabilitation, the reduction of complications and the improvement of the quality of life. Although recommendations for prevention are clearly defined, their implementation emerged as a challenge in Serbia. Better coordination, continuous education of the population and improvement of the health care system, especially in the field of post-hospital rehabilitation, are necessary. A comprehensive, integrated approach that includes public health and medical interventions is crucial for the long-term reduction of the burden of IHD in Serbia.

Key words: cardiovascular diseases, ischemic heart disease, acute coronary syndrome, prevention, risk factors

Introduction

Ischemic heart disease (IHD) is one of the leading causes of death globally, and its prevention is essential for maintaining population health (1). It occurs as a result of atherosclerosis of coronary arteries, which leads to the reduction of blood flow to the cardiac muscle and may result in angina pectoris, myocardial infarction or sudden cardiac death (2).

The main modifiable risk factors for the development of IHD include smoking, hypertension, hyperlipidemia, diabetes mellitus, obesity, physical inactivity, and stress (3). Since these factors are subject to change through a healthy lifestyle and medical interventions, prevention is divided into primary (preventing the onset of the disease), secondary (early detection and prevention of complications in patients), and tertiary (rehabilitation and reduction of disability) (4-7). Understanding and implementing IHD prevention strategies play a key role in reducing the incidence and mortality associated with this disease.

The aim of this review paper is to analyze the epidemiological situation of IHD in the Republic of Serbia and to propose comprehensive preventive measures.

Metode

U okviru ovog preglednog rada sprovedena je pretraga naučne literature u bazama podataka PUBMED, Google Scholar i Scopus. U pretrazi su korišćene sledeće ključne reči i njihove kombinacije: "ishemijska bolest srca" (ischemic heart disease), "mortalitet" (mortality), "incidencija" (incidence), "faktori rizika" (risk factors), "primarna prevencija" (primary prevention), "sekundarna prevencija" (secondary prevention) i "tercijarna prevencija" (tertiary prevention). Uključeni su svi tipovi radova (pregledni radovi, meta-analize, kliničke studije, vodiči dobre kliničke prakse) koji su bili napisani na engleskom jeziku i koji su objavljeni tokom poslednjih 25 godina. Epidemiološki podaci za Republiku Srbiju preuzeti su iz zvaničnih izveštaja Instituta za javno zdravlje Srbije „Dr Milan Jovanović Batut". Selektovani radovi su potom analizirani u celosti i korišćeni za sintezu informacija.

Učestalost i rasprostranjenost ishemijske bolesti srca u svetu i Republici Srbiji

Kardiovaskularne bolesti (KVB), obuhvataju veliki broj različitih kategorija oboljenja srca, što čini ovu grupu veoma heterogenom. Prema desetoj reviziji međunaredne klasifikacije bolesti (MKB)10 (8), pod ovom klasifikacijom obuhvaćene su sledeće kategorije: akutna reumatska groznica, hronične reumatske bolesti srca, bolesti prouzrokovane krvnim pritiskom, ishemijsku bolest srca (koronarna bolest srca), bolest srca plućnog porekla i bolesti krvnih sudova pluća, bolest krvnih sudova mozga, bolesti arterija, malih arterija i kapilara, vena, limfnih sudova i limfnih čvorova, i druge nenaznačene bolesti srca i krvotoka. U ovoj velikoj grupi ishemijska bolest srca (IBS) je bolest, koja se najčešće javlja u populaciji. IBS nije isto što i akutni koronarni sindrom (AKS). Najjednostavnije, IBS je hronično stanje, dok je akutni koronarni sindrom akutni (iznenadni) događaj koji predstavlja jednu od najtežih manifestacija IBS.

Akutni koronarni sindrom (AKS), može obuhvatati različita klinička stanja, uzrokovana akutnom ishemijom i/ili nerkozom miokarda, čiji uzrok leži u akutnoj koronarnoj leziji, usled rupture aterosklerotičnog plaka koronarne arterije sa pratećom trombozom, inflamacijom, vazokonstrikcijom i mikroemolizacijom (9), (10). AKS se može manifestovati kao nestabilna angina pektoris, akutni infarkt miokarda bez i sa elevacijom ST segmenta ili kao iznenadna smrt (10). Prema desetoj reviziji Međunarodne klasifikacije bolesti (8) akutni infarkt miokarda se predstavlja šifrom I21, ponovljeni infarkt miokarda - I22 i nestabilna angina pektoris sa I20.0.

AKS predstavlja najučestaliji razlog urgentne hospitalizacije i/ili iznenadne smrti, poslednjih decenija i u razvijenim i zemljama u razvoju (11), (12). Istraživanja u ovoj oblasti (13), (14), (15), (16), (17), (18), (19) i u svetu i kod nas, daju korisne kliničke, ali ne toliko i epidemiološke podatke o pojavi AKS u populaciji. Podaci pokazuju da je stopa mortaliteta od IBS viša u zemljama sa niskim i srednjim prihodima, gde su faktori rizika poput pušenja, nezdrave ishrane i fizičke neaktivnosti izraženiji, a dostupnost medicinske nege ograničena (20). Studije ukazuju na to da su najviše pogođene regije jugoistočna Azija i jugoistočna Evropa, dok je u razvijenim zemljama zabeležen pad smrtnosti od IBS zahvaljujući unapređenju terapije i preventivnih mera (21).

Prema podacima studije o globalnom Opterećenju društva bolestima (engl. *Global Burden of Disease* - GBD), prevalencija IBS je u stalnom porastu, a očekuje se da će do 2030. godine broj obolelih dostići preko 600 miliona ljudi širom sveta (22). Faktori koji doprinose ovom trendu uključuju starenje populacije, urbanizaciju i promene u načinu života koje povećavaju prisustvo metaboličkog sindroma (23).

Republika Srbija se nalazi među zemljama sa visokom prevalencijom KVB, gde IBS predstavlja jedan od glavnih uzroka smrtnosti. Prema podacima Instituta za javno zdravlje Srbije „Dr Milan Jovanović Batut", KVB su odgovorne za više od 45% svih smrtnih slučajeva u Srbiji (Tabela 1), pri čemu IBS zauzima vodeće mesto. AKS čini 51,7%, a ostale IBS (MKB10: I20.1-20.9, I23, I24, I25) 48,3% svih smrtnih ishoda usled bolesti sistema krvotoka (slika 1) (24).

Sirova stopa mortaliteta od AKS a u Republici Srbiji iznosila je 2022. godine 68,7 na 100.000 stanovnika, a standardizovana u odnosu na Evropu 39,7 i svet 25,4 na 100.000 stanovnika (24). Iako su u poslednjoj deceniji sprovedene brojne kampanje i programi prevencije, učestalost faktora rizika poput pušenja, gojaznosti i fizičke neaktivnosti i dalje ostaje visoka (25)

IBS predstavlja jedan od vodećih uzroka smrtnosti i obolevanja u svetu, sa značajnim zdravst-

Methods

Within this review paper, a search of the scientific literature was conducted in the PUBMED, Google Scholar, and Scopus databases. The following keywords and their combinations were used in the search: ischemic heart disease, mortality, incidence, risk factors, primary prevention, secondary prevention, and tertiary prevention. All types of papers (reviews, meta-analyses, clinical studies, good clinical practice guidelines) written in the English language and published over the last 25 years were included. Epidemiological data for the Republic of Serbia were obtained from the official reports of the Institute of Public Health of Serbia "Dr Milan Jovanović Batut". The selected papers were then analyzed in full and used for the synthesis of information.

The incidence and prevalence of ischemic heart disease in the world and in the Republic of Serbia

Cardiovascular diseases (CVD) include a large number of different categories of heart diseases, which makes this group very heterogeneous. According to the tenth revision of the International Classification of Diseases (ICD-10) (8), this classification includes the following categories: acute rheumatic fever, chronic rheumatic heart diseases, diseases caused by blood pressure, ischemic heart disease (coronary heart disease), heart disease of pulmonary origin and pulmonary vascular diseases, cerebrovascular diseases, vascular diseases that affect arteries, arterioles and capillaries, veins, lymphatic vessels and lymph nodes, and other unspecified diseases of the heart and blood vessels. In this large group, ischemic heart disease (IHD) is a disease that occurs most frequently in the population. IHD is not the same as acute coronary syndrome (ACS). At its simplest, IHD is a chronic condition, while acute coronary syndrome is an acute (sudden) event that is one of the most severe manifestations of IHD.

Acute coronary syndrome (ACS) can include various clinical conditions and it occurs as the result of acute ischemia and/or myocardial necrosis from an acute coronary lesion caused by atherosclerotic plaque rupture in the coronary artery which involves thrombosis, inflammation, vasoconstriction and microembolization (9, 10). ACS can manifest as unstable angina pectoris, acute myocardial infarction with and without the ST-segment elevation or sudden death (10). According to the tenth revision of the International classification of diseases (8), code I21 represents acute myocardial infarction, while I22 represents a subsequent (repeated) myocardial infarction, and I20.0 unstable angina pectoris.

ACS has been the most frequent reason for urgent hospitalization and/or sudden death in developed and developing countries in recent decades (11,12). Studies that have been conducted in this field (13,14,15,16,17,18,19) in the world and in our country provide useful clinical data, but not as many epidemiological data on the occurrence of ACS in the population. Data show that the mortality rate from IHD is higher in low- and middle-income countries, where risk factors such as smoking, unhealthy diet and physical inactivity are more present, while the access to medical care is limited (20). Studies indicate that the most affected regions are Southeast Asia and Southeast Europe, while in developed countries, a decrease in mortality from IHD has been recorded due to the improvement of therapy and preventive measures (21).

According to the Global Burden of Disease (GBD) study, the prevalence of IHD is constantly increasing, and it is expected that by 2030, the number of people affected by IHD will reach 600 million people worldwide (22). Factors that contribute to this trend include the aging population, urbanization and lifestyle changes that increase the presence of metabolic syndrome (23).

The Republic of Serbia is among the countries with a high prevalence of CVD, where IHD is one of the main causes of death. According to the data of the Institute of Public Health of Serbia “Dr Milan Jovanović Batut”, CVDs are responsible for more than 45% of all deaths in Serbia (Table 1), while IHD takes the leading place. ACS accounts for 51.7%, while other IHDs (ICD-10: I20.1-20.9, I23, I24, I25) account for 48.3% of all deaths caused by diseases of the circulatory system (Figure 1) (24).

The crude mortality rate from ACS in the Republic of Serbia was 68.7 per 100,000 inhabitants in 2022, while the standardized rate per 100,000 was 39.7 in Europe and 25.4 in the world (24). Although numerous campaigns and prevention programs have been conducted in the last decade, the frequency of risk factors such as smoking, obesity and physical inactivity still remains high (25).

Tabela 1. Vodeći uzroci umiranja u Republici Srbiji u 2022. godini (24)

Vodeći uzroci umiranja	Broj (N)	Učešće (%)
Bolesti sistema krvotoka	51.624	47,3%
Zloćudni tumori	19.350	17,7%
Povrede i trovanje	2491	2,3%
Šećerna bolest	3091	2,8%
Hronična opstruktivna bolest pluća	2389	2,2%
Ostali uzroci umiranja	30.258	27,7%
Ukupno	109.203	100,0%

venim, ekonomskim i društvenim posledicama. Prema podacima Svetske zdravstvene organizacije, KVB, uključujući IBS, odgovorne su za približno 17,9 miliona smrtnih slučajeva godišnje, što čini oko 32% svih smrtnih ishoda globalno (26).

Faktori rizika za ishemijske bolesti srca

IBS nastaje kao posledica aterosklerotskog suženja koronarnih arterija, što dovodi do smanjenog snabdevanja miokarda kiseonikom. Ona je pod uticajem mnoštva faktora, prvenstveno metaboličkih i životnih stilova. Međusobna interakcija ovih faktora varira u različitim populacijama i regionima, naglašavajući složenost etiologije IBS. Istraživanja su identifikovala više faktora koji doprinose razvoju ove bolesti, uključujući biološke, životne navike i psihosocijalne faktore (27).

Genetski faktori

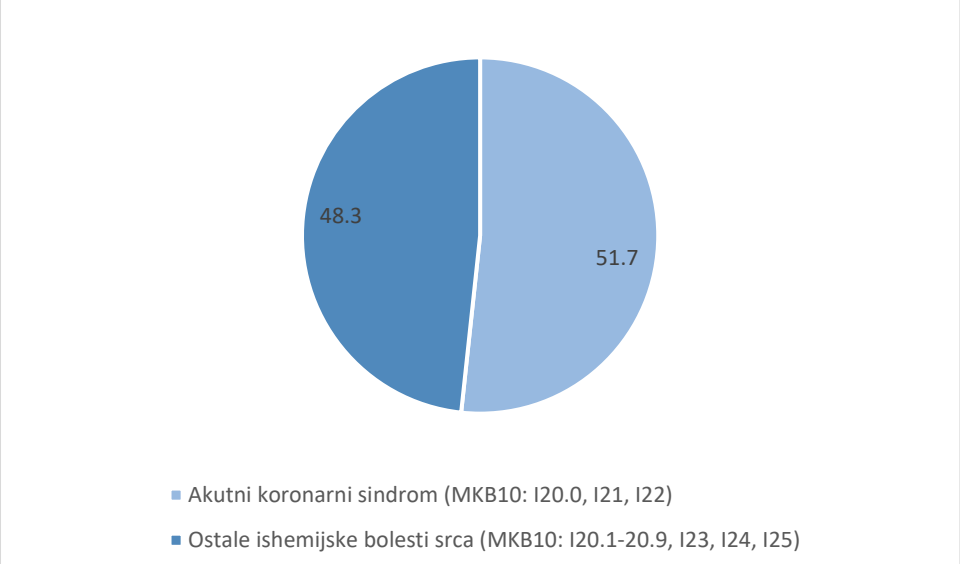
Genetska predispozicija igra važnu ulogu u razvoju ishemijske bolesti srca. Studije su pokazale da pozitivna porodična anamneza povećava rizik za razvoj IBS, posebno ako je jedan od roditelja pretrpeo infarkt miokarda pre 55. godine (28).

Hipertenzija

Povišen krvni pritisak smatra se jednim od najvažnijih faktora rizika za IBS. Dugotrajna hipertenzija može izazvati oštećenje endotela krvnih sudova i doprineti aterosklerotskim promenama (29).

Dijabetes melitus

Osobe koje boluju od dijabetesa tipa 2 imaju dva do četiri puta veći rizik od razvoja IBS-a. Hiperglikemija i insulinska rezistencija ubrzavaju proces ateroskleroze i povećavaju verovatnoću nastanka



Slika 1. Struktura umiranja od ishemijske bolesti srca (MKB10: I20-I25), Republika Srbija, 2022. godina (24)

Table 1. Leading Causes of Death, Serbia, 2022 (24)

Leading Causes of Death	Number (N)	Participation (%)
Diseases of the circulatory system	51.624	47,3%
Malignant neoplasms	19.350	17,7%
Injuries and poisoning	2491	2,3%
Diabetes mellitus	3091	2,8%
Chronic obstructive pulmonary disease	2389	2,2%
Other causes of death	30.258	27,7%
Total deaths	109.203	100,0%

IHD is one of the leading causes of mortality and morbidity globally, with significant health, economic and social consequences. According to the data of the World Health Organization, CVDs, including IHD, are responsible for approximately 17.9 million deaths annually, which accounts for 32% of all deaths globally (26).

Risk factors for ischemic heart diseases

IHD develops as a result of atherosclerotic narrowing of coronary arteries, which leads to reduced oxygen supply to the myocardium. It is influenced by many factors, primarily metabolic and lifestyle factors. The interaction of these factors varies in different populations and regions, emphasizing the complexity of the etiology of IHD. Studies have identified several factors that contribute to the development of this disease, including biological, lifestyle and psychosocial factors (27).

Genetic factors

Genetic predisposition plays an important role in the development of ischemic heart disease. Studies have shown that a positive family history increases the risk of developing IHD, especially if one of the parents suffered myocardial infarction before the age of 55 (28).

Hypertension

Hypertension is considered to be one of the most important risk factors for IHD. Long-lasting hypertension can cause damage of the endothelium of blood vessels and contributes to atherosclerotic changes (29).

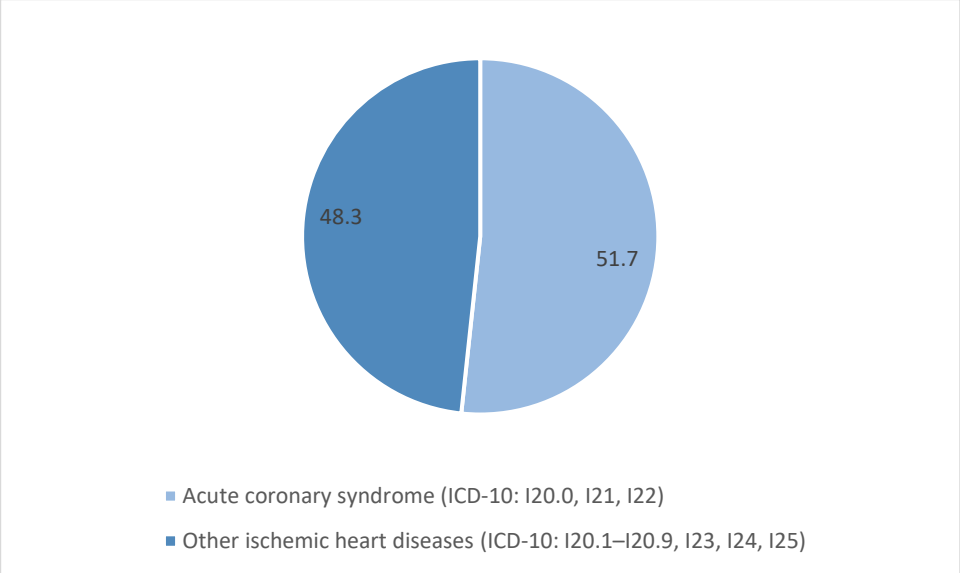


Figure 1. Structure of mortality from ischemic heart disease (ICD-10: I20–I25), Republic of Serbia, 2022 (24)

tromboze (30), a pojava dijabetesa je u visokoj korelaciji sa ozbiljnošću kliničke slike IBS (31).

Dislipidemija

Visok nivo LDL (engl. *low-density lipoprotein)* holesterola i nizak nivo HDL (engl. *high-density lipoprotein*) holesterola povezani su sa povećanim rizikom od koronarne bolesti srca (32).

Gojaznost

Gojaznost se smatra značajnim faktorom rizika za IBS, jer doprinosi razvoju hipertenzije, dislipidemije i insulinske rezistencije, što su ključni mehanizmi koji povećavaju aterosklerotski rizik (33). Istraživanja pokazuju da osobe sa indeksom telesne mase (engl. Body Mass Index - BMI) iznad 30 kg/m² imaju značajno veći rizik od koronarne bolesti u poređenju sa osobama sa idealnom telesnom masom (34).

Pušenje

Duvanski dim sadrži brojne toksične supstance koje oštećuju krvne sudove i povećavaju rizik od tromboze. Studije pokazuju da pušači imaju dvostruko veći rizik od infarkta miokarda u poređenju sa nepušačima (35).

Fizička neaktivnost

Sedentarni način života povećava rizik od prekomerne telesne mase, dijabetesa i hipertenzije, što su ključni faktori rizika u razvoju IBS. Redovna fizička aktivnost može značajno smanjiti ovaj rizik (36).

Nepravilna ishrana

Ishrana bogata zasićenim, trans-mastima i prostim i rafinisanim ugljenim hidratima doprinosi povećanju telesne mase i dislipidemiji, što direktno utiče na razvoj aterosklerotskih promena (37).

Stres i depresija

Hronični stres i depresija povećavaju rizik od IBS kroz neuroendokrine i imunološke mehanizme. Kortizol, koji se oslobađa tokom stresa, doprinosi povišenju krvnog pritiska i inflamatornim procesima (38) i prepoznat je kao značajni faktor koji doprinosi IBS (39).

Socijalna izolacija

Studije sugerišu da osobe sa slabom socijalnom podrškom imaju veći rizik od kardiovaskularnih oboljenja, uključujući IBS (40).

Preventivne mere

Prevencija poremećaja zdravlja podrazumeva mere vezane za unapređenje, očuvanje zdravlja i uspostavljanje zdravlja koje je narušeno. Ukoliko sve ovo nije moguće, mere su usmerene ka usporavanju nepovoljnog toka i ishoda bolesti. Postoje četiri nivoa prevencije: primordijalna, primarna, sekundarna i tercijarna (1).

Primordijalna prevencija ima za cilj sprečavanje nastanka i uspostavljanja sredinskih, ekonomskih, socijalnih i bihejvioralnih uslova za koje se zna da povećavaju rizik obolevanja (1). Suština je da se u one sredine gde ne postoje faktori rizika za nastanak KVB (na primer, nepravilna ishrana, pušenje), oni i ne unesu. (41). Neke od ključnih mera primordijalne prevencije obuhvataju: pravne i regulatorne mere (npr. donošenje zakona o zabrani pušenja na javnim mestima, ograničavanje reklama za nezdravu hranu i alkohol, itd.), organizovanje obrazovnih kampova (promocija zdravih životnih navika od najranijeg detinjstva, u školama i medijima), stvaranje zdravog okruženja (npr. planiranje gradova sa više zelenih površina i staza za bicikliste i pešake, čime se podstiče fizička aktivnost). Ove mere su ključne za trajno smanjenje tereta hroničnih nezaraznih bolesti, poput ishemijske bolesti srca, jer deluju na sam koren problema.

S obzirom na multifaktorsku etiologiju, primarna prevencija IBS zahteva holistički pristup koji uključuje promene u načinu života i ranu identifikaciju faktora rizika (33). Evropsko udruženje kardiologa je kao cilj postavilo da nijedno dete koje se rodi u trećem milenijumu do svoje 65. godine života ne oboli i umre od kardiovaskularnih bolesti (42). Cilj primarne prevencije je smanjenje ili eliminacija rizika od razvoja IBS kod osoba koje još nemaju manifestnu bolest i ona obuhvata:

Pravilna ishrana

Mediteranska ishrana, bogata voćem, povrćem, ribom i nezasićenim mastima, povezana je sa smanjenjem rizika od koronarne bolesti (4). Preporučuje se smanjenje unosa trans-masti i rafinisanih šećera, dok se unos vlakana i omega-3 masnih kiselina pokazao kao protektivni.

Fizička aktivnost

Redovna aerobna aktivnost smanjuje rizik od ateroskleroze i poboljšava kardiovaskularnu funkciju. Preporučuje se najmanje 150 minuta

Diabetes mellitus

People with type 2 diabetes mellitus have two to four times higher risk of developing IHD. Hyperglycemia and insulin resistance accelerate the process of atherosclerosis and increase the probability of thrombosis (30), while the occurrence of diabetes is highly correlated with the severity of the clinical picture of IHD (31).

Dyslipidemia

A high level of LDL (low-density lipoprotein) cholesterol and a low level of HDL (high-density lipoprotein) cholesterol are associated with an increased risk of coronary heart disease (32).

Obesity

Obesity is considered to be a significant risk factor for IHD, because it contributes to the development of hypertension, dyslipidemia, and insulin resistance, which are key mechanisms that increase the atherosclerotic risk (33). Studies have shown that people with a Body Mass Index (BMI) higher than 30/m2 have a significantly higher risk of coronary heart disease compared to people with an ideal body mass (34).

Smoking

Tobacco smoke contains numerous toxic substances that damage blood vessels and increase the risk of thrombosis. Studies have shown that smokers have two times higher risk of myocardial infarction compared to non-smokers (35).

Physical activity

Sedentary lifestyle increases the risk of excess body weight, diabetes and hypertension, which are key risk factors in the development of IHD. Regular physical activity can significantly reduce the risk (36).

Improper diet

Diet rich in saturated, trans-fats and simple and refined carbohydrates contributes to weight gain and dyslipidemia, which directly affects the development of atherosclerotic changes (37).

Stress and depression

Chronic stress and depression increase the risk of IHD through neuroendocrine and immunological mechanisms. Cortisol, which is released during stress contributes to elevated blood pressure and inflammatory processes (38) and is recognized as a significant factor that contributes to IHD (39).

Social isolation

Studies suggest that persons with poor social support have a higher risk of cardiovascular diseases, including IHD (40).

Prevention measures

The prevention of health disorders encompasses measures related to improving, preserving health and recovering health that has been impaired. If all this is not possible, measures are aimed at slowing down the unfavorable course and outcome of the disease. There are four levels of prevention: primordial, primary, secondary and tertiary (1).

Primordial prevention aims to prevent the occurrence and establishment of environmental, economic, social and behavioral conditions that are known to increase the risk of disease (1). The bottom line is that in those environments where there are no risk factors for the development of CVDs (for example, improper diet, smoking), they are not introduced (41). Some of the key measures of primordial prevention include: legal and regulatory measures (e.g. passing laws that ban smoking in public places, limiting advertisements for unhealthy food and alcohol, etc.), organizing educational camps (promoting healthy lifestyle habits from early childhood, in schools and media), creating a healthy environment (e.g. planning cities with more green areas and paths for cyclists and pedestrians, thus encouraging physical activity). These measures are essential for reducing permanently the burden of chronic non-communicable diseases, such as ischemic heart diseases, because they have impact on the very root of the problem.

Given the multifactorial etiology, the primary prevention of IHD requires a holistic approach that includes lifestyle changes and early identification of risk factors (33). The European Society of Cardiology has set as a goal that every child born in the third millennium has the right to live until the age of 65 without suffering or dying from CVDs (42). The goal of primary prevention is to reduce or eliminate the risk of developing IHD in asymptomatic persons, and it includes:

umerenog ili 75 minuta intenzivnog vežbanja nedeljno (43). Redovno vežbanje je od vitalnog značaja i za primarnu i za sekundarnu prevenciju IBS. Pomaže u kontroli kardiovaskularnih faktora rizika kao što su hipertenzija i dislipidemija i smanjuje verovatnoću naknadnih koronarnih događaja (44).

Kontrola telesne mase

Prekomerna telesna masa i gojaznost povećavaju rizik od IBS kroz mehanizme poput inflamacije, insulinske rezistencije i dislipidemije (34). Održavanje zdravog BMI (18,5-24,9 kg/m²) značajno smanjuje kardiovaskularni rizik.

Prestanak pušenja

Pušenje je jedan od najznačajnijih modifikabilnih faktora rizika za IBS. Prestanak pušenja može smanjiti rizik od infarkta miokarda za više od 50% (45).

Hipertenzija

Održavanje krvnog pritiska ispod 130/80 mmHg smanjuje rizik od kardiovaskularnih komplikacija (46).

Dijabetes

Stroga kontrola glikemije i HbA1c ispod 7% smanjuje vaskularne komplikacije (47).

Dislipidemija

Statini su pokazali značajne benefite u smanjenju LDL holesterola i prevenciji aterosklerotskih događaja (32).

U skladu sa savremenim smernicama za primarnu prevenciju, Evropsko udruženje kardiologa preporučuje strogu kontrolu modifikabilnih faktora rizika. To uključuje potpuni prestanak pušenja, redovnu fizičku aktivnost (najmanje 150 minuta umerenog vežbanja nedeljno), zdravu telesnu masu i kontrolu bioloških faktora rizika. Preporučene ciljne vrednosti za visokorizične osobe su često strože od standardnih: sistolni krvni pritisak idealno ispod 130 mmHg, a ciljni nivo LDL holesterola značajno niži od 3 mmol/L, zavisno od ukupnog kardiovaskularnog rizika pacijenta. (42).

Preventivni pregled odraslih obuhvata uzimanje anamnestičkih podataka, fizikalni pregled po sistemima, merenje telesne mase i visine i izračunavanje indeksa telesne mase, merenje obima struka, merenje krvnog pritiska, upućivanje na laboratorijske (glikemija i lipidni status, celokupni urin) i druge pretrage radi ranog otkrivanja faktora rizika i bolesti od većeg javno zdravstvenog značaja u zavisnosti od nalaza, ocena zdravstvenog stanja i procena zdravstvenog rizika po zdravlje, individualni zdravstveno-vaspitni rad, evidentiranje nađenog stanja i preduzetih mera, unos podataka u medicinsku dokumentaciju (48).

Nacionalne preporuke u Srbiji usmerene su na oportunistički skrining bioloških faktora rizika za KVB, kao što su gojaznost, hipertenzija, dijabetes i dislipidemija. Ovi pregledi se sprovode u okviru redovnih poseta izabranom lekaru na primarnom nivou zdravstvene zaštite, što omogućava rano otkrivanje osoba sa povećanim rizikom od IBS (49).

Za procenu rizika od IBS i drugih KVB koriste se različiti skorovi rizika. Ovi skorovi su zasnovani na dugogodišnjim istraživanjima i uzimaju u obzir kombinaciju različitih faktora rizika kako bi se izračunala verovatnoća da će osoba doživeti kardiovaskularni događaj (kao što je srčani ili moždani udar) u određenom vremenskom periodu (najčešće 10 godina).

Najčešće korišćeni skorovi su:

a) Sistematska procena koronarnog rizika (engl. *Systematic Coronary Risk Estimation* - SCORE)

Ovo je najznačajniji i najviše korišćen skor u Evropi, preporučen od strane Evropskog udruženja kardiologa (ESC). Koristi se za procenu 10-godišnjeg rizika od fatalnog kardiovaskularnog događaja. Faktori koji se analiziraju su: godine, pol, pušački status, sistolni (gornji) krvni pritisak i nivo ukupnog holesterola. Novi, poboljšani modeli SCORE2 i SCORE2-OP procenjuju rizik od fatalnih i ne-fatalnih kardiovaskularnih događaja i namenjeni su za mlađu i stariju populaciju, čineći procenu preciznijom (50).

b) Framinghamski skor rizik (engl. *Framingham Risk Score*)

Jedan od najstarijih i najpoznatijih skorova, razvijen na osnovu podataka iz Framingham studije srca u SAD, koja je počela još 1948. godine (51,52).

Iako se i dalje koristi, u Evropi je zamenjen SCORE-om. Koristi se za procenu 10-godišnjeg rizika od razvoja koronarne bolesti srca (uključujući infarkt miokarda i anginu). Faktori koji se analiziraju su: godine, pol, nivo holesterola (ukupnog i HDL), sistolni krvni pritisak, pušački status i prisustvo dijabetesa (53).

c) Jednačine udruženih kohorti (engl. *Pooled Cohort Equations* - ACC/AHA)

Proper diet

Mediterranean diet, rich in fruit, vegetables, fish and unsaturated fats, is associated with the reduced risk of coronary disease (4). The reduction in the intake of trans-fats and refined sugars is recommended, while the intake of fibers and omega-3-fatty acids has been shown to be protective.

Physical activity

Regular aerobic activity reduces the risk of atherosclerosis and improves the cardiovascular function. At least 150 minutes of moderate or 75 minutes of vigorous exercise per week is recommended (43). Regular exercise is vital for both primary and secondary prevention of IHD. It helps to control the cardiovascular risk factors such as hypertension and dyslipidemia and it reduces the probability of subsequent coronary events (44).

Body weight control

Excess body weight and obesity increase the risk of IHD through mechanisms such as inflammation, insulin resistance and dyslipidemia (34). Maintaining a healthy BMI (18.5-24.9 kg/m2) significantly reduces the cardiovascular risk.

Quitting smoking

Smoking is one of the most significant modifiable risk factors for IHD. The cessation of smoking can reduce the risk of myocardial infarction by more than 50% (45).

Hypertension

Maintaining blood pressure below 130/80mmHg reduces the risk of cardiovascular complications (46).

Diabetes

A strict control of glycemia and HbA1c below 7% reduces vascular complications (47).

Dyslipidemia

Statins have shown significant benefits in reducing LDL cholesterol and preventing atherosclerotic events (32).

In accordance with modern guidelines for primary prevention, the European Society of Cardiology recommends the strict control of modifiable risk factors. It includes complete cessation of smoking, regular physical activity (at least 150 minutes of moderate-intensity exercises per week), healthy body mass and control of biological risk factors. Recommended target values for high-risk individuals are often stricter than standard values: systolic blood pressure ideally below 130 mmHg, while the target level of LDL cholesterol should be lower than 3mmol/L, depending on the patient's overall cardiovascular risk (42).

The preventive examination of adults includes taking anamnestic data, physical assessment by body systems, measuring body weight and height, calculating body mass index, measuring waist circumference, measuring blood pressure, referring to laboratory tests (glycemia and lipid status, complete urine) and other tests for the early detection of risk factors and diseases that have greater public health significance depending on the findings, assessment of health status and assessment of health risks, individual health-educational work, keeping records of the found condition and taken measures, entering data into medical documentation (48).

National recommendations in Serbia focus on the opportunistic screening of biological risk factors for CVD, such as obesity, hypertension, diabetes and dyslipidemia. These examinations are done as part of regular visits to a selected physician at the primary level of health care, which enables the early detection of persons at increased risk of IHD (49).

Different risk scores are used to assess the risk of IHD and other CVDs. These scores are based on long-term studies and take into account the combination of different risk factors in order to calculate the likelihood of experiencing a cardiovascular event (such as a heart attack or stroke) over a certain period of time (usually 10 years).

The most commonly used scores are the following:

a) Systemic Coronary Risk Estimation – SCORE

This is the most significant and most commonly used score in Europe, recommended by the European Society of Cardiology (ESC). It is used to estimate the 10-year risk of a fatal cardiovascular event. The factors analyzed are: age, gender, smoking status, systolic (upper) blood pressure and total cholesterol level. The new, improved SCORE2 and SCORE2-OP models estimate the risk

Predstavlja skup jednačina koje je razvio Američki koledž kardiologa i Američko udruženje za srce (ACC/AHA) a kojim se vrši procena 10-godišnjeg rizika od aterosklerotske kardiovaskularne bolesti (ASCVD), koja uključuje infarkt miokarda i moždani udar. Faktori koji se analiziraju su: godine, pol, rasa, nivo holesterola (ukupnog i HDL), sistolni krvni pritisak, pušački status i prisustvo dijabetesa. Ovo je primarni alat za procenu rizika u SAD (54).

Važno je naglasiti da su svi ovi skorovi samo alati za procenu. Lekar koristi dobijeni rezultat kako bi pacijenta svrstao u grupu niskog, umerenog ili visokog rizika, što potom određuje dalje preventivne strategije — od promene životnih navika do uvođenja farmakoterapije (npr. statina za snižavanje holesterola).

Sekundarna prevencija se odnosi na mere koje se primenjuju kod pacijenata koji već imaju IBS, kako bi se sprečili dalji kardiovaskularni događaji.

Farmakološka terapija

Aspirin ili klopidogrel smanjuju rizik od ponovnog infarkta miokarda (55). Beta-blokatori smanjuju srčanu frekvenciju i potrebu miokarda za kiseonikom, čime smanjuju rizik od angine pektoris (56). ACE inhibitori/ARB su efikasni u kontroli hipertenzije i smanjenju progresije srčane insuficijencije (57). Snižavanje krvnog pritiska je ključno u prevenciji bolesti koronarnih arterija (CAD) i bolesti perifernih arterija (PAD). ACE inhibitori, često u kombinaciji sa tiazidnim diureticima ili blokatorima kalcijumskih kanala, preporučuju se za primarnu prevenciju kod hipertenzivnih pacijenata (58).

U akutnim oblicima IBS, farmakoterapija uključuje analgetike, antiishemične lekove i hipolipidemijske agense. Rano započinjanje ovih tretmana tokom hospitalizacije povezano je sa poboljšanim ishodima (59).

Invazivne procedure

Kod pacijenata sa ozbiljnom ishemijskom bolešću, perkutana koronarna intervencija (PCI) ili bajpas hirurgija (CABG) mogu biti neophodne kako bi se obezbedio adekvatan protok krvi kroz koronarne arterije (60).

Cilj tercijarne prevencije je ograničavanje nesposobnosti i rehabilitacija osoba kod kojih je patološki proces već odmakao. Ona podrazumeva lečenje i smanjenje komplikacija: na primer, ako je bolesnik sa srčanom insuficijencijom IV grupe prema Njujorškom udruženju za srce (engl. *New York Heart Association*) i vezan za krevet, njegovo lečenje i prebacivanje u III grupu bi se moglo smatrati tercijarnom prevencijom (34).

Zaključak

IBS ostaje jedan od vodećih uzroka morbiditeta i mortaliteta u svetu, uključujući i Republiku Srbiju. Uprkos značajnom napretku u dijagnostici i lečenju, prevencija IBS i dalje predstavlja ključni izazov. Analiza faktora rizika pokazuje da su nezdrav način života, pušenje, nepravilna ishrana, fizička neaktivnost, stres i prisustvo komorbiditeta (hipertenzija, dijabetes, dislipidemija) među glavnim uzrocima povećane učestalosti ove bolesti. Stoga je neophodno sprovesti sveobuhvatne mere koje će uzeti u obzir primarnu, sekundarnu i tercijarnu prevenciju. Primarna prevencija se temelji na ranom otkrivanju osoba sa povećanim rizikom od IBS, promociji zdravog načina života i ranom prepoznavanju faktora rizika, dok sekundarna prevencija obuhvata farmakološku terapiju, modifikaciju faktora rizika i invazivne procedure kod pacijenata kod kojih je bolest već prisutna. Međutim, iako su preporuke za prevenciju jasno definisane na međunarodnom i nacionalnom nivou, njihova primena u Srbiji nailazi na određene prepreke. Za unapređenje preventivnih mera neophodna je bolja koordinacija između zdravstvenih profesionalaca, kontinuirana edukacija populacije, poboljšanje uslova u zdravstvenim ustanovama i veća dostupnost savremenih terapijskih procedura. Posebno je važno ojačati sistem rehabilitacije pacijenata nakon preležane bolesti, jer trenutna praksa pokazuje da se mali broj obolelih upućuje na posthospitalnu kardiološku rehabilitaciju. Sveobuhvatni pristup IBS, koji uključuje medicinske i javnozdravstvene intervencije, može značajno doprineti smanjenju učestalosti i posledica ove bolesti. Samo kroz integrisane mere i multisektorsku saradnju moguće je dugoročno poboljšati ishode lečenja i unaprediti kvalitet života pacijenata sa IBS u Srbiji.

Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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of fatal and non-fatal cardiovascular events and are intended for younger and older populations, making the assessment more precise (50).

b) Framingham Risk Score

One of the oldest and most well-known scores was developed on the basis of data from the Framingham Heart Study in the USA, which began in 1948 (51,52).

Although still in use, it has been replaced by SCORE in Europe. It is used to estimate the 10-year risk of developing coronary heart disease (including myocardial infarction and angina). Factors that are analyzed are the following: age, gender, cholesterol level (total and HDL), systolic blood pressure, smoking status and presence of diabetes (53).

c) Pooled Cohort Equations (ACC/AHA)

They represent a set of equations developed by the American College of Cardiology and American Heart Association (ACC/AHA). They are used to assess the 10-year risk of atherosclerotic cardiovascular disease (ASCVD), which includes myocardial infarction and stroke. The following factors are analyzed: age, gender, race, cholesterol level (total and HDL), systolic blood pressure, smoking status and the presence of diabetes. This is the primary tool for the assessment of risks in the USA (54).

It is important to point out that all these scores are only evaluation tools. The doctor uses the obtained result to classify the patient into a group of low, moderate or high risk, which then determines further preventive strategies – from the change of lifestyle habits to the introduction of pharmacotherapy (e.g. statins to lower cholesterol).

Secondary prevention includes measures that are implemented in patients who already have IHD to prevent further cardiovascular events.

Pharmacotherapy

Aspirin or clopidogrel reduce the risk of repeated myocardial infarction (55). Beta-blockers decrease heart rate and myocardial oxygen demand, thus reducing the risk of angina pectoris (56). ACE inhibitors/ARBs are effective in controlling hypertension and reducing the progression of heart failure (57). Lowering blood pressure is essential in preventing coronary artery disease (CAD) and peripheral artery disease (PAD). ACE inhibitors, often combined with thiazide diuretics or calcium channel blockers, are recommended as part of primary prevention in hypertensive patients (58).

In the acute forms of IHD, pharmacotherapy includes analgesics, anti-ischemic drugs and hypolipidemic agents. Prompt initiation of therapy during hospitalization is associated with better outcomes (59).

Invasive procedures

In patients with severe ischemic disease, percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG) may be necessary to ensure adequate blood flow through coronary arteries (60).

The aim of tertiary prevention is to limit disabilities and rehabilitate people, in whom the pathological process has already progressed. It includes treatment and reduction of complications: for example, if a patient who has class IV heart failure according to the New York Heart Association classification is bedridden, treatment and transfer to class III could be considered as tertiary prevention (34).

Conclusion

IHD remains one of the leading causes of morbidity and mortality globally, including the Republic of Serbia. Despite the significant progress in diagnosis and treatment, the prevention of IHD remains a key challenge. The analysis of risk factors shows that unhealthy lifestyle, smoking, improper diet, physical inactivity, stress and the presence of comorbidities (hypertension, diabetes, dyslipidemia) are among the main causes of increased incidence of this disease. Therefore, it is necessary to implement comprehensive measures that will take into account primary, secondary and tertiary prevention. Primary prevention is based on the early detection of persons with an increased risk of IHD, promotion of a healthy lifestyle and early recognition of risk factors, while secondary prevention includes pharmacological therapy, modification of risk factors and invasive procedures in patients, in whom the disease is already present. However, although recommendations for the prevention are clearly defined at the international and national level, barriers to their implementation are faced in Serbia. Better coordination between health professionals, continuous education of the population, improvement of conditions in

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health institutions and greater availability of modern therapeutic procedures are necessary for the improvement of preventive measures. It is especially important to strengthen the system of rehabilitation of patients after an illness, because their current practice shows that a small number of patients are referred to post-hospital cardiac rehabilitation. A comprehensive approach to IHD, which includes medical and public health interventions, can significantly contribute to reducing the incidence and consequences of this disease. It would be possible to improve the long-term outcomes of treatment and the quality of life in patients with IHD in Serbia only with the help of integrated measures and multisectoral coordination.

Competing interests

Authors declare no conflicts of interest.

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