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EDITORIAL

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Public Health Dimensions of Cardiovascular Diseases (CVD) Prevention and Control – Global Perspectives and Current Situation in the Federation of Bosnia and Herzegovina

Aida Ramic - Catak¹, Senka Mesihovic - Dinarevic², Besim Prnjavorac³, Nabil Naser⁴, Izet Masic^{5,6}

¹Institute for Public Health of the Federation of Bosnia and Herzegovina

²Department of Medical Sciences, Academy of Sciences and Arts of Bosnia and Herzegovina, Sarajevo, Bosnia and Herzegovina

³General Hospital Tesanj, Tesanja, Bosnia and Herzegovina

⁴Polyclinic "Nabil" Sarajevo, Sarajevo, Bosnia and Herzegovina

⁵Department of Family Medicine, University of Sarajevo, Sarajevo, Bosnia and Herzegovina

⁶Academy of Medical Sciences of Bosnia and Herzegovina, Sarajevo, Bosnia and Herzegovina

Corresponding author
Professor Emeritus Izet Masic, MD, PhD.
Department of Family Medicine, University of Sarajevo, Sarajevo, Bosnia and Herzegovina.
Academy of Medical Sciences of Bosnia and Herzegovina, Sarajevo, Bosnia and Herzegovina.
E-mail: izetmasic@gmail.com. ORCID ID: <http://www.orcid.org/0000-0002-9080-5456>.

ABSTRACT

Background: Cardiovascular diseases (CVD) are the cause of 17 million deaths a year worldwide, of which 25% are sudden cardiac deaths (SCD). In Europe cardiovascular diseases (CVD) remains a leading cause of death in Europe accounting for 3.9 million deaths each year. Even with well-known risk factors and the current standards of health care, improvement of health and quality of life of CVD patients are still remains one of the biggest public health challenges we must overcome. **Objective:** The aim of this study was to analyze of current strategic documents and relevant facts of WHO and other appropriate institutions regarding CVDs prevention and control for potentially use in Bosnia and Herzegovina (B&H). **Methods:** Authors made a narrative review to provide a brief overview of the recent and relevant documents of good practice in prevention, diagnostic and therapeutic approaches of cardiovascular diseases that should be consider as milestones for the health authorities in the Federation of B&H. **Results and Discussion:** Bosnia and Herzegovina is among the countries with a high risk of CVD together with Albania, Croatia, Czech Republic, Estonia, Hungary, Kazakhstan, Poland, Slovakia, and Turkey. The main public health challenge in Bosnia and Herzegovina is reducing noncommunicable diseases (NCDs): heart disease, stroke, cancer, diabetes and chronic respiratory disease. NCDs are estimated to account for 80% of the country's annual deaths, and addressing them is the foremost public health priority in the country. Cardiovascular diseases still represent a worldwide public

health problem, with some new dimensions caused by challenges caused through pandemic of COVID-19. The well-known cardiovascular risk factors require new and more efficient public health approaches to the prevention and control. **Conclusion:** Due to the recently developed cardiovascular guidelines that were made by the European Society of Cardiology and World Heart Federation, key priority for health authorities should be is to update the existing CVD guidelines in the Federation of BiH in accordance with the international good practice to support healthcare professionals in their efforts to reduce the burden of cardiovascular disease in both individual patients, as well as at a population level..

Keywords: Cardiovascular diseases, risk factors, public health.

1. BACKGROUND

Cardiovascular diseases (CVD) are the cause of 17 million deaths a year worldwide, of which 25% are sudden cardiac deaths (SCD). In Europe cardiovascular diseases (CVD) remains a leading cause of death in Europe accounting for 3.9 million deaths each year. Even with well-known risk factors and the current standards of health care, improvement of health and quality of life of CVD patients are still remains one of the biggest public health challenges we must overcome (1,2). In EU countries, CVD is associated with

36% of all deaths, with a strong impact on the health and quality of life of over 60 million people. Data show that as many as 85% of cardiovascular deaths are the result of heart attack and stroke, despite the fact that most risk factors are known and can be prevented and monitored. If the situation does not change, it is estimated that by the end of 2030, global mortality from CVD will amount to 23.6 million deaths per year. More than three-quarters of CVD deaths occur in middle- and low-income countries (3,4). Although reducing inequalities in health is at the heart of EU interventions, the goals of the SDGs are still far from being realized. In the European region, there are significant differences in the approach to CVD protection, due to social, economic and health differences between countries. The lowest standardized mortality rates are recorded, for all age groups and both sexes, in France, Spain and Switzerland, and the highest in the countries of the former Soviet Union (Kyrgyzstan, Russia and Moldova). The lowest mortality rates for CVD are recorded in France, San Marino, Spain and Portugal and mostly in Ukraine, Kyrgyzstan and Moldova (5). Not only do CVDs have a human health cost, but they also represent a significant financial burden for European healthcare systems. It is estimated that CVDs cost the EU €210 billion every year: €111 billion in healthcare costs, €54 billion in loss of productivity and €45 billion in informal care for CVD patients (6).

2. MULTIFACTORIAL ETIOLOGY OF DVD

Multifactorial etiology of CVD is the result of an interaction between different risk factors. The main causal and modifiable CVD risk factors are high LDL-C, high BP, cigarette smoking, and DM. Another important risk factor is adiposity, which increases CVD risk via both major conventional risk factors and other mechanisms. In addition to these, there are many other relevant risk factors, modifiers, and clinical conditions, which are addressed under risk modifiers and clinical conditions. In group of environmental factors dominate population age structure, urbanization and socio-economic status. The population continually ageing. Between 1970 to 2020 globally the median age increased from 29,6 to 41,1 years as well increase of the prevalence of CVD. Life expectancy globally is longer in high income countries (81,6 years) compared to middle income countries (74,2 years). In 1970, a median of urban population was 52,3% compared to 69,4% in 2020. WHO estimates that by 2040 in the WHO European Region, there are 155 million people in the age group of 65 and over, with a 35% increase stroke morbidity. (From 9 million in 2017 to 12 million in 2040) (3-5). The most dominant metabolic risk factors remain hypertension, dyslipidemia, obesity and diabetes while smoking, unhealthy dietary habits and physical inactivity are dominant lifestyle risk factors. Without serious systemic interventions, focus to all different risk factors, the number of patients and deaths from CVD will increase dramatically and affect countries and will continue to represent a challenge for limited health systems for a long time. International good practice-framework for national interventions

European Alliance for Cardiovascular Health (EACH). In the EU, CVD accounts for 36% of all deaths and impacts the lives of some 60 million people that are living with CVD Furthermore, the reduction in CVD mortality has started to plateau and, in some countries, mortality has even started to increase. This should be a cause of great concern for policymakers when considering both population health and the effect on health systems. Risk and prevalence of CVD increases even further with age and unpreventable functional decline. This is of utmost relevance in view of Europe's ageing population. In 2040, 155 million Europeans will be over 65.6 Without decisive action starting today, the number of citizens suffering from CVD and the burden of dealing with the disease will increase dramatically. For example, the projected number of people living with stroke will increase by 35% (from nine million in 2017 to 12 million in 2040).

3. INTERNATIONAL GOOD PRACTICE FRAMEWORK FOR NATIONAL INTERVENTIONS

Main goal of the European Alliance for Cardiovascular Health (EACH) through which 17 European and international health organizations have joined forces to call on the EU to elaborate an ambitious plan to address the burden of CVD and really make a difference by improving the lives of millions of people in EU. The Alliance provides a platform to aggregate knowledge and expertise of key stakeholders active in the field of CVD and to advise and guide policymakers. The Alliance calls for greater focus on improving cardiovascular health and reducing the burden cardiovascular disease at European level. The Alliance was officially launched on 27 September 2021 during a high-level policy debate attended by representatives of the European Commission, Member States and the European Parliament. The policy debate discussed policy actions to improve cardiovascular health for citizens across the EU. The Alliance partners cover all aspects of cardiovascular care: from the patients who suffer from the disease to the clinicians and health professionals who take care of them, from health insurers to research organizations, and industries that develop the medical and technological innovations to improve the management and care of CVD. Main partner's organizations as members of EACH are: European Heart Network (EHN), European Society for Cardiology (ESC), MedTech Europe, European chronic diseases alliance (ECDA), European Stroke Organization (ESO), European Congenital Heart Organization (ECHDO) (7). An EU Action Plan for Better Cardiovascular Health completed by MedTech Europe under umbrella of the European Alliance for Cardiovascular Health (EACH), defined main priorities for European Commission (EC) and member states in systematic approach (8). According member states should invest smartly to improve access: In their Recovery Plans, allocate investments into projects aiming to improve equal access to detection, CVD care and treatment, and reward smart investments into (digital) medical innovations that improve patient outcomes and quality of life, reduce the burden on hospitals and

improve the resilience of the healthcare system. Also, member states should promote awareness, digitalization and capacity-building: Introduce widespread early detection and screening programs, while promoting the use of digital and diagnostic tools to facilitate early detection and invest in comprehensive multidisciplinary early detection training programs for reskilling healthcare professionals, especially within primary care and amongst specialist nurses (8).

4. ESC GUIDELINES DEVELOPMENTS

ESC guidelines developments. The European Society of Cardiology (ESC) as a world leader in the discovery and dissemination of best practices in cardiovascular medicine recent years developed a CVD guidelines present relevant evidence to help physicians weigh the benefits and risks of a particular diagnostic or therapeutic procedure, that should be essential in everyday clinical decision-making (9). CVD prevention needs an integrated, interdisciplinary approach including input from several disciplines and areas of expertise. In general, risk factor treatment recommendations are based on categories of CVD risk ('low-to-moderate', 'high', and 'very high'). The cut-off risk levels for these categories are numerically different for various age groups to avoid undertreatment in the young and to avoid overtreatment in older persons. Public health systems, being those providing publicly-funded healthcare, are under intense pressure to meet increasing demand for health care in environments of considerable and increasing financial resource constraint. During the period from 2019 to 2022, several significant CVD guidelines were made by ESC, of which they are more significant following: in 2019 Diabetes, Prediabetes and Cardiovascular Diseases, Dyslipidemia's, Acute Pulmonary Embolism, Supraventricular Tachycardia and Chronic Coronary Syndromes, while in 2020 were produced guidelines for Sports Cardiology and Exercises in Patient with CVD, Atrial Fibrillation, Adult Congenital Heart Disease and Acute Coronary Syndromes. Also, in 2021 were completed guidelines for CVD Prevention, Valvular Heart Disease, Cardiac Pacing & CRT and Heart Failure, and finally in 2022, were completed ESC guidelines for Pulmonary Hypertension, Cardio-oncology, Non-Cardiac Surgery, Cardiovascular Assessment and Management and Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death (9). According to the ESC guidelines Bosnia and Herzegovina are among the countries with a high risk of CVD together with Albania, Croatia, Czech Republic, Estonia, Hungary, Kazakhstan, Poland, Slovakia, and Turkey.

5. CVD AND COVID-19

People living with CVDs are at 3.9 times higher risk of having severe outcomes from COVID-19, with the risk of death from COVID-19 2.7 times higher. Patients with CVD are at a higher risk of developing severe clinical forms of COVID-19. The rate of fatal heart failure in CVD patients with COVID-19 is up to 10.5% compared to 2.3% in the general population (10). COVID-19 has created a signifi-

cant backlog of patients with serious health conditions who will need care, treatment and support. As healthcare systems rebuild, unprecedented collaboration is needed to ensure that immediate and longer-term challenges, such as ageing, can be addressed. As age is a significant risk factor for CVDs, keeping the growing ageing population healthy will relieve pressure on healthcare systems during public health threats such as COVID-19. CVDs have to be addressed as a key component of an ambitious pandemic preparedness program in order to increase the resilience of healthcare systems for future public health crises and achieve a true European Health Union (10). In 2019 World Heart Federation (WHF) initiated a Global Study on COVID-19 and CVD. Aim of the study was to describe cardiovascular outcomes in hospitalized patients with COVID-19 and identification of risk factors for CVD and their association with a worse prognostic outcome in hospitalized patients with COVID-19. Until September 2021, coverage of 5313 patients from 23 countries (Argentina, Bangladesh, Bosnia and Herzegovina, Brazil, Chile, Colombia, Georgia, India, Indonesia, Iran, Japan, Mexico, Pakistan, Portugal, Russia, Switzerland, USA and many African countries). The study is coordinated by the Public Health Foundation of India (PHFI) and the Center for Chronic Disease Control and is supported by the WHF Scientific Committee (11). As a part of this Study, some overarching recommendations by World Heart Federation (WHF) are: * COVID-19 patients need to be triaged or designated for care based on disease severity so that patients with moderate and severe disease are admitted in a separate ward or hospital depending on the available infrastructure. * Further, patients also need to be triaged based on underlying health risks such as hypertension, diabetes, prior cardiovascular or respiratory disease, kidney failure and cancer as part of the process to identify patients with a higher likelihood of developing a severe form of COVID-19 and implement targeted care. * Special attention must be given to ensuring that there are separate facilities in place for dealing with COVID-19 cardiac patients and non-COVID-19 cardiac patients including catheterization laboratories for performing invasive heart examinations (11). *Related to management of COVID-19 in patients with hypertension and diabetes, WHF recommended: * Continuing treatment with ACE-i and ARBs in patients receiving it for managing high blood pressure. This is in line with recommendations by other cardiology groups such as the American College of Cardiology (ACC) and the European Society of Cardiology (ESC). Cardiovascular disease has been costing the EU EUR 210 billion per year, due to direct healthcare costs, productivity loss, and informal care by caregivers. The COVID-19 pandemic has added to this challenge due to the significant impact it has had on CVD patients, in terms of access to and delivery of care, as well as of heart health and cardiovascular complications. Indeed, data shows that preexisting cardiovascular conditions are particularly important predictors of COVID-19 severity and mortality. Close monitoring of blood sugar fluctuations: the challenges of management due to insulin resistance is critical as diabetics

are also at high-risk for COVID-19 related mortality, and in general, more vulnerable to viral infections. (11). Management measures for ACS patients with COVID-19 emerge according to confirmed and suspected cases. In confirmed cases of COVID-19: Patients at low risk of heart attack (STEMI) can be treated to have blood clots dissolved (thrombolysis) while cardiac catheterization should be considered for rescue PCI. Patients at high risk of heart attack would likely need primary PCI but risks to medical staff must be considered in taking this decision, along with availability of appropriately trained lab staff. Conservative management is a recommended way forward for patients at lowest risk of heart attack (NSTEMI). In suspected COVID-19 cases infection presenting with ACS: STEMI patients should receive treatment to dissolve clots (thrombolysis), as with patients who are confirmed as COVID-19 positive. NSTEMI patients would not have full-blown treatment or invasive procedures but rather, more conservative management, pending test results for COVID-19. Timing is important so that results of COVID-19 tests can be integrated into planning and decision-making for control of infection (12). In May 2020, WHO initiated a survey (RA) COVID-19 and the disruption of noncommunicable diseases services: snapshot of survey results for the European Region with the aim of collecting data on resources, preparedness and response of countries to the COVID-19 pandemic. Out of 194 countries, 163 (84%) answered, of which 39 countries belong to the European region, including Bosnia and Herzegovina. In the WHO European Region: only 6 countries or 15% reported that there were no changes in the way health care was provided, 16 out of 39 countries (41%) had no interruptions in hospital healthcare, 29 out of 39 countries (74%) worked with interruptions in outpatient health care, and with reduced capacities and working methods, cancellation of surgical procedures, screening programs and the operation of centers and counseling centers for NCDs as a result of interruptions in the provision of health care (13).

6. CURRENT SITUATION IN THE FB&H

Similar to other countries in the region and in the Federation of Bosnia and Herzegovina (FB&H), chronic non-communicable diseases dominate morbidity and mortality among the population, among which cardiovascular diseases are the most common. Cardiovascular diseases represent a significant public health problem in the Federation of BiH, causing premature mortality, disability, reduced work capacity, and high costs for patients, families, the health system and the community as a whole.

CVDs risk factors

According to the WHO regional office report for Europe in 2018, over 80% of public health suboperations across all four key areas of the health systems - governance, financing, resource generation and service provision - were considered in need of improvement. Situational analyses in the Republika Srpska and the Federation of Bosnia and Herzegovina strongly indicated a need for further prioritization and strategic refocusing

in the process of planning and formulating new policies. According to the results of the Study on the state of health of the adult population in the Federation of BiH, implemented by the Institute of Public Health of the Federation of BiH, the dominant risk factors for CVD among the adult population are (16): • Hypertension: Almost half of adults in FBiH (42.1%), of which 45.3% of men and 38.9% of women have hypertension and/or are under therapy. • Obesity: Almost a quarter of adults in FBiH (21.2%) are obese, of which 19.1% are men and 23.3% are women. • Physical activity: Only a quarter of adults in FBiH (24.6%) are physically active, of which 28.7% are men and 20.3% are women. • Smoking: Almost half of the adult population in FBiH (44.1%) are smokers, of which 56.3% are men and 31.6% are women. More than half (54.1%) are daily exposed to tobacco smoke by other smokers in their own home, 44.4% at the workplace, and 52.7% in a public place.

CVD mortality

Exposure to the mentioned CVDs risk factors is associated with the maintenance of the trend of increasing the total number of deaths from cardiovascular diseases in adult population in the Federation of Bosnia and Herzegovina. In 2020 the leading mortality cause of population in the Federation of BiH are circulatory system diseases (I00-I99), with a share of 44.2% of total mortality while related to particular CVD disease second leading cause of death was acute myocardial infarction (I20) with a rate of 120.8 per 100,000 population, stroke (I63) with a rate of 111.0 per 100,000 population, essential hypertension (I10) with a rate of 79.6/100,000 population and chronic ischemic heart disease (I25) with a rate of 53.0 per 100,000 population (17). The five leading causes of death for women in the Federation of BiH in 2020 were: stroke (I63), with a rate of 121.9/100,000 population, acute myocardial infarction (I21), with a rate of 97.5/100,000 population, essential hypertension (I10) with a rate of 93.0/100,000 population, Covid-19 virus confirmed (U07.1) with a rate of 88.1 per 100,000 population, and chronic ischemic heart disease (I25) with a rate of 60.2 per 100,000 population (17). In 2020, the five leading causes of mortality of men in the Federation of BiH were: Covid-19 virus confirmed (U07.1) with a rate of 159.2 per 100,000 population, acute myocardial infarction (I21) with a rate of 145.1 per 100,000 population, stroke (I63), with a rate of 99.6/100,000 population, malignant neoplasms of the lung and bronchus (C34) with a rate of 77.7 per 100,000, and chronic ischemic heart disease (I25), with a rate of 65.7 per 100,000 population (17). Air pollution contributes to mortality and morbidity. It specifically increases the risk of respiratory and CV diseases, notably coronary artery disease (CAD), heart failure, cardiac arrhythmias and arrest, cerebrovascular disease, and venous thromboembolism. Reducing CVD risk at the individual level begins with appropriate assessment of individual risk and effective communication of risk and anticipated risk reduction by risk factor treatment. Patient–doctor interactions are complex and communicating risk is challenging.

Public health interventions

With the aim of effective measures to reduce morbidity and mortality from CVD, the Federal Ministry of Health has drawn up an Action Plan for the prevention and control of non-communicable diseases, in which a significant place dedicated to CVDs as the leading cause of death in the population in the Federation of BiH. The key segments of the Action Plan are the improvement of monitoring, the CVD registry, periodical population studies of risk factor trends, increase of access to preventive health services in PHC related to CVD risk factors and health promotion (18). In cooperation with the WHO office in BiH, in the period 2017-2018. the Institute for Public Health of the Federation of Bosnia and Herzegovina, in cooperation with the Federal Ministry of Health, implemented 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”, which is supported in partnership between the Swiss Agency for Development and cooperation (SDC) and the World Health Organization (WHO) (19, 20). Within the framework of project component number 2: Adaptation/production of instruments, materials and sets of indicators for the implementation, monitoring and evaluation of interventions in the domain of risk assessment and management of cardiovascular diseases (CVRAM), the following guides and guidelines intended for family medicine teams were prepared and published: Guidelines for the Prevention of Cardiovascular Diseases and Determination of Cardiovascular Risk (SCORE); Guide to hypertension; Guide to dyslipidemia; Guidelines for the prevention and treatment of obesity in children and youth; Guidelines for the prevention and treatment of obesity in adults; Guidelines for the promotion of physical activity; Guidelines for the prevention and treatment of diabetes and cardiovascular diseases; Guidelines for smoking cessation. The European Guide for the Prevention of Cardiovascular Diseases in Clinical Practice (version 2021) prepared by the European Association for Cardiovascular Prevention and Rehabilitation (EACPR) was used to create the aforementioned CVD guidelines for the Federation of the BiH. Representatives of the Association of Cardiologists of Bosnia and Herzegovina (member of the European Society of Cardiology -ESC) participated in the preparation of the guidelines, including experiences of a few influential experts in the field of Cardiology, Family medicine and public health in Bosnia and Herzegovina (21-30).

Due to the large number of newer available guides that were made by the ESC in the period 2019-2022. the Institute for Public Health of the Federation of Bosnia and Herzegovina, in cooperation with relevant institutions and associations, plans to update the existing CVD guides in accordance with the international good practice of ESC and WHF to support healthcare professionals in their efforts to reduce the burden of cardiovascular disease in both individual patients, as well as at a population level. NCD prevention strategies are only effective if explicit strategic approaches are applied to: a) Reduc-

tion of individual risk (aimed at high-risk individuals). b) Population risk reduction (aimed at social determinants). c) Rational and effective use of health services (by empowering users and health care providers especially in the primary health care setting). d) An integrated referral system supports. 4. A robust health information system. e) Effective health promotion initiatives.

7. CONCLUSION

A stepwise approach starts with prevention goals for all, regardless of CVD risk. This is followed by CVD risk stratification and discussion of potential benefits of treatment with the patient. If treatment is initiated, its effect must be evaluated, and subsequent treatment intensification to reach ultimate risk factor goals must be considered in all patients, taking into account additional benefit, comorbidities, and frailty, all of which converge with patient preferences in a shared decision-making process. Even before pandemic of COVID-19, cardiovascular diseases represent a significant public health problem in the Federation of BiH, causing premature mortality, disability, reduced work capacity, and high costs for patients, families, the health system and the community. The challenges that COVID-19 has faced in healthcare system in the Federation of BiH only emphasize the importance of CVD monitoring and control. Health care for CVD patients is expensive and requires a more rational use of limited funds in the health sector. CVD prevention needs an integrated, interdisciplinary approach including input from several disciplines and areas of expertise. We must work together in a patient- and family-centered way to address each of the core components of prevention and rehabilitation, including lifestyle modification, psychosocial factors, risk factor treatment, and social determinants. Without systemic interventions, the number of patients and deaths from CVD will increase dramatically and will continue to represent a challenge for health system for a long time in the Federation of BiH. Our plan should promote ambitious actions across the whole disease pathway to keep people in good health and optimize their quality of life, thereby also strengthening resilience at a population level, whilst making efficient use of healthcare resources. This should be done throughout health systems, looking at: • primary and secondary prevention • early detection, screening, and diagnosis • access to care and optimal treatment • rehabilitation • quality of life after a CVD event. Respectable number of recently developed CVD guidelines that were made by the ESC, WHF should be milestones for public health authorities in the Federation of BiH to update the existing CVD guides in accordance with the international good practice of ESC and WHF. The importance of updating the existing CVD guidelines in the Federation of BiH and simultaneously building robust health-care systems that can deliver the ultimate goal of a strong, healthy society in which NCDs are prevented, managed, and controlled. Once we look at the bigger picture, it becomes clear that reducing the NCD burden in a sustainable manner is a goal that we and the world cannot afford to miss.

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REFERENCES

1. European Society of Cardiology (ESC). Cardiovascular Realities 2020. www.flipsnack.com/escardio/esc-cardiovascular-realities-2020/full-view.html.
2. WHO. The top 10 causes of death. Available at: www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death
3. European Heart Network. European Cardiovascular Disease Statistics 2017. Available at: ehnheart.org/cvd-statistics/cvd-statistics-2017.html.
4. WHO. Cardiovascular Diseases. Available at: www.who.int/nmh/publications/fact_sheet_cardiovascular_en.pdf.
5. ESC Cardiovascular realities 2022, ESC, ISBN 978-2-492212-01-7 Available at: <https://www.flipsnack.com/escardio/esc-cardiovascular-realities-2022/full-view.html>
6. European Heart Network and European Society of Cardiology (2020). Fighting cardiovascular disease—a blueprint for EU Action. Available at: <https://www.escardio.org/static-file/Escardio/Advocacy/Documents/2020 ESC-EHN-blueprint digital edition.pdf>
7. European Alliance for Cardiovascular Health (EACH), Available at: <https://www.cardiovascular-alliance.eu/>
8. An EU Action Plan for Better Cardiovascular Health, MedTech Europe, 2021. Available at: https://www.medtecheurope.org/wp-content/uploads/2021/05/an-eu-action-plan-for-better-cardiovascular-health_25_5_2021.pdf
9. European Society of Cardiology. ESC. CVD Guidelines. Available at <https://www.escardio.org/Guidelines>
10. British Heart Foundation (2021). Coronavirus and Heart & Circulatory Diseases Factsheet. Available at: <https://www.bhf.org.uk/what-we-do/our-research/heart-statistics>
11. The Public Health Foundation of India (PHFI) the Centre for Chronic Disease Control. The Global Study on CVD and COVID-19. 2019. Available at:
12. WHF Global Study on COVID-19 and CVD—World Heart Federation (world-heart-federation.org)
13. Understanding the covid-19 and heart connection in resource settings. WHF. Available at: <https://world-heart-federation.org/news/understanding-the-covid-19-heart-connection-in-low-resource-settings/>
14. WHO. COVID-19 and the disruption of noncommunicable diseases services: snapshot of survey results for the European Region. 2020. Available at: <https://bci-hub.org/documents/covid-19-and-disruption-noncommunicable-disease-services-snapshot-survey-results-european>
15. Bosnia i Hercegovina, WHO country profile. Available at: https://www.who.int/nmh/countries/2018/bih_en.pdf?ua=1
16. Global Health Observatory data Repository. Available at: <https://apps.who.int/gho/data/node.main.NCDDEATHCAUSENUMBER?lang=en>
17. Study of the Health status of the adult population of the Federation of BiH, Institute for Public Health of the Federation of BiH 2012. Available at: <https://www.zzjzfbih.ba/>
18. Report of the Health status of the population and health system organization in the Federation of BiH, Institute for Public Health of the Federation of BiH, 2020. Available at: <https://www.zzjzfbih.ba/>
19. Action Plan for prevention and control of NCDs in the Federation of BiH 2019-2025. Available at: <https://www.fmoh.gov.ba/>
20. Tackling noncommunicable diseases in Bosnia and Herzegovina (2018) Available at: <https://www.euro.who.int/en/countries/bosnia-and-herzegovina/publications/tackling-noncommunicable-diseases-in-bosnia-and-herzegovina-AKAZ>, available at: <http://akaz.ba/klinicke-vodilje>.
21. Zildzic M, Salihefendic D. Masic I. Non-pharmacological Measures in the Prevention and Treatment of COVID-19 Infection. *Med Arch.* 2021; 75(4): 307-309. doi: 19.5455/medarh.2021.75.307-309.
22. Masic I, Rahimic M, Dilic M, Kadribasic K, Toromanovic S. Socio-medical characteristics of coronary disease in Bosnia and Herzegovina and the world. *Mater Sociomed.* 2011; 23(3): 171-176.
23. Masic I, Dilic M, Raljevic E, Vulic D, Mot D. Trends in Cardiovascular Diseases in Bosnia and Herzegovina. *Med Arh.* 2010; 64(5): 260-263.
24. Gerc V, Masic I, Salihefendic N, Zildzic M. Cardiovascular Diseases (CVDs) in COVID-19 Pandemic Era. *Mater Sociomed.* 2020 Jun;32(2):158-164. doi: 10.5455/msm.2020.32.158-164.27.
25. Masic I, Gerc V. On Occasion of the COVID-19 Pandemic - One of the Most Important Dilemma: Vaccinate or Not? *Med Arch.* 2020 Jun;74(3):164-167. doi: 10.5455/medarh.2020.74.164-167.
26. Masic I, Naser N, Zildzic M. Public Health Aspects of COVID-19 Infection with Focus on Cardiovascular Diseases. *Mater Sociomed.* 2020 Mar;32(1):71-76. doi: 10.5455/msm.2020.32.71-76.
27. Naser N, Hadziomerovic N. Sudden Cardiac Death. *Int J Biomed Healthc.* 2018; 6(2): 110-119. doi: 10.5455/ijbh.2018.6.110-119.
28. Naser N, Alajbegovic J, Masic I, Zildzic M. The Role of Health Care System in Understanding of Psychosocial Factors in Etiopathogenesis of Cardiovascular Diseases in Bosnia and Herzegovina. *Int J Biomed Healthc.* 2022; 10(1): 25-32. doi: 10.5455/ijbh.2022.19.25-32.
29. Masic I. Community Health Interventions - Planning, Methods and Quality Assessment - a One Forgotten Idea in Bosnia and Herzegovina. *Int J Biomed Healthc.* 2022; 10(3): 80-88. doi: 10.5455/ijbh.2022.10.80-88.
30. Abou Ghayda R, Lee KH, Han YJ, Ryu S, Hong SH, Yoon S, Jeong GH, Yang JW, et al. The global case fatality rate of coronavirus disease 2019 by continents and national income: A meta-analysis. *J Med Virol.* 2022 Jun;94(6):2402-2413. doi: 10.1002/jmv.27610. Epub 2022 Feb 25.