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

Mesihović Dinarević, Senka

2022-06-03

Academy of Sciences and Arts of Bosnia and Herzegovina

https://bastina.anubih.ba/items/7352c280-9809-4d6f-97ed-551ca13e1944

CARDIOVASCULAR DISEASES AND ORAL HEALTH – THE IMPACT OF PREGNANT WOMEN'S ORAL HEALTH ON CHILDREN'S CARDIOVASCULAR HEALTH

AKADEMIJA NAUKA I UMJETNOSTI BOSNE I HERCEGOVINE
АКАДЕМИЈА НАУКА И УМЈЕТНОСТИ БОСНЕ И ХЕРЦЕГОВИНЕ
ACADEMY OF SCIENCES AND ARTS OF BOSNIA AND HERZEGOVINA

Posebna izdanja
Knjiga CCIII

Odjeljenje medicinskih nauka
Knjiga 62

Kardiovaskularne bolesti i oralno zdravlje – uticaj oralnog zdravlja trudnica na kardiovaskularno zdravlje djece

Urednica
Senka Mesihović-Dinarević

SARAJEVO, 2022.

10.5644/PI2022.203.00

AKADEMIJA NAUKA I UMJETNOSTI BOSNE I HERCEGOVINE
АКАДЕМИЈА НАУКА И УМЈЕТНОСТИ БОСНЕ И ХЕРЦЕГОВИНЕ
ACADEMY OF SCIENCES AND ARTS OF BOSNIA AND HERZEGOVINA

Special Editions
Volume CCIII

Department of Medical Sciences
Volume 62

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

Editor
Senka Mesihović-Dinarević

SARAJEVO 2022

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

Publisher
Academy of Sciences and Arts of Bosnia and Herzegovina

For the Publisher
Academician Muris Čičić

Editor
Academician Senka Mesihović-Dinarević

Authors
Senka Mesihović-Dinarević, Berislav Topić, Vjekoslav Krželj, Lutvo Sporišević, Aida Ramić-Čatak, Anes Jogunčić, Senad Sarić, Grit Kirsten-Sarić, Samir Prohić, Sanja Jurišić, Liana Cambj-Sapunar, Davor Petrović

Reviewers
Vjekoslav Gerc, Zumreta Kušljugić, Vesna Miranović

Editing
Irma Grebović-Muratović

Translation
Meliha Begović

DTP
Narcis Pozderac

Print
Fojnica d.d.

Print run
200

EBSCO

Sarajevo, 2022.

ISBN 978-9926-410-76-6

CIP zapis dostupan u COBISS sistemu Nacionalne i univerzitetske biblioteke BiH pod ID brojem 49496838

CONTENT

INTRODUCTION

The book „Cardiovascular Diseases and Oral Health" talks about the impact oral health of pregnant women has on the cardiovascular health of children. It was created as a result of years of teamwork of medical professionals on the International Project of the Committee for Cardiovascular Pathology of the Department of Medical Sciences of the Academy of Sciences and Arts of Bosnia and Herzegovina, a project which has been under implementation since 2017 in Bosnia and Herzegovina, Croatia and Germany.

The results of the first phase of the project were presented at the World Congress on Cardiology held in **Rome, in August of 2018**. Dinarević SM, Topić B, Jurišić S, Prohić S, Sporišević L, Saric S, Sarić GK, Krželj V, Jogunčić A and Ramić: **"The challenges of detecting risk factors for the development of atherosclerosis"**, Challenges in Cardiology: Cardiology Congress, August 16-18, 2018, Rome, Italy, https://cardiology. innovincconferences. com/, p: 28-30, 2018, publication: Dinarević SM, Topić B, Jurišić S, Prohić S, Sporišević L, Sarić S, Sarić GK, Krželj V, Jogunčić A and Ramić: "The challenges of detecting risk factors for the development of atherosclerosis", J Cardiovasc Dis Diagn 2018; 6: 342. doi: 10.4172 /2329-9517.1000342, ISSN: 2329-9517; p:2-9.

At the **8th Congress of Cardiologists and Angiologists of Bosnia and Herzegovina** held in September of **2018** in Sarajevo with international participation, a part of the study: **"Oral and Cardiovascular health – The Challenges of Detecting Risk Factors for the Development of Atherosclerosis"** written by the following authors: S Mesihović- Dinarević, L Sporiševic, B Topić, S Kupešić, S Sarić, GK Sarić, V Krželj, A Jogunčić, S Prohić, A Ramić was presented. The study was published in the Book of abstracts, ISSN: 9772 566 471006; vol.1; No:1, sepmt 2018; p:185-186.

The results of the second phase of the international project were presented in Split in April 2019 at the annual international 36th Seminar "Croatian Spring Pediatric School". Paper titled "**New Potential Risk Factors for Prematurity and Cardiovascular Diseases in Children"** written by Senka Mesihović-Dinarević, Lutvo Sporišević, Berislav Topić, Vjekoslav

Krželj Sanja Jurišić, Grit Kirsten-Sarić, Senad Saric Anes Jogunčić, Samir Prohić, Aida Ramić was also published, Paediatria Croatica. 2019; vol. 63 (Supl 1): 1-5, ISSN 1330-724X, UDK 616-053.2 36. Seminar Croatian Spring Pediatric School, Split, Croatia, 8-12.4.2019.

The 3rd International Conference on Women Health was held in Nice during May 30-31. The Conference gathered numerous eminent medical experts from the United States of America and Europe who presented the latest papers and research in this field. The results of the scientific research study continue to generate significant scientific interest. The study which has been conducted since 2017 as a joint effort in the countries of the region, Bosnia and Herzegovina, Croatia, and Germany, explores new potential risk factors for premature birth. Pregnancy is a condition of complex physical and physiological changes that have major effects on multiple organ systems. Some authors suggest a possible link between periodontal disease in pregnant women and the risk of premature childbirth, low birth weight and gestational age of the newborns and possible cardiovascular diseases. Good oral health is reflected on and affects general health as well as quality of life. Pregnant women with periodontitis have 2 to 7 times higher risk of premature birth. Incidence of premature births and low birth weight deliveries varies from 5% to 18% depending on the geographical area and characteristics of population. The causes of premature births are believed to be unknown in 50% of cases, and other potential causes are: socio-economic factors, acute and chronic diseases, multiple pregnancies, gynecological causes, hereditary diseases, placental and other causes. It is extremely important to identify potential risk factors related to premature birth and low birth weight deliveries because this can significantly reduce incidence, perinatal mortality, number of potential perinatal complications, financial costs of neonatal intensive care and therapy and cardiovascular repercussions on the health of the newborn. Primary prevention of atherosclerotic should start as early as possible, during pregnancy by creating healthy lifestyle. Proper nutrition in pregnancy, monitored pregnancy and regular dental care can reduce the frequency and occurrence of caries, periodontal diseases, preterm births, and cardiovascular consequences on the health of the newborn and contribute to better overall health of the society. The results of the Study constitute the health base for the Balkan region, as well as the geographical, demographic, and epidemiological source of information for detection and identification of new potential risk factors for preterm birth and the possible development of atherosclerosis. Published paper: Dinarević-Mesihović S, Lutvo Sporišević, Berislav Topić, Sanja Jurišić, Senad

Saric, Grit Kirsten-Sarić, Vjekoslav Krželj, Anes Jogunčić, Samir Prohić, Aida Ramić: **"The oral health of pregnant women as a new potential risk factor for prematurity and cardiovascular diseases in children"** 3rd International Conference on Women Health and Breast Cancer, 30-31.5.2019, Nice:141st Conference Scientific Federation; p:34-35. http://scientificfederation.com.

In December 2019, the results of the second phase of the project were presented in **Florence** and the following paper published: Senka Mesihović-Dinarević, Anes Jogunčić Grit Kristen Sarić, Liana Cambj-Sapunar, Davor Petrovic, Berislav Topić, Vjekoslav Krželj, Sanja Jurišić, Senad Sarić, Lutvo Sporišević, Samir Prohić, Aida Ramić: **"The influence of mother's nutrition and oral health on the child's blood vessel development",** December 5-6 2019, Florence, Italy 26th International Conference on Pediatric Cardiology and Congenital Heart Disease; Euro Sci Con; Archives of Medicine; ISSN 1989- 5216; DOI 10 36648 /19895261-C3-013; p:21-22.

At the **10th Europaediatrics Congress** that took place in **Zagreb, Croatia** from 7-9 October 2021, the following paper was presented: **"Child's blood vessel development in relation to mother's dietary eating habits and oral health"** written by: Senka Mesihović-Dinarević, Anes Jogunčić, Kristen Sarić, Lutvo Sporišević, Berislav Topić, Vjekoslav Krželj, Liana Cambj-Sapunar, Davor Petrović, Sanja Jurišić, Senad Sarić, Samir Prohić and has been published in Arch Dis Child 2021;106 (Suppl 2): A1–A216.
A presentation of results of the project **"A new potential risk factors for prematurity and cardiovascular diseases in children"** written by: Senka Mesihovic-Dinarevic, Anes Jogunčić Grit Kristen Sarić, Liana Cambj-Sapunar, Davor Petrovic, Berislav Topić, Vjekoslav Krželj, Sanja Jurišić, Senad Saric, Lutvo Sporišević, Samir Prohic, Aida Ramić, was planned at the **10th World Congress of Perinatal Medicine in Tuzla**, but due to the COVID-19 pandemic, it was postponed to 2022.

The result of the final phases of this project is the publication of a **book/ monograph** that is presented on the following pages and contains six chapters.

Special thank you to all team members for their hard work on this prospective research: academician Berislav Topić, PhD, Vjekoslav Krželj, PhD, Lutvo Sporišević, PhD, Samir Prohić, PhD, Aida Ramić, PhD, Senad Sarić, Prim. Dr. Grit Kristen, MD, Lian Cambj-Sapunar, MD, Davor Petrović, MD, Anes Jogunčić, MD, Sanja Jurišić, MD, PhD, Zana Boloban, MD, nurses: Enita Turajlić and Sanela Begović, as well as pregnant women who took part in the research and showed interest in contributing to science in this sufficient unexplored field.

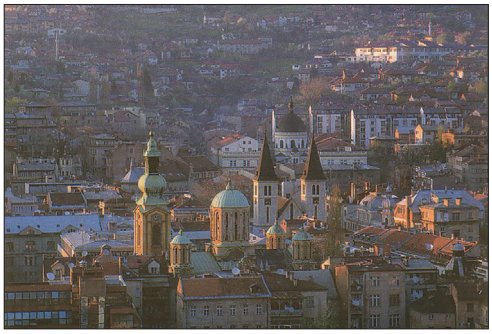
Colleagues expressed enthusiasm for researching the new and selflessly gave their contribution. The presented results attracted the attention of the medical community, which makes us incredibly happy. I hope that these results will serve the profession and science and be the basis for future research.

Sarajevo, October 2021. Prof. Senka Mesihović-Dinarević, MD, PhD

Rome

Florence

Nice



Sarajevo

Chapter I
CARDIOVASCULAR DISEASES

Prof. Senka Mesihović-Dinarević, MD, PhD

Cardiovascular medicine is an area of clinical practice with a continually rapid expansion of knowledge, guidelines, best practices, and modern technology in both adult and pediatric cardiovascular medicine.

Cardiovascular diseases (CVD) are the leading cause of disability and premature deaths globally and substantially contributes to the rising cost of healthcare /1, 2, 3/.

The majority of CVD can be prevented by addressing behavioral risk factors such as tobacco use, unhealthy diets and obesity, physical inactivity, and harmful use of alcohol, through strategic approach aimed at entire population. Systematic approach to the control of cardiovascular diseases is necessary, with the aim of integrating into European and world medical trends, which would result in reducing morbidity and mortality rates from cardiovascular diseases.

Continuous monitoring of risk factors for the development of cardiovascular diseases is necessary, starting from fetal period to the period of adolescent and adult.

As a part of lifelong learning process for all professionals in cardiovascular medicine, the imperative is to have continuity of reviewing novelties, with results data from numerous research in order to treat patient according to best practices and evidence-based medicine.

The underlying pathology of cardiovascular diseases is atherosclerosis.

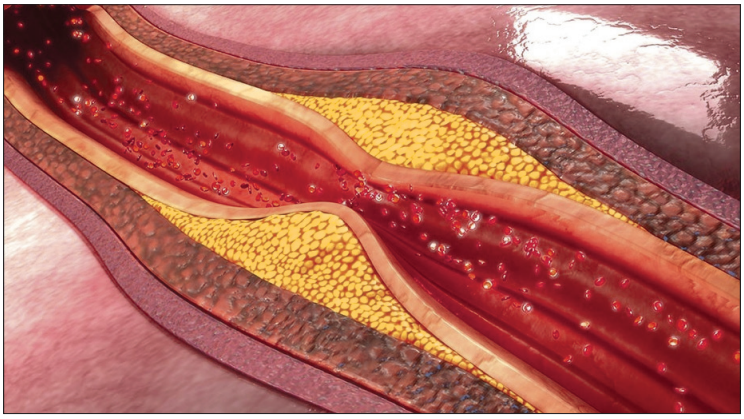


Figure 1. Blood vessel with fatty streak obstructing the lumen
Source: https://med.stanford.edu/news/all-news/2020/06/unregulated-artery-cell-growth-may-drive-atherosclerosis.html

Atherosclerosis is the most common arterial disease characterized by the reduction in the lumen of the blood vessel due to local plaque or atheroma thickening (2–4). It is one of the leading causes of mortality in developed countries. Of the ten most common causes of death, six are related to heart and blood vessels as a result of atherosclerosis. Atherosclerosis begins in childhood, but the patient is asymptomatic for a long time. Symptoms develop over many years, and at around 50 years of age health rapidly begins to deteriorate.

Cardiovascular disease, atherosclerosis is an interdisciplinary problem that is treated by: cardiologist, neurologist, epidemiologist, nutritionist and other specialists.

The most important *risk factors* for the development of atherosclerotic disease are:

- hyperlipidemia,
- hypertension,
- smoking,
- diabetes,
- high fibrinogen,
- male and younger sex,
- menopause in women taking oral contraceptives or hormonal therapy only in the presence of other risk factors,
- increased weight,
- elevated level homocysteine,

- lack of physical activity,
- inheritance and
- immune response in some diseases (5,6)

Consequences of atherosclerosis are:

- coronary or ischemic heart disease, in particular, myocardial infarction,
- cerebrovascular disease and
- cerebrovascular events (80% of all myocardial infarction and strokes occur due to atherosclerosis),
- narrowing or blocking of peripheral arteries, and carotid arteries, especially in legs, which can lead to gangrene (7,8).

Since there is no specific cure for atherosclerosis, the best way to avoid it is prevention. In the US and Western Europe, where risk factors have been preventively eliminated long time ago, mortality rate "fell" below 50%. Prevention includes avoiding risk factors: normal body weight in relation to sex, age and height is preferred instead of obesity, working out or speed walking at least half an hour a day because skeletal muscles designed for movement make up 40% of our bodies (5,6).

The aim of primary prevention is to prevent the occurrence of risk factors for atherosclerosis, and the secondary is to prevent the development of aggravation of the illness along with the reduction or control of existing risks.

Modification of risk factors has been shown to reduce mortality and morbidity in people with diagnosed or undiagnosed cardiovascular disease. Several forms of therapy can prevent coronary, cerebral and peripheral vascular events.

Decisions about whether to start specific preventive action, and with what degree of intensity, should be guided by estimation of the risk of any such vascular event. The risk prediction charts that accompany these guidelines allow treatment to be targeted according to simple predictions of absolute cardiovascular risk.

Due to CVD 17,5 million people die worldwide, which is 30% of all global deaths (9).

Around 1.5 billion lives are lost due to premature death and disability, and CVD is responsible for 10%.

The mortality rate in Europe region was 9,6 million, out of which cardiovascular diseases were responsible for 4.9 million or 51% of deaths. 34.4 million years of life is lost due to premature death and disability, which represents 30% of total number of years of life lost from all causes of death.

In the Balkan region in the last few years, mortality rate for cardiovascular diseases ranges from 48% to 57% of total number of deaths.

Extensive research studies of risk factors, morbidity and mortality of cardiovascular diseases and epidemiological research of other noncommunicable diseases strongly support multifactorial, socio-ecological paradigm.

Early detection and reduction of risk factors, which are included in the prevention and control of cardiovascular diseases program, can be accomplished if we shift the focus of the health care onto the primary level in order to stop morbidity and mortality rate with more rational measures (cheaper cost-effective health measures) (10).

According to the World Health Organization, over three quarters of CVD deaths can be prevented by appropriate lifestyle changes.

CVD prevention as a major challenge for the general population, politicians, and healthcare workers alike, is defined as a "coordinated set of actions, at public and individual level, aimed at eradicating, eliminating, or minimizing the impact of CVDs and their related disability". The bases of prevention is rooted in cardiovascular epidemiology and evidence-based medicine. (10,11).

A lifetime approach to cardiovascular risk is important since both risk and prevention are dynamic and continuous as *patients ages and/or accumulate co-morbidities*. That means, apart from improving lifestyle and reducing risk factor levels in patients with established cardiovascular disease (CVD) and those at increased risk of developing CVD, healthy people of all ages should be encouraged to adopt a healthy lifestyle. Healthcare professionals in their clinical practice, play an important role in helping patients to achieve this.

Coronary artery disease mortality has declined since the 1980s, particularly in high-income regions (16,17). Coronary artery disease rates are now less than half what they were in the early 1980s in many countries in Europe, due to *preventive measures including the success of anti-smoking laws.*

However, inequalities between countries persist and many risk factors, particularly obesity (18) and diabetes mellitus (DM), (19) have been increasing substantially. If prevention was practiced as instructed it would markedly reduce the prevalence of CVD.

Prevention should be delivered at the general population level by promoting healthy lifestyle behavior and at the individual level, i.e., in those subjects at moderate to high risk of CVD or patients with established CVD, *by tackling unhealthy lifestyles* (e.g., poor-quality diet, physical inactivity, smoking) and by *optimizing risk factors*.

Prevention is effective: the elimination of health risk behaviors would make it possible to prevent at least 80% of CVDs and even 40% of cancer (20, 21).

When to start prevention?

Ideally, prevention of cardiovascular diseases begins *during pregnancy and lasts for the rest of patient's life* /21, 22/.

All scientific evidence collected through studies in recent decades have confirmed that an increased cardiovascular risk begins to develop in the (very) early years of life. Even exposure to risk factors before birth can affect the risk of CVD during life.

Although children have a low absolute risk of developing CVDs, those with a relatively high risk compared to their peers, an increased risk of having cardiovascular events *later in life* remains due to *risk factors 'monitoring'* (those at the upper percentiles of the cardiovascular risk distribution early in life, have tendencies to stay there).

Healthy lifestyle is therefore crucial among young people, even though ethical and other reasons do not provide strong evidence according to randomized studies in favor of reducing CVD, *such as school health education programs or smoking cessation programs*.

Primary prevention should begin in early childhood by creating a healthy diet, banning smoking, regular physical exercise which will prevent or slow down the development of atherosclerosis.

There is a growing number of studies in modern medicine indicating that children nowadays are overweight, which is risk factor for many chronic diseases such as: cardiovascular diseases, type II diabetes, orthopedic and psychological illnesses.

The epidemic of obesity is one of the most important health problems facing the world today. Obesity prevalence has increased threefold in European countries in the last two decade.

A question is raised: what shall we do to prevent cardiovascular diseases?

Why should schools worry about heath?

As a society, we value good health. Good health is necessary for effective learning. Healthy students become healthy, productive citizens. School is the place where we spend most of our youth, therefore we need to initiate change. We need to work as a team on our environment, society and on introducing new policies.

Our priority should be creating a place for physical activity and proper nutrition in schools, developing funded prevention programs and systematic approach to the problem. We need to point out the problem of obesity in an adequate manner and create partnerships with local communities in creating healthy lifestyle. Schools can provide quality physical education classes, healthy nutrition campaigns, parenting education, psycho-social education/ intervention with nutrition strategies.

Prevention is the key!

It is necessary to establish dialogue in cardiovascular medicine!
Prevention of obesity consists of nutrition conducted according to modern guidelines in relation to the input of carbohydrates, fats, proteins, vitamins, and fluids. It is necessary to maintain regular physical activity, both in school and in free time (22). It is also necessary to promote continuous education about healthy eating and lifestyle (physical activity, negative effect of smoking) *in all primary and secondary schools in the country*, and to involve *teams of family doctors in monitoring the nutritional status of young children and youth.*

In order to further implement strategy of systematic risk prevention of CVD and develop health promotion concept, more efficient coordination and active participation of relevant institutions is needed, starting with the Ministry of Health and all level of healthcare system by paying special attention to primary healthcare teams, family medicine teams, all the way to educational institutions at all levels as well as patient associations.

References

1. World Health Organization. Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases. 2002. Report No. 916.
2. Berenson GS, Blonde CV, Faris RP (1979) Cardiovascular disease risk factor variable during the first year of life. Am J Dis Child 133: 1049-57.
3. Mesihović-Dinarević, J Cardiovasc Dis Diagn:" Prevention of Cardiovascular Disease from an Early Age", 2017, 5:3; DOI: 10.4172/2329-9517.1000268
4. Berenson GS, Srinivasan SR, Hunter SM, Nicklas TA, Freedman DS, et al. (1989) Risk factors in early life as predictors of adult heart disease: The Bogalusa heart study. Am J Med Sci 298: 141-151.
5. Geer JC, McGill, He Strong JP (1961) The fine structure of human atherosclerotic lesions. Am J Pathol 38: 263-269.
6. Dhuper S, Buddhe S, Patel S (2013) Managing cardiovascular risk in overweight children and adolescents. Paediatr Drugs 15: 181-190.

7. Berenson GS, Srinivasan SR, Bao W, Newman WP III, Tracy RE, et al. (1998) Association between multiple cardiovascular risk factors and atherosclerosis in children and young adults. The Bogalusa Heart Study. N Engl J Med 338: 1650-1656.
8. Newman WP, Freedman DS, Voors AW, Gard PD, Srinivasan SR, et al. (1986) Relation of serum lipoprotein levels and systolic blood pressure to early atherosclerosis. The Bogalusa Heart Study. New Eng J Med 314: 138-144.
9. European Center for Peace and development, University for Peace by the United Nations, New trends in prevention, diagnostics and treatment of cardiovascular disease, Montenegro,2017.
10. Resolution WHA61.14. WHO 2008–2013Action plan for the global strategy for prevention and control of noncommunicable diseases. Geneva, World Health Organization, 2008.
11. Last JM, ed. A Dictionary of Epidemiology. 4th ed. New York: Oxford University Press; 2001.
12. Health 2020: a European policy framework supporting action across government and society for health and well-being, 2013 WHO Regional Office for Europe, available from: www.euro.who.int/publications
13. Country experiences in integrated policy development for the prevention and control of noncommunicable diseases 2015, WHO Regional Office for Europe, available from: www.euro.who.int/publications
14. WHO Report on the Global Tobacco Epidemic 2015, available from: http://www.who.int/tobacco/global report/2015/en/
15. European Heart Journal (2016) 37, 2315–2381 doi:10.1093/eurheartj/ehw106JOINT ESC GUIDELINES
16. World Health Organization. Global status report on non-communicable diseases 2010 http://apps.who.int/iris/bitstream/10665/44579/1/9789240686458_eng. pdf.
17. Moran AE, Forouzanfar MH, Roth GA, Mensah GA, Ezzati M, Murray CJ, Naghavi M. Temporal trends in ischemic heart disease mortality in 21 world regions, 1980 to 2010: the Global Burden of Disease 2010 study. Circulation 2014;129:1483–1492. /2016/
18. Finucane MM, Stevens GA, Cowan MJ, Danaei G, Lin JK, Paciorek CJ, Singh GM, Gutierrez HR, Lu Y, Bahalim AN, Farzadfar F, Riley LM, Ezzati M. National, regional, and global trends in body-mass index since 1980: systematic analysis of health examination surveys and epidemiological studies with 960 country-years and 9.1 million participants. Lancet 2011;377:557–567.
19. Danaei G, Finucane MM, Lu Y, Singh GM, Cowan MJ, Paciorek CJ, Lin JK, Farzadfar F, Khang YH, Stevens GA, Rao M, Ali MK, Riley LM, Robinson CA, Ezzati M. National, regional, and global trends in fasting plasma glucose and diabetes prevalence since 1980: systematic analysis of health examination surveys and epidemiological studies with 370 country-years and 2.7 million participants. Lancet 2011; 378:31–40.
20. Liu K, Daviglus ML, Loria CM, Colangelo LA, Spring B, Moller AC, Lloyd-Jones DM. Healthy lifestyle through young adulthood and the presence of low cardiovascular disease risk profile in middle age: the Coronary Artery Risk Development in (Young) Adults (CARDIA) study. Circulation 2012;125: 996–1004.
21. NICE Public Health Guidance 25. Prevention of Cardiovascular Disease. http://www.nice.org.uk/guidance/PH25.
22. Survey of the health status of the population of FBiH, 2002, Institute for Public Health of the Federation of BiH, available from: http: www.zzjzfbih.ba

CHAPTER II
ORAL AND CARDIOVASCULAR HEALTH

Prof. Senka Mesihović-Dinarević, MD, PhD
Prof. Lutvo Sporišević, MD, PhD

The correlation between oral health and cardiovascular diseases was evaluated in the past, but not the influence of mother's nutrition and oral health on the fetal cardiovascular development which can lead to:

- slow fetal growth,
- low birth weight,
- difference in the development of blood vessels

Pregnancy is a state during which the body undergoes complex physical and physiological changes that have important impact on multiple organs and systems.

Some authors suggest a possible link between periodontal disease in pregnant women and the risk of premature childbirth, low birth weight newborns and possible cardiovascular diseases.

Hence, the aim of this research, the results of which are presented in the following pages, is to evaluate the link between maternal oral health, their diet during the pregnancy with the development of coronary and carotid arteries and cardiovascular system.

The consideration of origin of the development of diseases of the cardiovascular system will start with a brief overview of the development of atherosclerosis.

Atherosclerosis

As a cardiovascular disease, atherosclerosis is a multifactorial in its etiopathogenesis and is treated by: family doctor, pediatrician, pediatric cardiologist, cardiologist, neurologist, diabetologist, endocrinologist, cardiovascular surgeon, neurosurgeon, radiologist, nuclear radiologist, epidemiologist, nutritionist, pathologist, and biochemist with the aim of early detection and

treatment of atherosclerosis and also minimizing the development of risk factors for coronary artery diseases.

Pathophysiology of atherosclerosis is characterized by the damaged cells located in the inner surface of the arteries where endothelium is exposed to chemical or mechanical injury.

Elevated blood cholesterol, smoking or elevated homocysteine (one of researched causes of atherosclerosis today) are some examples of chemical and mechanical cell injury as well as high blood pressure, injury caused by catheter during diagnostic procedures and even infections.

The first stage of atherosclerosis development occurs in the form of a "fatty streak".

Fatty streak is totally reversible, which means that endothelial cells can completely recover when harmful activities of pathogens are terminated. However, if harmful activities continue, atherosclerotic plaque grows and narrows lumen even further.

This results in inadequate blood flow and oxygen delivery to the tissues. In the blood vessel, itself due to reduced elasticity, an increase of blood pressure occurs. Elevated blood pressure can lead to rupture of the blood vessel or formation of aneurysms or plaque which can calcify and narrow down blood vessel walls and help form a blood clot.

Plaque composition is much more important than plaque size for atherosclerosis. *Subclinical atherosclerosis* is and early indicator of cardiovascular changes. It is very important and alarming since the process can be stabilized and reversed if treated in time.

Ultrasound measurements of carotid intima-media thickness cIMT is considered a valid surrogate marker for assessing cardiovascular risk, which allows the assessment of the atherosclerotic changes at an early stage.

Oral health

The association between oral health and atherosclerotic cardiovascular disease

Oral diseases are among the most common chronic noncommunicable diseases. Oral health is key indicator of well-being and quality of life and have close linkages with general health.

Periodontitis is progressive disease of tooth-supporting apparatus-*paradoncium* whose role is to support the tooth and keep it fixed to the bone. It includes: cementum, alveolar bone, periodontal ligament and gingival tissue.

If one of these elements is jeopardized, the whole apparatus begins to decay. It happens gradually which makes this a progressive disease. The cause of periodontitis are bacteria from dental plaque.

If not diagnosed and treated, periodontitis becomes chronic inflammatory, immune-driven disease, characterized by deterioration of periodontal ligament and alveolar bone.

Links between oral diseases and general health are multifaceted and complex.

Most oral diseases have common risk factors, including:

- unhealthy diet high in free sugars,
- tobacco use and
- excessive alcohol consumption by people with cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes mellitus.

Oral cavity is an integral part of human body and thus there is a link between oral and systemic health. There is reciprocity between periodontitis and some systemic diseases, such as diabetes, osteoporosis, HIV infection, and trisomy 21.

People with periodontitis are more prone to some systemic diseases than healthy people:

- chronic periodontitis is a risk factor for future cardiovascular diseases,
- pregnant women with chronic periodontitis are at a higher risk of preterm births and
- women give birth to low-birth-weight infants.

The explanation for the pathophysiological mechanisms *of periodontal focus and systemic disease* is linked to the increased level of circulating pro-inflammatory cytokines and prostaglandins derived from: periodontal disease, gram-negative bacteria and endotoxin-like substances that appear from subgingival biofilms directly entering the bloodstream.

Dominant problems of everyday dental practice are *caries, periodontal disease, occlusal abnormalities, the link between oral and general health and holistic approach to the patient.*

Caries and periodontal disease are of an infectious etiology, therefore the prevention of dental caries and periodontal disease means preventing odontogenic focuses.

A periodontal pocket is a risk factor for the development or worsening of systemic disease and focal infection because the infection is always present in it. The flora of periodontal pocket is diverse, massive, virulent and penetrates

the soft wall of the pocket. The pocket is under constant mechanical stimulation during chewing, swallowing and speech, and it all benefiting the penetration of bacteria into circulation and the formation of transient bacteremia.

Interdisciplinary cooperation in eliminating potential negative effects of periodontal infections will result in better systemic health.

Dental caries and periodontal disease are the most common and significant oral disease that can cause and aggravate numerous other disease:

- of the cardiovascular system (infective endocarditis, atherosclerosis,
- myocarditis, and myocardial infarction),
- of the respiratory system (pneumonia, chronic obstructive pulmonary disease, bronchial asthma, and pulmonary abscess),
- neurological disorders (cerebral infarction and cerebral abscess),
- diabetes mellitus, rheumatoid arthritis,
- Alzheimer's disease,
- complications of pregnancy (preeclampsia, stillbirth, miscarriage),
- preterm births and low birth weight,
- osteoporosis.

Pregnancy

Pregnancy is a state in which there are complex physical and physiological changes, which have important effects on multiple systems of organs. High levels of circulating estrogen during pregnancy are associated with high prevalence of gingivitis and gingival hyperplasia or certain forms of periodontal disease.

It is believed that approximately 40% of pregnant women have a certain form of periodontal disease. Offembacher et al. (1996) first suggested a possible link between periodontal disease and risks for child delivery of a low gestational age or small birth weight. Many researchers suggest a possible link between periodontal disease in pregnant women with a risk for preterm delivery, i.e., low birth weight. Researchers show that pregnant women with periodontal disease have 2-7 times higher risk for premature birth.

That is why dentists need to motivate, educate, and instruct pregnant women towards a higher level of oral hygiene and to repair all orodental lesions in dental therapeutic procedures, especially periodontal pockets, thereby reducing the number of premature births.

It is considered that genetic factors may be an important factor in developing periodontal disease. Scientists believe that DNA sequence variations

influence the individual risk for the development of periodontal disease because they have found that due to the variation of gene sequences, the activity of alpha defensins (antimicrobial peptides present in neutrophil granulocytes) which is responsible for the destruction of periodontopathogenic bacteria, could be stopped. Munz et al. discovered that gene loci linked with chronic and aggressive periodontal disease susceptibility is due to disorders in congenital and acquired immunity which leads to development of periodontal disease.

Prematurity

Incidence of premature births and low birth weight deliveries varies from 5% to 18% depending on the geographical area and characteristics of population.

Causes of premature births are believed to be unknown in 50% of cases, and other possible causes are: socio-economic factors, acute and chronic diseases, multiple pregnancies, gynecological causes, hereditary diseases, placental and other causes.

It is extremely important to identify *potential risk factors* of preterm birth because this can significantly decrease incidence of preterm birth and low birth weight deliveries which reduces perinatal mortality rate and potential perinatal complications.

Preterm infants and low birth weight infants are at increased risks of cardiovascular disease vs. full-term infants and normal birth weight infants.

Risk factors for prematurity are:

Prior premature birth, multiple pregnancies, uterine or cervical problems/ uterine infections, cervical insufficiency, placental abruption, chronic high blood pressure, preeclampsia, diabetes, smoking, alcohol use, age, lack of prenatal care, poor nutrition, untreated infection. Mothers who gave birth to preterm infants or low birth weight infants have significantly higher levels of PGE2 in gingival fluid as opposed to mothers who gave birth to full-term and normal birth weight infants.

During pregnancy there is an increased susceptibility to caries due to:

- increased acidity in the oral cavity,
- increased consumption of refined sugars and
- poor oral hygiene.

Caries in children is usually transmitted by direct transmission through the mother's saliva. Mothers with high level of Streptococcus mutans in their saliva are more likely to transmit the bacteria to their baby – by vertical transmission, creating conditions for the development of caries in early childhood.

Time and frequency of bacteria transmission, proneness to the accumulation of bacteria on child's teeth, saliva composition and flow, the amount of refined sugar in child's diet are all significant indicators of early childhood caries development.

Due to the immaturity of their organ systems, preterm and low birth weight infants belong to the vulnerable group of infants – preterm birth complications are the leading cause of death among children under five years of age. Preterm or low birth weight infants exhibit a higher incidence of cardiovascular risk factors (obesity, hypertension, dyslipidemia), and type 2 diabetes mellitus.

Animal and epidemiological studies indicate that elevated levels of glucocorticoids in utero are programming the hypothalamic-pituitary-adrenal axis during life which plays a key role in contributing to the higher occurrence of cardiovascular risk in preterm and low birth weight infants.

Apart from the role of oral microbiome (microbiome - all microbes, their genome and mutual interaction in particular environment) as a risk factor for preterm birth or low birth weight infant, it is possible that *microorganisms of the oral cavity during chronic inflammation can become an atherosclerotic risk factor for cardiovascular diseases.*

Appropriate prenatal health care should include oral health care of pregnant women. It is important to point out the importance of practicing regular oral hygiene and the need for regular dental check-ups.

Considerable number of pregnant women have inadequate oral health due to irregular visits to the dentist, poor oral hygiene, unhealthy diet and everything that might cause the occurrence of caries and periodontal disease in pregnant women.

The sufficient oral health screening of pregnant women is not carried out in daily work. Therefore, by reviewing the oral health status of larger number of pregnant women, including the assessment of their oral hygiene, we could timely identify pregnant women who have dental caries or periodontal disease.

Timely dental treatment could decrease occurrence of dental caries and periodontal disease in pregnant women and could reduce the rate of preterm delivery and low birth weight infants, early childhood caries and predictors

of early atherosclerotic cardiovascular risk (increased body mass index, blood pressure and carotid intima-media thickening).

In a group of children who were born prematurely or had low birth weight, a certain number of children aged 3 years have higher body mass index, higher systolic and diastolic blood pressure, as well as thickening of carotid artery intima-media complex with early signs of cardiovascular disease.

Insufficient insight into the possible pathological implications of the oral health status of pregnant women and their eating habits on premature expression of cardiovascular risk factors in children initiated this research.

References

1. Pezelj-Ribarić i sur. Oralno zdravlje – uvjet za opće zdravlje. Rijeka; medicinski fakultet Sveučilišta u Rijeci; 2013.
2. Teles R, Wang CY. Mechanisms involved in the association between periodontal diseases and cardiovascular disease. Oral Dis 2011;17:450–461.
3. Zoellner H. Dental infection and vascular disease. Semin Thromb Hemost 2011;37:181–192.
4. Kamer AR, Craig RG, Dasanayake AP, Brys M, Glodzik-Sobanska L, de Leon MJ. Inflammation and Alzheimer's disease: possible role of periodontal diseases. Alzheimers Dement 2008;4:242–250.
5. Boggess KA, Edelstein BL. Oral health in women during preconception and pregnancy: implications for birth outcomes and infant oral health. Matern Child Health J 2006; 10 (5 Suppl):S169-174.
6. Hemaltha V, Manigandan T, Sarumathi T,Aaarthi Nisha V,AmudhanA. Dental considerations in pregnancy − a critical review on the oral care. J Clin Diagn Res 2013; 7:938.
7. American College of Obstetricians and Gynecologists. Oral health care during pregnancy and through the lifespan. Committee Opinion No. 569. Obstet Gynecol 2013;122:417–422.
8. Offenbacher S, Katz V, Fertik G, Collins J, Boyd D, Myynor G i sur. Periodontal infection as a possible risk factor of preterm low birth weight. J Periodontal 1996;67:1103-1113.
9. Soroey M, Avanbadejo P, Savage K, Oluwole A. Association between periodontal disease and pregnancy outcomes. Odontostomatol. Trop. 2015; 38 (152):5-16.
10. Turton M, Africa CW. Further evidence for periodontal disease as a risk indicator for adverse pregnancy outcomes. Int Dent J. 2016 Dec 17. doi: 10.1111/idj.12274.
11. Trivedi S, Lal N, Singhal R. Periodontal disaease during pregnancy. J Orofacial Sci 2015; 7:67.
12. Govindaraju P, Venugopal S, Shivakumar MA, Sethuraman S, Ramaiah SK, Mukundan S. Maternal periodontal disease and preterm birth: A case-control study. J Indian Soc Periodontol. 2015;19(5):512-515. doi: 10.4103/0972-124X.164751
13. Reza Karimi M, Hamissi JH, Naeini SR, Karimi M. The Relationship Between Maternal Periodontal Status of and Preterm and Low Birth Weight Infants in Iran: A Case Control Study. Glob J Health Sci. 2015 ;8(5):184-188. doi: 10.5539/gjhs.v8n5p184.

14. Moore S, Ide M, Coward PY, Randhawa M, Borkowska E, Baylis R, Wilson RF. A prospective study to investigate the relationship between periodontal disease and adverse pregnancy outcome. Br Dent J. 2004 Sep 11;197(5):251-258.
15. Ali TB, Abidin KZ. Relationship of periodontal disease to pre-term low birth weight infants in a selected population--a prospective study. Community Dent Health. 2012; 29(1):100-105.
16. Davenport ES, Williams CE, Sterne JA, Murad S, Sivapathasundram V, Curtis MA. Maternal periodontal disease and preterm low birthweight: case-control study. J Dent Res. 2002;81(5):313-318.
17. Offenbacher S, JaredHL, O′Reilly PG, Wells SR, Salvi GE, Lawrence HP et al. Potential pathogenic mechanism of periodontitis pregnancy complications. Ann Perriodontol 1998; 3:233-250.
18. Jeffcoat MK, Guers NC, Reddy MS, Cliver SP, Goldenberg RL, Hauth JC. Periodontal infection and preterm birth: results of a prospective study. J Am Dent Assoc 2001; 132:875-880.
19. Silk H, Douglass AB, Douglass JM, Silk L. Oral health during pregnancy. Am Physician 2008; 77:1139-1144.
20. Haake SK, Newman MG, Nisengard RJ, Sanz M: Periodontal microbiology. Clinical Periodontology. Edited by: Newman MG, Takei HH, Carranza FA. 2002, Philadelphia: Saunders, 96-112.
21. Nair PNR: Pathogenesis of apical periodontitis and the causes of endodontic failures. Crit Rev Oral Biol Med. 2004, 15: 348-381.
22. Škrinjarić I. Prevencija oralnih bolesti u djece: U: Bralić I. i sur. Prevencija bolesti u dječjoj dobi. Medicinska naklada. Zagreb, 2014. str. 412-431.
23. World Health Organization. Preterm birth. Fact sheet. Reviewed November 2016. http://www.who.int/mediacentre/factsheets/fs363/en/ (pristup 10. 1. 2017).
24. Mardešić D., Benjak V. Nedonošče. U: Mardešić D. i sur. Pedijatrija. Školska knjiga; Zagreb, 2016. str. 389-397.
25. Crispi F, Bijnens B, Figueras F, Bartrons J, Eixarch E, Le Noble F et al. Fetal growth restriction results in remodeled and less efficient hearts in children. Circulation 2010; 121 (22): 2427-2436.
26. Barker DJ. Human growth and cardiovascular disease. Nestle Nutr Work-shop Ser Pediatr program 2008; 61:21-38.
27. Mitchell RN, Schoen FJ. Atherosclerosis. U: Kumar V, Abbas AK,Fausto N, Aster JC, (ur.). Robbins & Cotran Pathologic Basis of Disease, 8 izd. Philadephia: WB Saunders; 2010. str. 1020-35.
28. Al-Ghamdi A, Jiman-Fatani AA, El-Banna H. Role of Chlamidia pneumoniae, helicobacter pylori and cytomegalovirus in coronary artery disease. Pak J Pharm Sci 2011; 24(2):95-101.
29. Bearfield C, Davenport ES, Sivapathasandarem V, Allaker RP. Possible association between amniotic fluid micro-organism infection and microflora in the mouth. BJOG. 2002; 109:527-533.
30. Dunlop AL, Mulle JG, Ferranti EP, Edwards S, Dunn AB, Corwin EJ. The Maternal Microbiome and Pregnancy Outcomes that Impact Infant Health: A Review. Advances in neonatal care: official journal of the National Association of Neonatal Nurses. 2015;15(6):377-385. doi:10.1097/ANC.0000000000000218.

31. Boggess KA, Urlaub DM, Moos MK, Polinkovsky M, El-Khorazaty J, Lorenz C. Knowledge and beliefs regarding oral health among pregnant women. J Am Dent Assoc 2011; 142(11):1275-1282.
32. Glaziou Philippe. Samsize. Computer sample size and power. Version 06.2003. Dostupno s URL: http://sampsize.sourceforge.net/ (pristup 10.1.2017).
33. WHO. Child growth standards. WHO Anthro (version 3.2.2., January 2011) http://www.who.int/childgrowth/software/en/
34. World Health Organization. BMI-for - age BOYS. Birth to 5 years (percentiles) Dostupno s URL: http://www.who.int/childgrowth/standards/cht_bfa_boys_p_0_5.pdf?ua=1 (pristup 10. 1. 2017).
35. World Health Organization. BMI-for - age GIRLS. Birth to 5 years (percentiles) Dostupno s URL: http://www.who.int/childgrowth/standards/cht_bfa_girls_p_0_5.pdf?ua=1 (pristup 10. 1. 2017)
36. Baylor College of medicine. USDA/ARS Children's Nutrition Research Center, Houston, Texas. Age-based Pediatric Blood Pressure Reference Charts. Dostupno s URL: https://www.bcm.edu/bodycomplab/Flashapps/BPVAgeChartpage.html (dostupno 10. 1. 2017).
37. National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. The Fourth report on the diagnosis, evaluation and treatment of high blood pressure in children and adolescents. Pediatrics 2004; 114 (2 Suppl 4 th Report) 555-576. (dostupno 10. 1. 2017).
38. Rosamond W, Flegal K, Friday G, Furie K, Go A, Greenlund K et al: Heart disease and stroke, statistics-2007 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation 2007; 115-e 69-e171.
39. Friedewald VE, Kornman KS, Beck JD, Genco R, Goldfine A, Libby P et al: The American Journal Cardiology and Journal of Peridontology editor's consensus: peridontitis and atherosclerotic cardiovascular disease. J. Peridontol 2009; 80:1021-32.
40. Paraskevas S, Huizinga JD, Loos BG. A systemic review and meta-analyses on C reactive proten in relation to periodontitis. J Clin Periodontol 2008; 35: 277-90.
41. Humphrey Li, Fu R, Buckley DI, Freeman M, helfand M. Peridontal disease and coronary heart disease incidence: a systemic review and meta-analyses. J Gen Inter Med 2008; 23:2079-86.
42. Tonetti MS, D'Aiuto F, Nihali L, Donald A, Storry C, Parkae M et al: Treatment of peridontitis and endothelial function. N Engl J Med 2007: 356:911-20.
43. Pizzo G, La Cara M, Conti Nibali M, Guiglia R. Peridontitis and preterm delivery. A review of the literature. Minerva. Stomatol 2005; 54:1-14.
44. Srinivas SK, Sammel MD, Stamilio DM, Cothier B, Jeffcoat MK; Perry S et al: Peridontal disease and adverse pregnancy outcome: Is there an association? Am J Obstet Gynecol 2009; 200:497-e491-98.
45. Meqa et al: Periodontal disease, preterm delivery and preterm low gestational mass. Acta stomatol Croat. 2017; 51(1):33-40. DOI: 10.15644/asc51/1/4.
46. Mesihović-Dinarević S:"Prevention of Cardiovascular Disease from an Early Age", Journal of Cardiovascular Disease/Diagnosis, 2017; S:3, vol 5, issue 3, DOI: 10.4172/2329-9517.1000268, p 2-5.
47. Berenson GS, Blonde CV, Faris RP: Cardiovascular disease risk factor variable during the first year of life. American Journal of Disease in Children, 1979; 133:1049-1057.
48. Berenson GS, Srinivasan SR, Mac D et al: Risk factors in early life as predictors of adult heart disease: The Bogalusa heart study, Am.J.Med.Sci.1989; 298:141-151.

49. Geer JC, McGill, He Strong JP: The fine structure of human atherosclerotic lesions, An. J. Pathol. 1961; 38:263-9.
50. Dhuper S, Buddhe S, Patel S. Managing Cardiovascular Risk in Overweight Children and Adolescents. Paediatric Drugs, 2013, 15(3):181-90. doi: 10.1007/s40272-013-0011-y
51. Berenson GS, Srinivasan SR, Bao, Newman WP, III, Tracy RE, Wattigney WA. Association between multiple cardiovascular risk factors and atherosclerosis in children and young adults. The Bogalusa Heart Study. N Engl J Med 1998; 338:1650–6.
52. Vt H, T M, T S, Nisha V A, A A. Dental considerations in pregnancy-a critical review on the oral care. J Clin Diagn Res. 2013;7 (5):948-53.
53. Offenbacher S, Katz V, Fertik G et al. Periodontal infection as a possible risk factor for preterm low birth weight. J Periodontol. 1996 ; 67 (10 Suppl):1103-13.
54. Soroye M, Ayanbadejo P, Savage K, Oluwole A. Association between periodontal disease and pregnancy outcomes. Odontostomatol Trop. 2015; 38 (152):5-16.
55. Turton M, Africa CWJ. Further evidence for periodontal disease as a risk indicator for adverse pregnancy outcomes. Int Dent J. 2017; 67(3):148-56. doi: 10.1111/idj.12274.
56. Govindaraju P, Venugopal S, Shivakumar MA, Sethuraman S, Ramaiah SK, Mukundan S. Maternal periodontal disease and preterm birth: A case-control study. J Indian Soc Periodontol. 2015;19(5):512-5. doi: 10.4103/0972-124X.164751.
57. American College of Obstretricians and Gynecologists. Oral health care during pregnancy and through the lifespan. Committee Opinion No.569. Obstet Gynecol. 2013; 122:417-22.
58. Reza Karimi M1, Hamissi JH, Naeini SR, Karimi M. The Relation Between Maternal Periodontal Status and Preterm and Low Birth Weight Infants in Iran: A Case Control Study. Glob J Health Sci. 2015;8(5):184-8. doi: 10.5539/gjhs.v8n5p184.
59. Boggess KA, Edelstein BL. Oral health in women during preconception and pregnancy: implications for birth outcomes and infant oral health. Matern Child Health J. 2006;10 (5 Suppl):S169-74.
60. World Health Organization. Oral health. Key facts. 2018. (pristupljeno 15.1.2019) Dostupno na: https://www.who.int/news-room/fact-sheets/detail/oral-health
61. NSW Ministry of Health. Oral Health 2020: A Strategic Framework for Dental Health in NSW. 2014. (pristupljeno 15. 1. 2019) Dostupno na: https://www.health.nsw.gov.au/oralhealth/Publications/progress-on-oral-health-2020.pdf
62. Bale BF, Doneen AL, Vigerust DJ. High-risk periodontal pathogens contribute to the pathogenesis of atherosclerosis. Postgrad Med J. 2017;93(1098):215-20. doi: 10.1136/postgradmedj-2016-134279.
63. Karami S, Ghobadi N, Pakravan A, Dabirian M, Sobouti F. Periodontal Diseases and Possible Future Cardiovascular Events, Are they Related? An Overview. J. Pediatr. Rev. 2018; 6 (1): 44-8. doi: 10.5812/jpr.11144
64. Dörfer C, Benz C, Aida J, Campard G. The relationship of oral health with general health and NCDs: a brief review. Int Dent J. 2017; 67(Suppl 2):14-8. doi: 10.1111/idj.12360.
65. Munz M, Willenborg C, Richter GM et al. A genome-wide association study identifies nucleotide variants at SIGLEC5 and DEFA1A3 as risk loci for periodontitis. Hum Mol Genet. 2017. 26(3): 2577-88. doi: 10.1093/hmg/ddx151.
66. Friedewald VE, Kornman KS, Beck JD et al. American Journal of Cardiology; Journal of Periodontology. The American Journal of Cardiology and Journal of Periodontology editors' consensus: periodontitis and atherosclerotic cardiovascular disease. J Periodontol. 2009 ; 80(7):1021-32. doi: 10.1902/jop.2009.097001

67. Boggess KA, Edelstein BL. Oral health in women during preconception and pregnancy: implications for birth outcomes and infant oral health. Matern Child Health J. 2006;10 (5 Suppl):S169-74.
68. Horton AL, Boggess KA. Periodontal disease and preterm birth. Obstet Gynecol Clin North Am. 2012;39(1):17-23, vii. doi: 10.1016/j.ogc.2011.12.008.
69. Mardešić D. i Benjak V. Nedonošče. In: Mardešić D. i sur., editors. Pedijatrija. osmo prerađeno i dopunjeno izdanje. Zagreb: Školska knjiga.; 2016. str. 389-90.
70. Crispi F, Bijnens B, Figueras F et al. Fetal growth restriction results in remodeled and less efficient hearts in children. Circulation. 2010; 121 (22): 2427-36. doi: 10.1161 Circulation, AHA. 110.937995.
71. Atherosclerosis. 2015 Feb;238(2):380-7. doi: 10.1016/j.atherosclerosis.2014.12.029. Epub 2014 Dec 24. Intima media thickness measurement in children: A statement from the Association for European Paediatric Cardiology (AEPC) Working Group on Cardiovascular Prevention endorsed by the Association for European Paediatric Cardiology

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

Prof. Aida Ramić-Čatak MD, PhD

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%. High-risk: LDL <2,5 mmol/L (<100mg/dL) or a reduction of at least 50% (2,6–5,2 mmol/L). 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

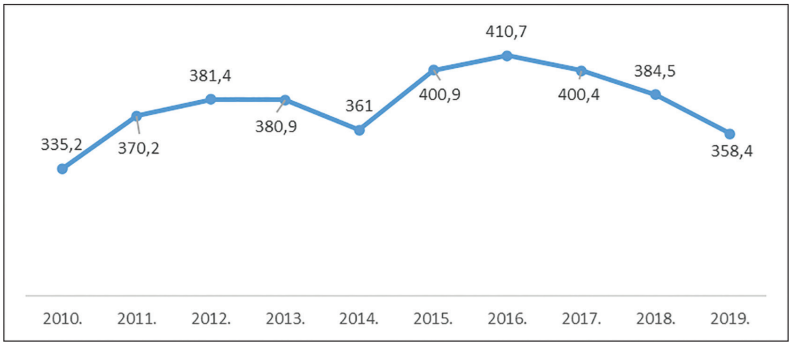
Year	Total number of deaths	Males	Females
2000	17774	8614	9160
2005	19965	9652	10313
2010	20095	9318	10777
2015	20044	9235	10809
2016	200279	9298	10982

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



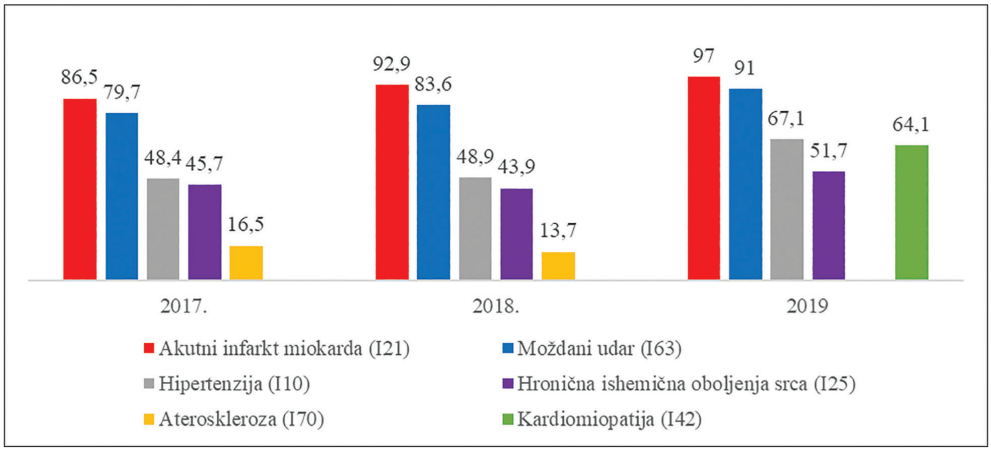
Source: FBiH Public Health Institute, 2020

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)

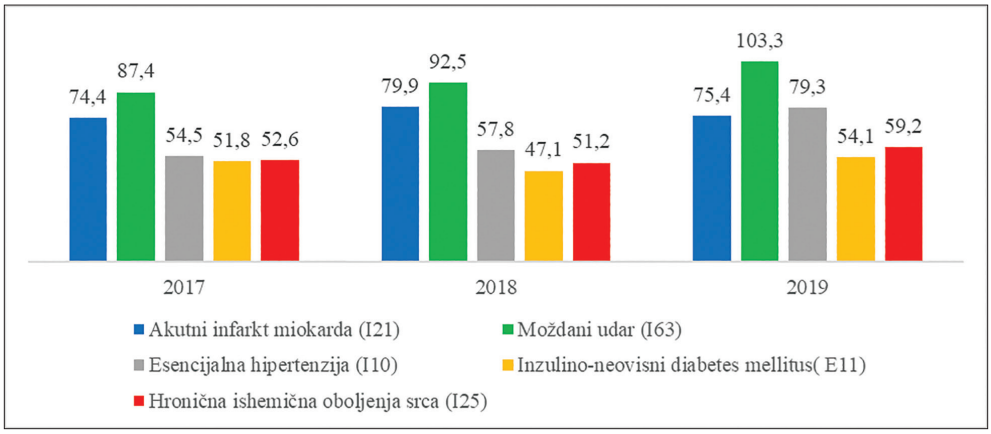
Graph 2: Mortality rate from CVD per 100.000 persons in BiH, period from 2017 to 2019



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)

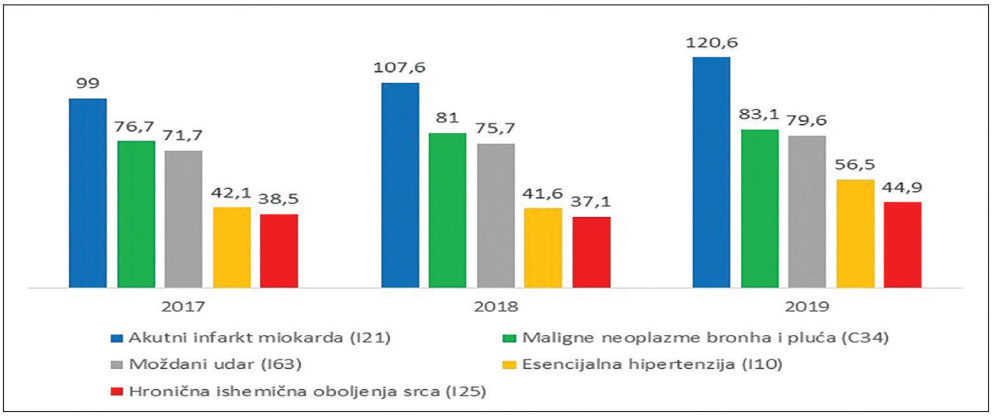
Graph 3: Five leading causes of death among women in FBiH in the period from 2017 to 2019, mortality rate per 100.000 persons



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)

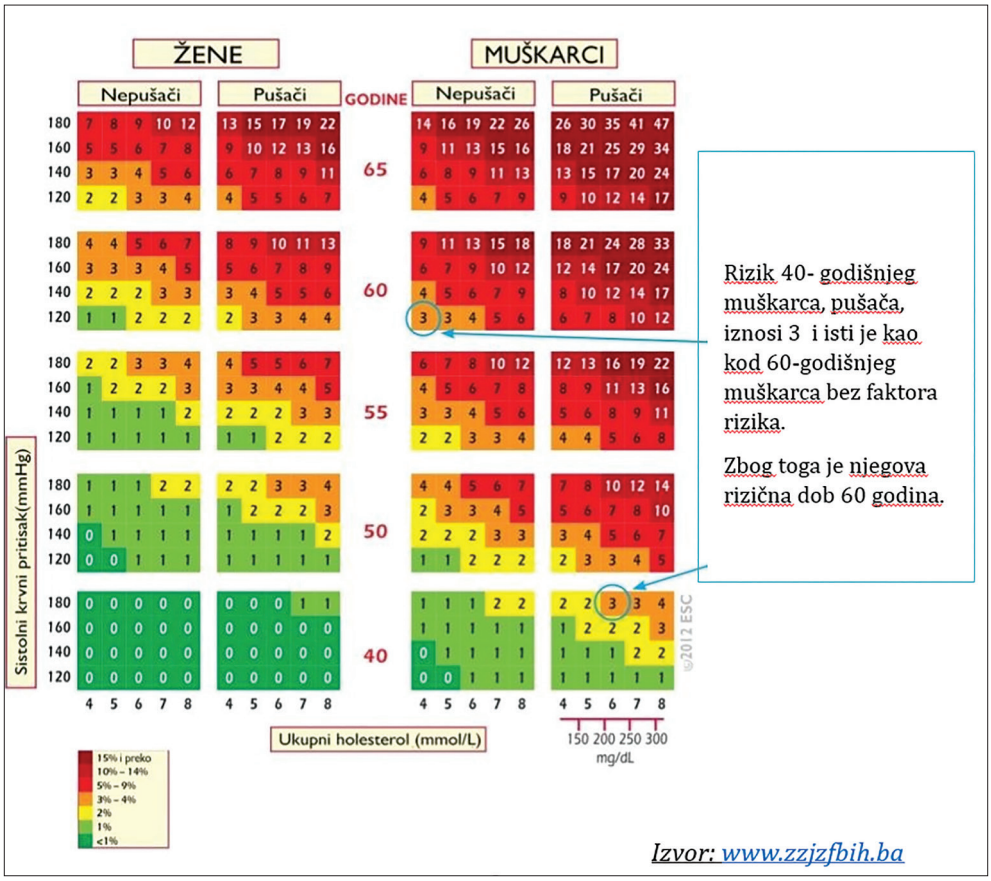


Figure 1: WHO SCORE table of risk factors for CVD in BiH, 2012

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)

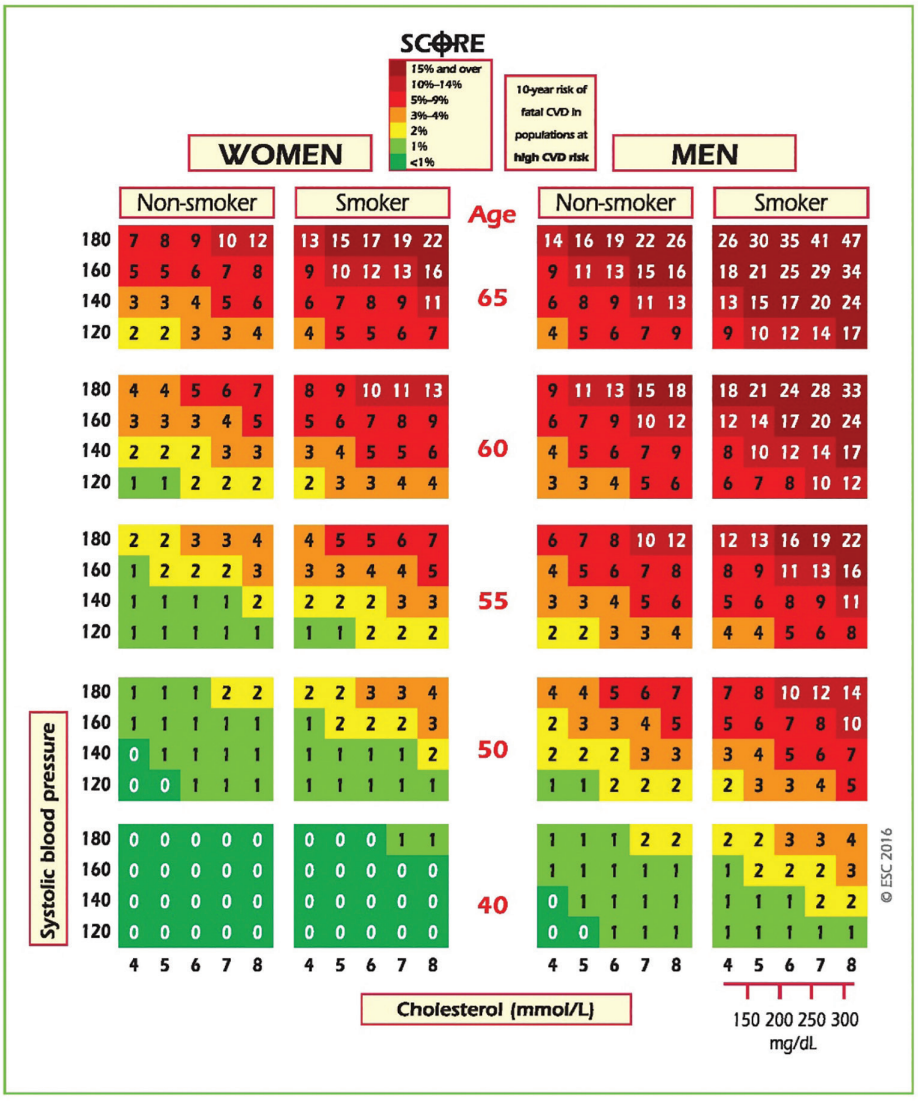


Figure 1 SCORE chart: 10-year risk of fatal cardiovascular disease in populations of countries at high cardiovascular risk based on the following risk factors: age, sex, smoking, systolic blood pressure, total cholesterol. CVD = cardiovascular disease; SCORE = Systematic Coronary Risk Estimation.

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)

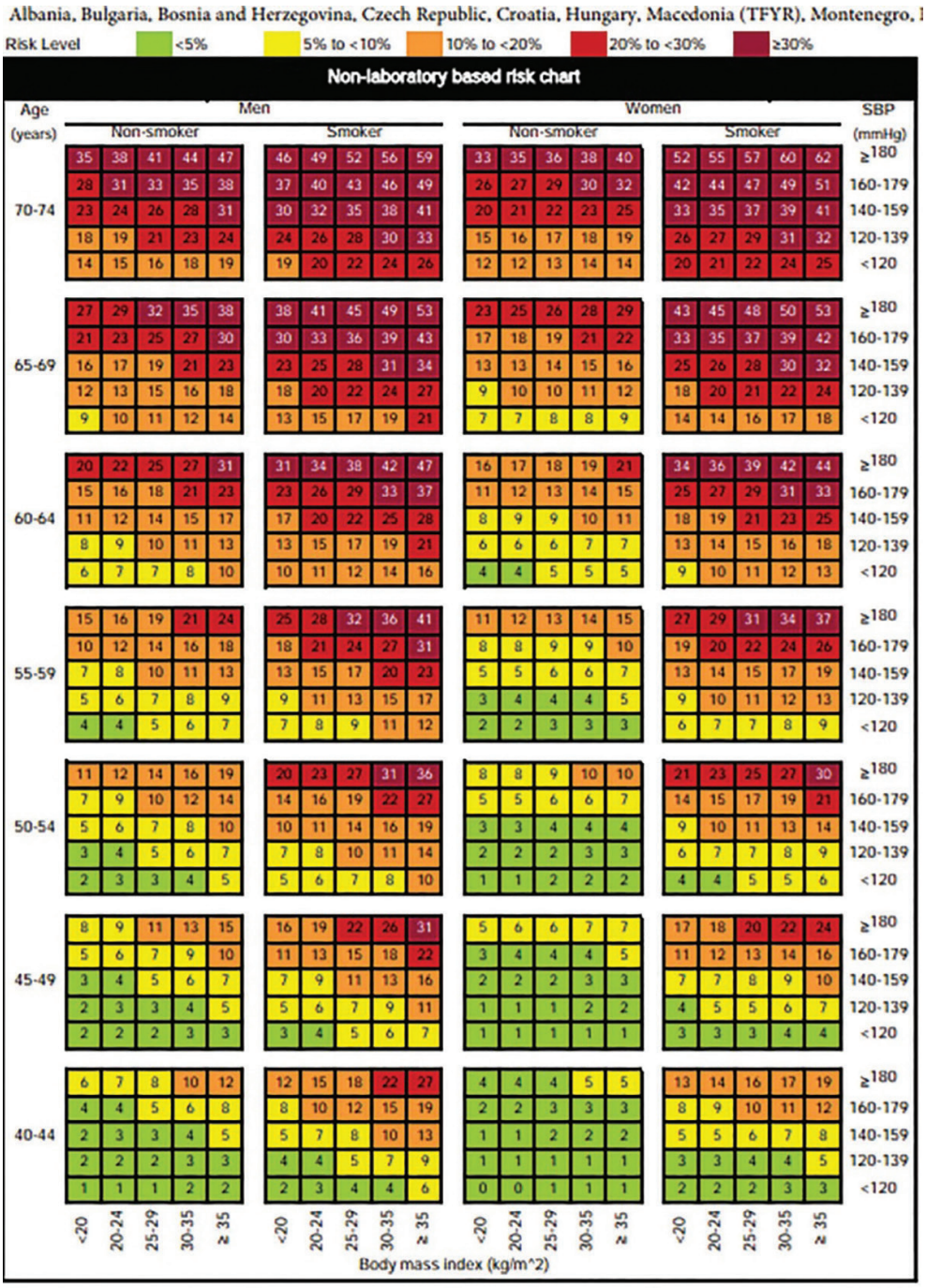


Figure 5: CVD risk non-laboratory-based SCORE table, ECS 2016
Source: https://www.who.int/docs/default-source/cardiovascular-diseases/central-europe.pdf?sfvrsn=5d127541_2

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% • Documented CVD • Diabetes mellitus type 1 or 2 with one or more CVD risk factors and/or target organ damage • Chronic kidney disease (Glomerular filtration rate <30 mL/min/1,73 m^2)
High-risk	SCORE ≥ 5 < 10% • Elevated values of single risk factors • 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).

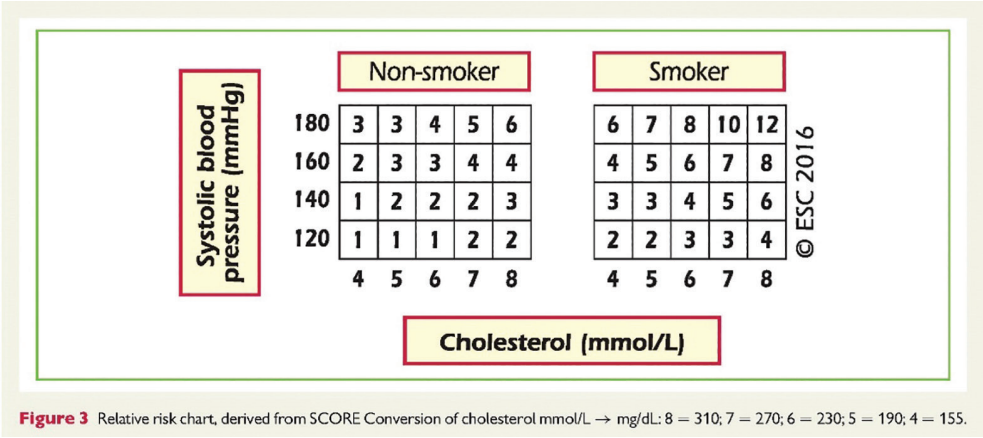


Figure 6: 10-year relative risk of fatal CVD ECS, 2016
Source: ECS, 2016

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.

References

1. World Health Organization [Internet]. About cardiovascular diseases. Dostupno na: https://www.euro.who.int/en/health-topics/noncommunicable-diseases/cardiovascular-diseases/cardiovascular-diseases2
2. World Health Organization [Internet]. Global Health Observatory (GHO) data. NCD mortality and morbidity. Dostupno na: http://www.who.int/gho/ncd/mortality_morbidity/en
3. Wilkins E, Wilson L, Wickramasinghe K, Bhatnagar P, Rayner M, Townsend N. European Cardiovascular Disease Statistics 2017 edition. Eur Hear Netw. 2017;
4. Lloyd-Jones DM, Hong Y, Labarthe D et al. Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic Impact Goal through 2020 and beyond. Circulation 2010; 121: 586–613.
5. Guy De Backer, EFESC. Prevention of cardiovascular disease: recent achievements and remaining challenges Eur Heart J; 15, 13 - 09 Aug 2017. Dostupno na: https://www.escardio.org/Journals/E-Journal-of-Cardiology-Practice/Volume15/prevention-of-cardiovascular-disease-recent-achievements-and-remaining-challeng
6. Wahid, A, Manek, N, Nichols, M, et al. Quantifying the association between physical activity and cardiovascular disease and diabetes: A systematic review and meta-analysis. J Am Heart Assoc 2016; 5: e002495
7. Centres for diseases control and prevention.Dostupno na: https://www.cdc.gov/tobacco/data_statistics/sgr/50th-anniversary/pdfs/fs_smoking_CVD_508.pdf
8. How Smoking Affects Heart Health, Dostupno na: https://www.fda.gov/tobacco-products/health-information/how-smoking-affects-heart-health
9. International Agency for Research on cancer. Tobacco Control: Reversal of Risk After Quitting Smoking (IARC Handbooks of Cancer Prevention in Tobacco Control), Volume 11. Lyon: IARC; 2007.
10. Vorko-Jović A, Strnad M, Rudan I. Epidemiologija kroničnih nezaraznih bolesti. Zagreb: Medicinska naklada; 2010.
11. Sofi F, Abbate R, Gensini GF, Casini A. Accruing evidence on benefits of adherance to the Mediterranean diet on health: an updated systematic review and meta – analysis. Am J Clin Nutr. 2010; 92: 1189 – 1196.
12. Bergman-Marković B. Novosti u prevenciji kardiovaskularnih bolesti. HDOD; 2012. Dostupno na: http://www.hdod.net/rad_drustva/Nov_u_prev_kardiovask_bol_2012.pdf
13. Yusuf S, Hawken S, Ounpu S i sur. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet 2004; 364:937-952.
14. Miura K, Daviglus ML, Dyer AR i sur. Relationship of blood pressure to 25-year mortality due to coronary heart disease, cardiovascular diseases, and all causes in young adult men:

The Chicago Heart Association detection project in industry. Arch Intern Med 2001; 161:1501-1508
15. Sipahi I, Tuzcu EM, Schoenhagen P i sur. Effects of normal, pre-hypertensive, and hypertensive blood pressure levels on progression of coronary atherosclerosis. J Am Coll Literatura 23 Cardiol 2006; 48:833-838.
16. Almdal T, Scharlin H, Jensen JS, Vestergaard H. The independent effect of type 2 diabetes mellitus on ischemic heart disease, stroke, and death: a population-based study of 13,000 men and women with 20 years of follow-up. Arch Intern Med 2004; 164:1422-1426.
17. Almdal T, Scharlin H, Jensen JS, Vestergaard H. The independent effect of type 2 diabetes mellitus on ischemic heart disease, stroke, and death: a population-based study of 13,000 men and women with 20 years of follow-up. Arch Intern Med 2004; 164:1422-1426.
18. Dimsdale JE. Psychological Stress and Cardiovascular Disease. J am Coll Cardiol. 2008; 51(13): 1237 – 1246.
19. Last J, i sur. A dictionary of Epidemiology. 4th ed. New York: Oxford University Press; 2001.
20. Katić M, Švab I, i sur. Obiteljska medicina. Zagreb: Alfa d.d.; 2013
21. Hobbs FDR. Cardiovascular disease: different strategies for primary and secondary prevention? Heart. 2004;90:1217–1223.
22. 10. Liu K, Daviglus ML, Loria CM, Colangelo LA, Spring B, 7. Moller AC, i sur. Healthy lifestyle through young adulthood and the presence of low cardiovascular disease risk profile in middle age: the Coronary Artery Risk Development in (Young) Adults (CARDIA) study. Circulation 2012;125: 996 –1004.
23. Global action plan for the prevention and control of NCDs 2013-2020, Dostupno na: https://www.who.int/nmh/publications/ncd-action-plan/en/
24. Perk J, De Backer G, Gohlke H, et al. European Guidelines on cardiovascular disease prevention in clinical practice (version 2012). The Fifth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of nine societies and by invited experts). European Heart Journal 2012; 33: 1635-1701.
25. 2016 European Guidelines on Cardiovascular Disease Prevention in Clinical Practice (European Heart Journal 2016; 37:2315–2381 - doi:10.1093/eurheartj/ehw106)
26. World Health Organization cardiovascular disease risk charts: revised models to estimate risk in 21 global regions. Dostupno na: https://www.who.int/news/item/02-09-2019-who-updates-cardiovascular-risk-charts
27. WHO HEARTS technical package. Dostupno na: https://www.who.int/publications/i/item/hearts-technical-package
28. Bosnia i Hercegovina, profil SZO. Dostupno na: https://www.who.int/nmh/countries/2018/bih_en.pdf?ua=1
29. Global Health Observatory data Repository, Dostupno na: https://apps.who.int/gho/data/node.main.NCDDEATHCAUSESNUMBER?lang=en
30. Izvještaj o zdravstvenom stanju i organizaciji zdravstvene zaštite u Federaciji BiH 2019.god. Zavod za javno zdravstvo Federacije BiH, 2020. Dostupno na: https://www.zzjzfbih.ba/
31. Studija o stanju zdravlja odraslog stanovništva Federacije BiH, Zavod za javno zdravstvo Federacije BiH, 2012. Dostupno na: https://www.zzjzfbih.ba/
32. Globalno istraživanje pušenja kod školske djece i mladih u Federaciji BiH (GYTS) 2019. god. Zavod za javno zdravstvo Federacije BiH, 2020.

33. Istraživanje znanja, stavova i ponašanja zdravstvenih radnika u PZZ u Federaciji BiH, 2018. Zavod za javno zdravstvo Federacije BiH
34. Ministarstvo zdravlja i socijalne zaštite Republike Srpske, Dostupno na: https://www.vladars.net/sr-SP-Cyrl/Vlada/Ministarstva/MZSZ/Publikacije/Pages/Zdravstvena_zastita.aspx
35. Zakon o zdravstvenoj zaštiti "Službene novine Federacije BiH", broj 46/10), Dostupno na: https://www.fmoh.gov.ba/
36. Zakon o pravima, obavezama i odgovornostima pacijenata ("SN FBiH", broj 40/10)), Dostupno na: https://www.fmoh.gov.ba/
37. Pravilnik o specijalizacijama za zdravstvene radnike i saradnike, Federalno ministarstvo zdravstva, Dostupno na: https://www.fmoh.gov.ba/
38. Akreditacijski standardi za timove obiteljske medicine, Agencija za kvalitet i akreditaciju u zdravstvu, 2014, Dostupno na: http://www.akaz.ba/
39. Strateški plan razvoja zdravstva u FBiH 2008.-2018. god. Dostupno na: https://www.fmoh.gov.ba/
40. Strategija razvoja PZZ u FBiH 2008. god. Dostupno na: https://www.fmoh.gov.ba/
41. Strategija za prevenciju, tretman i kontrolu malignih neoplazmi u FBiH 2012.-2020. god. Dostupno na: https://www.fmoh.gov.ba/
42. Rezolucija o dijabetesu 2012. god. Dostupno na: https://www.fmoh.gov.ba/
43. Politika za unaprjeđenje ishrane djece u FBiH 2013.god Dostupno na: https://www.fmoh.gov.ba/
44. Politika i strategija za zaštitu i unaprjeđenje mentalnog zdravlja u FBiH 2012.-2020. god Dostupno na: https://www.fmoh.gov.ba/
45. Strategija borbe protiv dijabetesa 2014.-2024. god. Dostupno na: https://www.fmoh.gov.ba/
46. Zakon o kontroli i ograničenoj upotrebi duhana, duhanskih i ostalih proizvoda za pušenje 2018. (prijedlog) Dostupno na: https://www.fmoh.gov.ba/
47. Akcioni plan za prevenciju i kontrolu hroničnih nezaraznih bolesti u Federaciji BiH 2019.-2025. god. Dostupno na: https://www.fmoh.gov.ba/
48. Tackling noncommunicable diseases in Bosnia and Herzegovina (2018). Dostupno na: https://www.euro.who.int/en/countries/bosnia-and-herzegovina/publications/tackling-noncommunicable-diseases-in-bosnia-and-herzegovina
49. Krogsboll LT, Jorgensen KJ, Gronhoj Larsen C, Gotzsche PC. General health checks in adults for reducing morbidity and mortality from disease. Cochrane Database Syst Rev 2012.

Chapter IV
ORAL HEALTH

Academician Berislav Topić

INTRODUCTION

Oral health (OH) is nowadays accepted both as a concept and as a content. At the Department and Clinic for Oral Medicine and Periodontology, Faculty of Dental Medicine, University of Sarajevo, we educate undergraduate and postgraduate that *oral health* is:

– absence of orofacial pain,
– healthy teeth,
– healthy periodontium

Healthy oral mucosae:

– normal functioning of occlusion, temporomandibular joint (TMJ) and salivary glands,
– gustatory quality of mastication,
– prevention of oral precarcinosis,
– involvement of dentists in the treatment of patients with systemic diseases which have their own symptomatology related to orodental tissues,
– dental preparation of patients for radiation therapy to the head and neck, transplantation and cardiovascular surgery.

THE CONCLUSION IS: GOOD ORAL HEALTH IS A REQUIREMENT FOR GOOD GENERAL HEALTH!

Federation Dentaire International (FDI) defined oral health at the congress held in Poznan, Poland, on September 6, 2016 as:

"Oral health is multi-faceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow and convey a range of emotions through facial expressions with confidence and without pain, discomfort and disease of the craniofacial complex" (1).

All of the above mentioned is accompanied by the curse of the text written at the end of the 19th century by the German historian of medicine Dr. Geist-Jacobi who wrote: "...scientific dentistry did not appear until 17th century and before that it was like a pendant of general medicine, a pendant unloved and hated like a poor relative, which can be used, and maybe it must be used, but is liked more if we don't see or hear about it..."(2).

But, according to the World Health Organization (WHO), oral health expenses should make up 11%, i.e., 1/9 of total health spending! (3). After the Second World War, medicine developed dynamically, especially dentistry, whereby a dozen of other dental disciplines developed in addition to dentists. The Central European model of dental education was established through Faculty of Medicine, whose curriculum included about 30 medical and 10 dental courses. That system is different from the Anglo-Saxon system, which is educationally emphasized more through dentistry, and less through medicine. Due to satisfactory results of prevention in the branches of cariology, periodontal medicine and orthodontics, there has been a reduction in restorative dentistry and more emphasis and value is given to medical work on increasing parameters of oral health through preventive medicine.

PREVENTIVE MEDICINE

ANDRIJA ŠTAMPAR, our esteemed physician, academician, the most important figure in the field of social medicine of the 20th century and the first president of WHO, taught us that disease prevention is the most noble goal of modern medicine. Furthermore, prevention in practice is even more important since it global, simpler, cheaper than treatment and belong to primary health care.

Oral preventive measures include good oral hygiene, proper diet, and a lifestyle free of unhealthy habits (smoking, drinking, drugs, stress). Prevention measures of caries and periodontal diseases are highly successful, perhaps the most successful in health practice after vaccination. Prevention in periodontology is also the most important part of the initial treatment and it belongs to primary healthcare.

Students receive enough information about the importance of dental plaque, especially plaque as an etiological agent of periodontal diseases and caries in the field of etiology and pathology of these clinical entities. In preventive dental care it is necessary to apply this knowledge practically. Plaque

control requires more than just brushing your teeth. It includes motivation, education, and instructions for better oral health.

There is no DENTAL HYGIENIST position in our health care system, therefore the dentists take on themselves to motivate, educate and provide instructions. It is up to the dentist to explain to the patient the cause, nature and consequences of periodontal disease and carious lesions in a popular and understandable way. Dentist must be patient and persistent until the patient accepts his explanations and becomes his first and irreplaceable collaborator in the treatment of his disease. Preventive measures are largely done at home, and to a lesser extent at the dentist's office. Preventive dentistry program is a very important component of the health education program which should be done through the use of posters, pamphlets, short illustrated brochures, daily newspapers and electronic media.

PREVENTIVE DENTISTRY PROGRAM

Prevention program at the Department and Clinic for Oral Medicine and Periodontology of the Faculty of Dental Medicine, University of Sarajevo, was originally related to two WHO publications: Periodontal disease. Geneva. Technical report No. 207, 1961. (4) and 1978 Epidemiology, etiology and prevention of periodontal diseases. Geneva, Technical report series No. 621, 1978 (5). WHO Commission on Periodontology has recommended Prevention programs in primary health care which consists of six periods and determines what needs to be done in which period.

1. Fetal period: balanced general lifestyle of the pregnant woman, adequate diet, treatment of orthodontic lesions and educating pregnant woman on oral health.
2. Period from birth to 3 years of age: This is the period of deciduous teeth eruption and the beginning of the development of the permanent teeth. Balanced general lifestyle of mother and child, adequate nutrition of the mother, child nutrition according to the nutrition scheme during the first year of life - insist on breastfeeding during the first six months of life. Providing the instructions to mother on elements of child's oral hygiene, regular treatment of mother's orodental lesions if present and dental check-ups twice a year, prevention of child's bad habits such as thumb sucking, local application of fluoride and education of parents on oral hygiene.
3. Period from 4 to 7 years of age: This is the period of formation and eruption of permanent teeth. Balanced general lifestyle of a child, adequate

nutrition with special emphasis on the reduction of sugar in food and drink between meals, oral hygiene, treatment of orodental lesions if any, local application of fluoride to permanent dentition, education of children and parents on oral health.

4. Period from 8 to 17 years of age: This is the period of final formation and maturation of permanent dentition. Balanced lifestyle (strict parental supervision of child's possible consumption of tobacco, alcohol, drugs) proper diet with emphasis on the reduction of sugar in food and drink between meals, local application of fluoride to permanent teeth, regular treatment of orodental lesions and remineralization of white spots if any, evaluation of oral hygiene and reinstruction on how to brush teeth with toothbrush and toothpaste, diagnosis of aggressive periodontitis if any, education on oral health.
5. Period from 18 to 40 years of age: Balanced lifestyle and hygiene practices, elimination of harmful habits (cigarettes, alcohol, drugs, stress), adequate diet with reduction of sugar in food and drink between meals, regular dental checkups, and treatment of orodental lesions if any, optimal occlusion restoration, evaluation of oral hygiene and reinstruction on the methods for its improvement.
6. 41 years of age and older: the same as under point 5. Pay attention to possible precancerous orofacial regions.

ORAL HEALTH EDUCATION

Commission on Periodontology (WHO 4, 5) recommends elements of oral health educational program in seven stages.

1. A pregnant woman should have information about the most common dental diseases, oral health, effective brushing techniques and the importance of a suitable diet during pregnancy and breastfeeding period.
2. Period up to the age of 6 is in the period of primary socialization. Parents should brush children's mouths and teeth and brush their own teeth in front of children. Reducing the consumption of refined sugars in food and drink is recommended, and explanation should be provided to elderly people (grandparents) why they should not buy children cariogenic food (chocolate, candies, cakes). Health and education professionals should explain harmful effects of refined sugars on oral health to both parents and children.

3. Children between the ages of 7 and 11 are in the period of secondary socialization. Education workers (teachers!) should provide up-to-date information to children on oral hygiene and types of food. Children need to be convinced of the benefits of oral hygiene and demonstrated more brushing techniques. Healthcare professionals should inform children who are more susceptible to dental and oral diseases about the possibility of preventive procedures and explain the signs of periodontal disease such as bleeding gums when brushing.
4. Pupils from 12 to 17 years of age should be given the same explanation as the previous group. It is still necessary to emphasize the importance of a healthy appearance of teeth, gums and mucous membrane for the external appearance of a person, and thus his social adaptation. It is also necessary to explain the relationship between poor oral hygiene and bad breath (fetor ex ore). Imagine dancing partners one of whom has bad breath!? Emphasize the importance of dental function and oral health throughout person's life.
5. Persons over the age of 17 should be explained the importance of good oral habits for oral health, dental checkups twice a year, convince them of the harmful consequences of bad habits for oral and general health (cigarettes, alcohol, drugs, stress).
6. Adults with clinical manifestation orodental lesions should be encouraged and reassured to trust health service, checkups, and dentists. Dentists should explain to patients in a visual, understandable way the nature (cause and diagnosis) of their disease and benefits of treating it at the dentist. Dentists should not argue with the patient, but rather speak patiently and using arguments and language understandable by the patient.
7. Benefits of oral hygiene that leads to improved oral health and thus general health should be demonstrated to older people. Possibilities of dental care should be explained to them. Require the patient to consult their dentist regarding any discomfort in the mouth, as well as morphological changes in the mucous membranes (discoloration, ulceration-wounds, increase in tissue volume). Older people should be required to make a positive impact on young people in terms of oral hygiene, dietary and bad habits.

MOTIVATING PATIENT ABOUT ORAL HYGIENE

Motivating patients about oral hygiene should be based on the personal practical clinical experience of the dentist and the necessary facts from the

scientific literature, which should be presented to the patient in a simple and understandable way. The following is suggested as a motivation:

1. Demonstrate to the patient: bleeding gingiva, gingival index simplified – GIP (6), papilla bleeding index - PBI (7). The patient observes gingival bleeding in the mirror. Numerical data for GIP and PBI is entered in the dental records.
2. Oral hygiene index /OHI/ is showed on patient's teeth. Teeth are coated with one of the colors: erythrosin, gentiana violet and methylene blue. One of these solutions is applied to the teeth using cotton wool. Erythrosine can also be administered in a form of a tablet. The patient rinses his mouth. The patient is shown the colored spots on his teeth in the mirror. Special record is required for OHI. Entered data should be marked with + if there is dental plaque, and - if there is no dental plaque. The percentage (%) of surfaces with plaque is calculated by counting plaque-free surfaces and divide that number with the number of teeth present x four surfaces examined (mesial, vestibular, distal and oral) and multiply that number by 100.
3. The patient is explained the symptoms of gingivitis and periodontitis and explained the meaning of plaque and other accumulations on the teeth which cause periodontal disease and caries. These explanations are given through visual, educational material (leaflet, short brochure, slide, CD, film, television).
4. The patient is presented their condition through Oral Hygiene Index - OHI, Gingival Index Simplified - GIP, Papilla Bleeding Index - PBI, pocket depth, and X-ray findings.
5. A highly effective way to motivate the patient is to demonstrate the composition of their own plaque under a microscope or on a television screen if possible. The bacterial cause of bleeding and gingivitis as a local infectious disease should be explained to the patient. If it is not prevented, it can advance and through circulation cause metastatic infection to already altered tissues/organs.
6. During the following visits to the dentist, the reduced values of the Oral Hygiene Index, Gingival Index Simplified and Papilla bleeding index will have a very stimulating effect on the patient's motivation, if they implement dentist's suggestions at home. This strengthens the patient's belief that better home oral care reduces the severity of the disease, i.e., improves oral health.

7. When motivating the patient about good oral hygiene, the dentist does not argue with them, but rather talks to them. This is the most important condition for creating complete trust between the patient and his dentist.

Pharmaceutical and cosmetic industry and trade network still do not offer the necessary range of oral hygiene products. A classic toothbrush and a wide selection of toothpastes is far below the standard required by modern oral hygiene. For example, 25 years ago more than $ 3.2 billion was spent on oral hygiene products in the United States, of which $ 272 million was spent on advertising oral hygiene products (Bakdash, 9).

ORAL HYGIENE INSTRUCTIONS

Plaque control is achieved through oral hygiene. Accumulations on teeth begin with plaque and it is the primary etiology in the development of periodontal disease and caries. Controlling plaque at home means applying a technique of toothbrushing where, in addition to reducing plaque, the massage stimulates circulation in the gingival tissue.

The goal of toothbrushing is to keep mouth clean. It helps prevent periodontal disease and tooth decay, and also makes the mouth more comfortable and fresher. By applying tooth brushing techniques, debris, materia alba, plaque, accumulations from the interdental spaces are removed, and a gentle gingival massage is achieved, which stimulates the circulation and gingival keratinization without irritating or lacerating the gingival tissue.

Dentist should ask patient to bring the toothbrush he uses and demonstrate the toothbrushing technique. In doing so, dentist must have a critical attitude towards the design and quality of the patient's toothbrush, as well as patient's brushing technique-method. Patient's teeth are coated with one of the colors, plaque and soft deposits are shown on his tooth surfaces and he is asked to brush his teeth the way he does at home. If this is the first time a patient is asked to do this, both the toothbrush and the brushing technique are usually far from the required standard. Therefore, brushing technique should be determined and demonstrated for patient's particular condition. If necessary, the dentist recommends oral hygiene kit to the patient.

Optimal oral hygiene at home is achieved by using oral hygiene kit by the diligent patient. Oral hygiene kit contains:

– Manual toothbrush
– Toothpaste
– Interdental toothbrush

– Dental stimulators
– Gum massage brush
– Interdental toothpicks
– Dental floss
– Plaque disclosing products
– Dental mirror
– Water flosser (shower, irrigator for mouth and teeth) and
– Electric toothbrush

The patient is invited for a check-up in ten days. At each check-up, the Oral Hygiene Index (IH) and Gingival Index Simplified (GIP) are evaluated and compared, and brushing technique is corrected. During these check-ups, an opinion is formed and a decision is made as to how much the patient is able and interested in cooperating with the dentist in order to improve his oral health.

An alternative approach to oral hygiene education could be this one: the patient is given one of the plaque indicators (1% gentian violet or 1% methylene blue, or erythrosine tablets). The patient is instructed to brush his teeth after dinner before going to bed the way he usually does. After brushing his teeth, the patient should use one of the indicators to color his teeth and rinse his mouth with excess paint. In the morning, after breakfast, the patient brushes his teeth until the paint is removed from all surfaces. The patient repeats this procedure every day. An assessment of oral hygiene and gingival condition is performed during the next check-up (after around 10 days), the patient recalled the experience, and an opinion is formed on the quality of possible cooperation with the patient. If a patient says that when brushing his teeth longer and more thoroughly in the evening, it was easier and faster to remove the stains from his teeth in the morning, such patient is a suitable candidate for future cooperation in order to improve his oral health. The specified brushing technique is recommended and demonstrated to the patient.

TEETH BRUSHING TECHNIQUES

Teeth should be brushed at least once every day after dinner and before going to bed.

It is best to brush your teeth twice a day – in the evening before bedtime and in the morning after breakfast.

It is ideal to brush your teeth after every meal.

The quality of brushing technique is more important than the frequency of brushing. The length of teeth brushing is important. Thus, it would be good to have 60 seconds hourglass timer in the bathroom.

It is recommended to eat an apple or a raw carrot after lunch, since this mechanically cleans the tooth surfaces well.

There are several brushing techniques and some of them are:

1. Scrub brush technique
2. The roll technique
3. Fones technique
4. Bass method – sulcus cleaning method
5. Modified Stillman technique
6. Charter's method

They are not described in this text because students practice them during their practicum studies. References where they are described are only provided here (10).

MANUAL TOOTHBRUSH VS. ELECTRIC TOOTHBRUSH

Electric toothbrushes started mass-producing after World War II. There have been numerous comparative discussions in the professional literature on the efficiency of electric and manual toothbrush. And it all boils down to the following:

– They are equally effective in removing plaque from teeth when used under the same conditions.
– They equally stimulate epithelial keratinization when used under the same conditions.
– Electric toothbrush is better for people with disabilities than manual toothbrush

In persons not highly motivated to oral health care, or in those who have difficulty in mastering suitable hand brushing technique, the use of an electric brush may result in better cleansing of the teeth. Oscillating-rotating movements, in addition to the combinations of horizontal and vertical movements, were developed in newer electric toothbrushes. These movements are more effective in removing plaque when time spent brushing teeth is shorter, and not only on vestibular and oral, but also on proximal surfaces (11). But for interdental proximal surfaces, we still need: interdental toothbrushes, dental stimulators, dental floss, interdental toothpicks (triangular cross-section), single-beam toothbrushes, water flosser.

Electric toothbrushes with horizontal, vertical, rotating and oscillating movements should be recommended to patients who are:

– Poorly motivated to maintain oral hygiene
– Have poor manual skills
– Physically or mentally disabled and
– Have poor plaque control.

CHEMICAL METHODS FOR PLAQUE PREVENTION

Chlorhexidine in dental medicine is used for pre-surgical disinfection of the oral cavity and in endodontics. Inhibition of plaque formation is explained by cationic characteristic of chlorhexidine. It has strong affinity for the bacterial cell wall and, depending on its concentration, has a bacteriostatic or bactericidal effect. The effect of chlorhexidine on plaque inhibition is extended to the anionic bond, which has an affinity toward pellicle and salivary glycoproteins. Rinsing twice a day with 10 ml of a 0.2% chlorhexidine solution results in plaque inhibition (12). Chlorhexidine is more effective as a preventative agent than as a therapeutic agent (13, 14).

Chlorhexidine is used:

– In addition to oral hygiene products
– In professional prevention
– In postoperative care, including periodontal surgery
– For mouth disinfection and irrigation before dental treatment in the dentist's office
– For patients with intermaxillary fixation
– In oral hygiene to improve the oral health of people with physical and mental disability
– by individuals with compromised health prone to oral infections (blood dyscrasias, chemo and radiotherapy, organ transplantation - bone marrow)
– High-caries risk patients
– For recurrent oral ulcers (reduces ulceration contamination)
– For fixed and mobile orthodontic appliances
– In case of stomatitis in combination (chlorhexidine and antifungal).

Side effects of chlorhexidine use can lead to:

– Staining of teeth, cavity fillings and tongue
– Alteration in taste perception, salty taste first

– Desquamation and erosion of oral mucosa
– Unilateral or bilateral parotid swelling, which is rare but difficult to explain
– Increased formation of supragingival calculus, due to precipitation of salivary proteins and/or precipitation of inorganic salts on the pelican layer
– If swallowed, it causes temporary stomach aches

Due to all of the above mentioned, chlorhexidine digluconate is used 10 to 14 days.

POSSIBLE FOCAL DISEASES OF ODONTOGENIC ETIOLOGY characterized by the existence of true/periodontal pocket.

Billings, in a publication from 1914, claims that infected teeth and tonsils may be responsible for the development of: endocarditis, arthritis, rheumatism, nephritis and other systemic diseases of unknown etiology (15). This opinion, due to the prevention of focal infection, drastically reduced endodontic treatments and showed the unreasonable mass extractions of teeth. This significantly increased the unreasonable toothlessness of the patients and compromised and discredited the significance of the focal infection. British Dental Association and American Association of Endodontist have taken the official stance that correct endodontic treatments are not responsible for the development of systemic diseases (16, 17). In recent years, the concept of odontogenic focal infection, i.e., systemic diseases of oral bacteria, is particularly related to chronic periodontitis and systemic diseases. The term "PERIODONTAL MEDICINE" was introduced at the World Workshop in Periodontics in 1996 by Offenbacher (18). In 1998, American Academy of Periodontology (AAP) declared that periodontal infection could play an important role as a potential risk factor for systemic diseases (19). There is general agreement that oral status is related to general/systemic health, because poor oral health may be related with other diseases or predispose to systemic disease (20). Susceptibility to some fatal systemic diseases is significantly higher in individuals with periodontitis than in healthy ones (e.g., coronary heart disease). The pioneering approach of periodontal medicine has helped to renew attention on the theory of focal infection and the deepening of the relationship between chronic gingivitis/periodontitis and systemic health.

PATHOPHYSIOLOGY OF CHRONIC PERIODONTITIS

There is biofilm on hard surfaces of periodontal i.e., true pocket (crown, neck, root). Dental plaque is the community of microorganisms found on a tooth surface as a biofilm. There is an accumulation of subgingival plaque in the pocket which differs qualitatively in its composition from supragingival plaque. In 1 mg of dental plaque, more than 100 million bacteria (10^8) are present and over 300 species have been isolated. Among Gram-negative bacteria, the following pathogens are prominent: Porphyromonas gingivalis, Prevotella intermedia, Prevotella melaninogenica, Treponema denticola, Tannerella forsythensis, Campylobacter rectus,

Aggregatibacter actinomycetemcomitans – A.a. (21, 22, 23). There is an equilibrium between the microorganisms in the periodontal pocket and the macroorganism, but if the equilibrium is compromised, either by microorganisms (increase in their number, virulence, reduction of the antibiotic process) or by the macroorganism (weakened immune system), it causes pathophysiological mechanisms to change. Periodontal pathogens, as well as their toxic substances (cytolytic enzymes) have access to circulation through the inflamed and/or ulcerated epithelium of the periodontal pocket. Moreover, within the inflamed gingival tissue, there are a number of inflammatory mediators, such as tumor necrosis factor-alpha, interleukin 1 beta, prostaglandin E2, and Gama interferon. These can enter the blood stream and contribute to metastatic infection on already altered tissues/organs.

There are three possible mechanisms:

- Metastatic infection caused by translocation of Gama-negative bacteria from the periodontal pocket, i.e., transient bacteremia
- Metastatic injury of vascular lesions from the effect of circulating microbial toxins and pro-inflammatory mediators, and
- Metastatic inflammation due to the immunological response to the periodontal pathogens and their toxins (24, 25, 26).

CHRONIC PERIODONTITIS AS A RISK FACTOR FOR SYSTEMIC DISEASES AND SOME PHYSIOLOGICAL CONDITIONS

Epidemiological and clinical studies provide data on the association between chronic periodontitis and systemic diseases: cardiovascular, respiratory rheumatoid and the effects on diabetes mellitus, osteoporosis, pregnancy, etc. (27, 28).

CARDIOVASCULAR DISEASES include atherosclerosis, hypertension, coronary heart disease, myocardial infraction, angina pectoris, peripheral arterial disease, and stroke. Atherosclerosis is the main cause of all cardiovascular diseases (29). There are studies that support the evidence that chronic periodontitis increases the level of systemic inflammation as measured by C-reactive protein (CRP) and other biomarkers (30). Periodontal pathogens can directly infect the vascular endothelium and atherosclerotic plaques, causing inflammation. Moreover, periodontal pathogens can produce variety of virulence factors (adhesions, hemolysins) that have harmful effect on vascular system, resulting in platelet adhesion and aggregation, formation of lipid-laden foam cells and deposits of cholesterol, all factors contributing to the formation of atheroma (31). Treatment of chronic periodontitis decreases systemic markers of inflammation (32).

ETIOLOGY FACTORS of periodontal diseases are classified into:

– Local
– Systemic and
– Hereditary

Biochemical-based explanation of heredity has advanced the biomedical sciences. Consequently, human genetics is gaining more and more importance in clinical medicine, because it determines the guidelines in the etiopathogenesis of certain diseases, and sometimes allows their prophylaxis. Dental medicine as a branch of clinical medicine has a special interest in human genetics. The orofacial region is accessible to direct dental inspection; therefore, the dentist objectively has more opportunities to observe a certain casuistry from a hereditary point of view (33, 34). Orofacial genetics exists as a branch of human genetics (35). Areas of orofacial genetics are related to the growth and development of the orofacial system as well as its hereditary anomalies, occlusal anomalies, dental defects, pathological changes of the tooth and its supporting structures.

Some conditions of genetic origin can affect periodontal tissues. They are rare, but they indicate the effect of genetic factors on the condition of the periodontium, i.e., pathological events in it. Eleven diagnoses are given (34):

– Down syndrome
– Hypophosphatasia
– Papillon-Lefevre syndrome
– Ehlers-Danlos syndrome
– Hereditary gingival fibromatosis
– Mucopolysaccharidosis

– Hyperoxaluria
– Acatalasemia
– Cyclic neutropenia
– Familial neutropenia
– Chediak-Higashi syndrome

Many diseases have a complex etiopathogenesis. For example, it is well known that the interaction of hereditary and environmental factors determines the occurrence of diseases such as heart disease, hypertension, cancer, Alzheimer's disease, etc.

Genes thought to be involved in complex multifactorial diseases are called MODIFIED GENES FOR THAT DISEASE. They are in contrast with the MAIN GENE FOR THAT DISEASE that is in accordance with Mendel's laws. They are responsible for the onset of disease in the presence of a mutant allele, like in the case of cystic fibrosis, a deadly inherited disease (36).

Genetic research on periodontitis conducted up to the year 2000 shows that periodontitis follows Mendel's principle. In the incestuous marriage of Jordanian relatives, a gene was identified and localized on chromosome 11, which is responsible for the severe form of prepubertal periodontitis (37).

A meta-analysis presented at EuroPerio 9 held in Amsterdam from 19th to 23rd June 2018, has found that periodontal disease and coronary artery disease share a common genetic basis in the promoter region of the VAMP 8 gene (Vesicle-Associated Membrane Protein 8). The gene that was more frequent in coronary artery diseases and periodontitis cases than in healthy controls, indicated the involvement of VAMP 8 gene in etiopathogenesis of both diseases. Schaefer singled out individuals who may share a genetic predisposition involving the VAMP8 function, which increases the risk for both diseases. Schaefer's general message for the public was that the most efficient way to prevent the onset of both heart and periodontal diseases is to quit smoking and live healthy (38).

CHRONIC PERIODONTITIS AND PULMONARY INFECTIONS: dental plaque may represent a source of potential respiratory pathogens, particularly in hospitalized patients in intensive care units and persons in retirement homes. Poor oral hygiene and chronic periodontitis may influence the initiation of pulmonary infection. Oral bacteria (A.a., Actinomyces israelii, Capnocytophaga spp., Eikenella corrodens and Prevotella intermedia) may be aspirated into the lower respiratory tract and lungs and cause infection (39, 40). In hospitalized patients in intensive care units, oral hygiene improvement obtained by mechanical (proper teeth brushing) and/or topical chemical

disinfection (rinsing mouth with chlorhexidine solution) decreased the incidence of pneumonia up to 40% (41).

UNTREATED DENTAL INFECTION in immune suppressed patients with kidney transplant can lead to transplant rejection. For these reasons, a collaboration between the dentist and nephrologist/urologist must be established. Transplant centers demand dental check-up in their pre-transplant protocol (42).

RHEUMATOID ARTHRITIS is systemic autoimmune inflammatory disease that is characterized by synovitis with the destruction of joint connective tissue and bone, resulting in structural damage, decreased mobility and loss of articular function. Rheumatoid arthritis is associated with significant morbidity and leads to premature death (43). The etiology of rheumatoid arthritis remains unclear. Infectious agents may play a role in the loss of self-tolerance, which leads to self-destruction, and consequent development of an autoimmune disease. High levels of periodontal bacteria antibodies have been found in the serum of synovial fluid of rheumatoid arthritis patients (44, 45, 46).

DIABETES MELLITUS is chronic, hormonal disease related to the endocrine component of the pancreas, whose beta cells of Langerhans islets create insulin, while alpha cells create glucagon. Diabetes is a disorder cause by inadequate insulin function (47). In the center of the pathogenetic mechanisms of diabetes are changes occurring in the walls of blood vessels in terms of diabetic angiopathy. Diabetes is interesting for dentists, from a professional point, from four aspects:

– Due to the effect of diabetes on orofacial tissues
– Due to the effect of tooth and gum disease on diabetes
– Due to the connection between internal medicine (diabetology) and dental therapy, and
– Due to oral changes as initial symptomatology in undiagnosed diabetes (48, 49, 50).

Chronic periodontitis may impact the metabolic state of diabetes. Patients with periodontitis have a higher concentration of inflammatory serum markers (CRP, IL-6, and fibrinogen) than patients without periodontitis. Blood sugar levels control in chronic periodontitis may be complicated by constant reservoir of Gama-negative bacteria that are in the periodontal pocket, leading to increased periodontal tissue destruction. Systemic inflammation increases insulin resistance and makes it difficult for patients to control blood glucose levels. Periodontal treatments (mechanical and antibiotic) leading to

a reduction of gingival tissue inflammation may reduce systemic inflammation and help glycemic control (51, 52).

OSTEOPOROSIS is a systemic skeletal disease characterized by low bone mass and micro-architectural deterioration of bone tissue, with an increase in fragility and susceptibility to fracture of bones (53). In the past, osteoporosis was considered a physiological process associated with ageing.

Today it is viewed as a heterogeneous chronic systemic condition which etiology is attributed to various endocrine, metabolic and individual factors. Osteoporosis has recently received increasing attention in relation to chronic periodontitis in postmenopausal women. Osteoporosis and chronic periodontitis are bone resorptive diseases sharing common risk factors (sex, heredity, cigarette smoking and systemic diseases) that affect or modulate the process of both diseases (54, 55, 56, 57).

REPRODUCTIVE GLANDS have exocrine (reproductive) and endocrine function. Endocrine function in men is connected to the testicular hormones – testosterone, and in women to ovaries hormones – estrogen and progesterone. In certain periods of life, the activity of gonads, i.e., the secretion of sex hormones is different. During this period, oral mucous have different reactivity, which is especially increased by local irritations, and plethora, diversity and virulence of oral flora.

Following diagnosis are not rare in dental medicine: gingival hyperplasia, gingivitis menstrualis, aphthae menstrualis recidivantes, recurrent herpes, gingivitis gravidarum, desquamative gingivitis, stomatitis climacteric (48, 58).

PREGNANCY is diagnosed based on medical history, absence of menstruation and pregnancy test. Pregnant women should avoid diagnostic methods with ionizing radiation, the use of drugs, amalgam fillings (mercury), exclude the use of alcohol and tobacco, beware of infections. During pregnancy, women should focus on educating themselves about their oral health and their future baby. The following medical history is important:

– Pregnancy trimester
– Were there any complications related to the pregnancy
– Blood pressure value

In the first trimester, organogenesis occurs, and the fetus is particularly sensitive to teratogenic effects of drugs, febrile conditions, and spontaneous termination of pregnancy.

The second trimester is the ideal time to perform routine dental care: dental prophylaxis in pregnant women, treatment of caries and gingivitis and periodontal diseases (gingivitis gravidarum). The following is contraindicated

in pregnancy: X-rays, aspirin, antifibrinolytics, barbiturates, systemic corticosteroids, vasoconstrictors in local anesthetics, gentamicin, sulfonamides, tetracyclines, drugs that cause respiratory depression, periodontal surgery techniques.

There are some risks to the cardiovascular system in the third trimester. Blood volume increases by 40% and erythrocyte volume by 15-20%.

Following conditions occur: fatigue, syncope, hypertension, anemia, low hematocrit, hypotensive syndrome in the supine position due to compression of caudal vena cava (hypotension, bradycardia, nausea, sweating, weakness, need for air), the condition instantly improves if the pregnant woman lies down on her left side, preeclampsia (hypertension, and proteinuria) and eclampsia (malignant hypertension, loss of consciousness, and encephalopathy).

LACTATION – although the amount of medicine in breast milk does not exceed 2% of the dose, it is still useful for a breastfeeding mother to take the medicine after breastfeeding. Some drugs are contraindicated for breastfeeding women: anti-cancer drugs, radioactive drugs, lithium, aspirin, atropine, phenytoin, phenothiazine, systemic corticosteroids, erythromycin, metronidazole, penicillin, sulfonamides, tetracyclines. (48, 58).

PERIODONTAL INFECTION can have a significant impact on the course of pregnancy for both the fetus and the mother. Consequences of periodontal infection on the fetus may include termination of pregnancy, premature birth (birth before 37 weeks of gestation), low birth weight (> 2.500 g), and for the mother may include gingivitis/periodontitis gravidarum and preeclampsia (59).

Periodontal pathogens, by means of maternal bacteremia transplacental passage, result in an intrauterine infection. Pro-inflammatory cytokines release endotoxins (lipopolysaccharide – LPS) which may precipitate in premature birth (59). Thus, dentists should motivate, educate, and instruct pregnant women about better oral hygiene, and in dental treatments have control over orodental lesions, especially gingival/periodontal pockets (60, 61, 62). This reduces complications during pregnancy for both the fetus and pregnant women.

DENTAAL ASPECT OF INFECTIVE ENDOCARDITIS PREVENTION

The example of the prophylaxis of infective endocarditis demonstrates the attitude that the dentist should have towards patients with affected organs of greater vital importance. American professor Stanley Robbins, the author of

the textbook "Pathologic Basis of Disease", which is translated into BHS, lists the most common entry points of infection in the development of infective endocarditis (63):

1. Dental infection and intervention
2. Using examining instruments in urinary tract
3. Respiratory infections
4. Skin infections
5. Puerperal sepsis
6. Infected burns
7. Surgical procedures on the heart
8. Valvular prostheses
9. Catheter-related bloodstream infections
10. Giving injections to addicts

According to this Robinson's priority list, dental infections and interventions are the number one cause of infective endocarditis.

During the 15-year period, 176 patients diagnosed with infective endocarditis were treated at the Cardiology Clinic of the University Hospital Center Sisters of Mercy in Zagreb. Medical history of thirty-two patients showed that infective endocarditis was preceded by some dental infections or treatment (64). The fact that dental casuistry preceded in 18.2% of cases of infective endocarditis call for caution when dealing with bleeding dental interventions, in order to prevent infective endocarditis.

Cawson estimates that 6 to 10% of cases of infective endocarditis occur after dental interventions (65).

Simmons et al estimate that around 1,500 patients in the UK get infective endocarditis each year. About 10% of them became ill after dental interventions (66). Bleeding dental procedures are likely to result in transient bacteremia. Bacteria settle easily - they are implanted on the damaged heart tissue (atherosclerotic disease, congenital heart defects, rheumatic disease, luteal heart infection).

According to the American Heart Association (AHA), high-risk patients with infective endocarditis are:

– Prosthetic cardiac valve
– Previous infective endocarditis
– Cyanotic congenital heart disease (Tetralogy of Fallot).

Moderate risk patients are:

– Acquired valve disease (rheumatic heart disease)

– Other congenital heart defects
– Hypertrophic cardiomyopathy
– Mitral valve prolapse with valve regurgitation (67, 68, 69).

According to the AHA, dental procedures that require prophylaxis of infective endocarditis are:
– Extraction of permanent teeth
– Periodontal treatment - periodontal surgery, scraping and polishing of tooth roots, probing pockets, periodontal examination - recall
– Endodontic instrumentation which becomes periapical
– Dental implants
– Subgingival application of antibiotic in cartridges
– Incision and drainage of infected tissue
– Intraligamentary injection of the local anesthesia.

Dental procedures that do not require prophylaxis of infective endocarditis are:
– Cavity filling
– Prosthetic restoration of extracted teeth
– Local anesthesia, not intraligamentary
– Extraction of primary teeth
– Rubber dam application
– Mobile dentures
– Orthodontic appliances
– Adjustment of orthodontic appliances if gingiva is not injured
– Taking teeth prints
– Fluoride treatment of teeth
– Dental radiography (67, 68, 69).

CONCLUSION

The dominant problems of everyday dental practice include caries, periodontal diseases, occlusal anomalies, link between oral and general health and a holistic approach to the patient. Caries and periodontal diseases are both infectious diseases in etiology. Therefore, the prevention of caries and periodontal diseases is also the prevention of odontogenic foci. Oral hygiene, regular and correct brushing technique, is the best way to prevent gingivitis and thus chronic periodontitis. Periodontal pocket is the biggest problem in

periodontology and a risk factor for the occurrence or worsening of systemic focal disease.

Characteristics of the periodontal pocket important for understanding focal infection are:

- Infection is always present in the periodontal pocket
- Periodontal pocket flora is large (108 microbes in 1 mg of plaque), diverse (over 300 species), virulent, with a tendency to penetrate through the epithelium of the pocket into the blood circulation
- Periodontal pocket is under constant mechanical load during chewing, swallowing and talking which contributes to the penetration of bacteria and their products into the blood circulation
- Periodontal pockets are more common in elderly who are less resistant, which makes them more susceptible to infection
- Emphasize to patient the importance their general and oral health through healthy lifestyles (diet, physical activity, general and oral hygiene), without bad habits (smoking, alcohol, black coffee, addictions, stressful situations)
- Iatrogenesis favors the formation of focal orodental foci. Therefore, in everyday dental practice, dentists need to pay more attention to *lege artis* work and timely treatments. Dentists must be competent, professional, precise, conscientious and responsible in order to avoid or reduce iatrogenesis to its minimum with proper treatment methods. The iatrogenic etiology of the disease or injury may also have forensic consequences.
- Focal infection is a great physical, mental, health, work and personal burden for the patient, his family, his workplace and society as a whole. Therefore, focal infection and the diseases that are caused by it have a significant social dimension, like: costs of treatment, sick leave, disability, increasing morbidity, and even lethality. When treating diseases of the teeth, mouth and improving oral health, dentists must keep in mind the social dimensions of their work, as well as the social consequences, both positive and negative.

Reference

1. Federation Dentaire International (FDI). Oral Health (OH). Poljska Poznanj, September 06. 2016. (prijevod ljubaznošću kolege Zvonimira Kaića).
2. Gajts Jacobi. Istorija zubarstva i stomatologije. U: Stanojević V. Istorija medicine. Beograd – Zagreb, Medicinska knjiga 1962.
3. Topić B. Svjetska Zdravstvena Organizacija (WHO) i znakovlje posvećeno oralnom zdravlju. Hrvat Stomatol Vjes 1994; 2:63-4.

4. WHO. Periodontal disease. Geneva. Technical report series No. 1961.
5. WHO. Epidemiology, etiology and prevention of periodontal diseases. Geneva, Technical report No.621. 1978.
6. Lindhe J.Textbook of clinical periodontology. Copenhagen, Munksgaard 1983.
7. Saxer UP, Mu*hlemann HR. Motivation und Aufklarung Schweiz Mschr Zanhnheil 1975;85:905-11.
8. O'Leary TJ, Drake RB, Naylor JE. The plaque control recird. J Periodont 1972; 43:38-44.
9. Bakdash B. Current patterrns of oral hygiene product and practices. Periodontol 2000, 1995; 8:11-4.
10. Topić B. Parodontologija. Sarajevo – Zagreb, Stomatološki fakultet – Medicinska naklada 2005, p. 172-85.
11. Egelberg J, Claffey N. Role of mechanical dental plaque removal in prevention and therapy of caries and periodontal diseases. U: Lang NP et al. Proceedings of the European Workshop on Mechanical plaque control, London, Quintessence 1998; 169-72.
12. Lo*e H, Schio*tt CR. The effect of mouth rinses and topical application of chlorhexidine on the development of dental plaquae and gingivitis in man. J Periodont Res 1970: 5:79-83.
13. Soskolne WA, Heasman PA, StabholzA, Smart GI, Palmer M, Flashner M, Neuman HN. Sustained local delivery of chlorhexidine in the treatment of periodontitis a multycentar study. J Periodont 1997; 66:32-8.
14. Addy M. Upotreba antiseptika u parodontnoj terapiji, U: Lindhe J, i sur, Klinička parodontologija i dentalna implatologija. Zagreb, Globus 2004; 464-93.
15. Billings F. Focal infection its broader application in the etiology of disease. J Am Med Assoc (JAMA) 1914:899-903.
16. British Dental Association. Endodontic treatment and general health. April, 1996.
17. American Association of Endodontists. Oral disease and systemic health: what is the conection? Endodontics: Colleagues for Excellence Spring/summer 2000.
18. Offenbacher S. Periodontal diseases: pathogenesis. Ann Periodontol 1996; 1:821-78.
19. Scannapieco FA. Position paper of the American Academy of Periodontology: periodontal disease as a potential risk factor for systemic diseases. J Periodontol 1998; 69:841-50.
20. Seymour GJ, Ford PJ, Cullinan MP, Yamazaki K. Relationship between periodontal infections and systemic disease. Clin Microbiol Infect 2007; 13(Suppl 4):3-10.
21. Socransky SS, Haffajee AD. Periodontal microbial ecology. Periodontol 2000, 2005; 38: 135-87.
22. Wolf HF, Rateitschak- Plu*ss EM, Rateitschak KH. Parodontologija: stomatološki atlas. Zagreb, Slap 2009.
23. Pašić E, Hadžić S, Gojkov-Vukelić M, Hukić M. Oralna mikrobiologija. Sarajevo, Stomatološki fakultet 2017; 81-101.
24. Topić B. Uvod u imunologiju parodontalne bolesti i karijesa. Sarajevo, Stomatološki vjesnik 1980.
25. Li X, Kolitveit KM, Tronstad I, Olsen I. Systemic diseases caused by oral infection. Clin Microbiol Rev 2000; 13:547-58.
26. Pizzo G, Guiglia R, Russo LL, Campisi G. Dentistry and internal medicine: from the focal infection theory to the periodontal medicine concept. Eur J Intern Med 2010; 21:496-502.
27. Glick M, Greenberg BL, Genco RJ, Tonetti MS, Scannapieco FA, Bobetsis YA et al. The Oral – Systemic Health Connection. A guide to patient care. Chicago – Berlin – Tokyo, Quintessence Publishing Co. Inc 2014.

28. Rosamond W, Flegal K, Friday G, Furie K, Go A, Greenlund K et al. Heart disease and stroke statistics – 2007 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation 2007; 115:e69-e171.
29. Friedewald VE, Kornman KS, Beck JD, Genco R, Goldfine A, Libby P et al. The American Journal of Cardiology and Journal of Periodontology editors'consensus: periodontitis and atherosclerotic cardivascular disease. J Periodontol 2009; 80:1021-32,
30. Paraskevas S, Huizinga JD, Loos BG. A systematic review and meta-analayses on C-reactive protein in relation to periodontitis. J Clin Periodontol 2008; 35:277-90.
31. Humphrey LI, Fu R, Buckley Dl, Freeman M, Helfand M. Periodontal disease and coronary heart disease incidence: a systematic review and meta-analysis. J Gen Intern Med 2008; 23:2079-86.
32. Tonetti Ms, D'Aiuto F, Nihali L, Donald A, Storry C, Parkae M et al. Treatment of periodontitis and endothelial function. N Engl J Med 2007; 356:911-20.
33. Topić B. Genetski aspekti parodontalnih bolest. Sarajevo, Drugi jugoslavenski simpozij iz humane genetike 1973.
34. Topić B. Parodontologija. Sarajevo – Zagreb, Stomatološki fakultet – Medicinska naklada, 2005; p. 73-77.
35. Škrinjarić I. Orofacijalna genetika. Zagreb, Školska knjiga 2006.
36. Haart TC, Marazita ML, Wright JT. The impact of molecular genetics on oral health paradigms. Crit Rev Oral Biol Med 2000a; 11:26-56.
37. Haart TC, Haart PS, Michaelis MD, Thank Y, Marazita Ml, Cooper M et al. Localisation of gene for prepubertal periodontitis to chromosome 11q14 and identification of cathepsin C gene mutation. J Med Genetics 2000b; 37:95-101.
38. https://eu.dental-tribune.com/news/periodontal disease-and-coronary-artery-disease-share-genetic-basis//
39. Paju S, Scannapieco FA. Oral biofilms, periodontitis and pulmonary infections, Oral Dis 2007; 13:508-12.
40. Scannapieco FA. Pneumonia in nonambulatory patients. The role of oral bacteria and oral hygiene. J Am Dent Assoc 2006; 137(Suppl):215-55.
41. Tantipong H, Morkchareonpong C, Jaiyndee S, Thalmlikitkul V. Randomized controlled trial and meta-analysis of oral decontamination with 2% chlorhexedine solution for the prevention of ventilator-associated pnemonia. Infect Control Hosp Epidemiol 2008; 29:131-6.
42. Proctor R, Kumar N, Stein A, Moles D, Porter S. Oral and dental aspects of chronic renal failure. J Dent Res 2005; 84:199-208.
43. Firestein G. Aetiology and pathogenesis of rheumatoid arthritis. In: Kelley WN et al. Textbook of rheumatology. Philadelphia, Saunders 2001; 921-66.
44. Liao F, Li Z, Wang Y, Shi B, Gong Z, Cheng X. Porphyromonas gingivalis may play an important role in the pathogenesis of periodontitis-associated rheumatoid artritis. Med Hypotheses 2009; 72:732-5.
45. Martinez-Martinez RE, Abud-Mendoza C, Patino-Marin N, Rizo-Rodriguez JC, Little JW, Loyola-Rodriguez JC. Detection of periodontal bacteria DNA in serum and synovial fluid in refractory rheumatoid arthritis patients. J Clin Periodontol 2009; 36:1004-10.
46. de Pablo P, Chapple IL, Buckley CD, Dietrich T. Periodontitis in systemic rheumatic diseases. Nat Rev Rheumatol 2009; 5:218-24.
47. Šalamon T. Diabetes mellitus i kožne bolesti. Sarajevo, Svjetlost 1973.

48. Topić B. Stomatološka praksa i bolesti pojedinih organskih sustava. Sarajevo – Zagreb, Stomatološki fakultet – Medicinska naklada 2008; p. 93-8.
49. Dedić A. Korelacija između visine glikoliziranog hemoglobina HbA1c i promjena na parodontu i drugim organima kod pacijenata s diabetes mellitusom. Dizertacija. Sarajevo, Stomatološki fakultet 1994.
50. Dedić A. Diabetes mellitus oralni aspekt. Sarajevo, Stomatološki fakultet 2004-
51. Mealey BL, Ocampo GL. Diabetes mellitus and periodontal disease. Periodontal 2000, 2007; 44:127-53.
52. Teeuw WJ, Gerdes VE, Loos BG. Effect of periodontal treatment on glycemic control of diabetic patients: a systemic review and meta-analysis. Diab Care 2010; 33:421-7.
53. Consensus conference: from the National Institutes of Health. Osteoporosis-prevention, diagnosis and therapy. J Am Med Assoc (JAMA) 2001; 285:785-95.
54. Jeffcoat MK, Lewis CE, Redy MS, Wang CY, Redford M. Post-menopausal bone loss and its relationship to oral bone loss, Periodontal 2000, 2000; 23:94-102.
55. Geurs NC. Osteoporosis and periodontal disease. Periodontal 2000, 2000; 44:29-43.
56. Lerner UH. Inflammation-induced bone remodeling in periodontal disease and the influence of post-menopausal osteoporosis. J Dent Res 2006; 85:596-607.
57. Gojkov-Vukelić M, Malić M, Hadžić S, Lincender L. Bone levels in patients with osteoporosis and periodontal disease, Acta Med Acad 2007; 36:76-81.
58. Đokić S, Topić B. Međusobna povezanost ginekoloških i stomatoloških oboljenja kod žena. U: Berić B. i sur. Osnovi ginekologije i poroditeljstva za studente stomatologije. Beograd - Zagreb, Medicinska knjiga 1985; 85-98.
59. Bobetsis YA, Borgnakke WS, Papapanou PN. Periodontal infections and adverse pregnancy outcomes. In: Glick M et al. The Oral-Systemic Health Connection, A guide to patient. Chicago-Berlin-Tokyo, Quintessence Publishing Co, Inc 2014; 200-19.
60. Pizzo G, La Cara M, Conti Nibali M, Guiglia R, Periodontitis and preterm delivery. A review of the literature. Minerva Stomatol 2005; 54:1-14.
61. Srinivas SK, Sammel MD, Stamilio DM, Clothier B, Jeffcoat MK, Parry S et al. Periodontal disease and adverse pregnancy outcomes: is there an association? Am J 0bstet Gynecol 2009; 200:497 e491-8.
62. Dinarević-Mesihović S, Sporišević L, Topić B, Jurišić S, Sarić S, Grit K et al. The challenges of detecting risk factor for the development of atherosclerosis. "Challenges in Cardiology: Cardiology Congress 2018". Italy, Rome, Aug. 16 – 18, 2018.
63. Robins LS. Patologijske osnove bolesti. Zagreb, Školska knjiga 1987; 737-41.
64. Matić M, Planinc D. Infekcijski endokarditis-retrospektivna analiza 176 bolesnika liječenih u petnaestogodišnjem razdoblju. I. kongres hrvatskog kardiološkog društva Opatija, travanj 1993.
65. Cawson RA. Infective endocarditis as a complications of dental treatment. Br Dent J 1981; 151:409-11.
66. Simmons NA, Ball PA, Cawson RA. Dental prophylaxis for endocarditis. Lancet 1992; 340:1353.
67. American Heart Association. Prevention of bacterial endocarditis. New guidlines. J Am Med Assoc (JAMA) 1997; 277:1794-801.
68. American Heart Association. Prevention of bacterial endocarditis. Circulation 1997; 96:358-66.
69. American Heart Association, Council on Dental Therapeutics. Preventing bacterial endocarditis. A statement for the dental profession. J Am Dent Assoc 1991; 122:87-92

Chapter V
PARENTHOOD, MOTHERHOOD, FATHERHOOD

Primarius Senad Sarić, MD, MSc, gynecologist specialist, reproductive medicine subspecialist

Grit Kirsten Sarić, MD, PhD, internal medicine specialist, cardiologist subspecialist

Motherhood and fatherhood, and parenthood in the general meaning of that word, is one of the most challenging, most attractive and most interesting social and natural roles of a woman and a man, of a mother and a father.

The natural process that lasted the usual nine months ends with a dramatic event that takes approximately several hours. A woman's physical body undergoes a huge change during that period of time, but in the context of change her psyche must not be neglected. Through this truly dramatic, perfect and significant process in the life of every woman (and indirectly her partner) we can talk about the period of preparation for an unusual event – them becoming a mother and father.

The process of giving birth is an unusual, fateful and a unique situation. When a woman conceives, the time of pregnancy begins in which she faces the inevitable physical and mental changes that are not as harmless as is often thought. Using her natural power of maternal intuition, a woman adapts to these physical and mental transitions, such as changes in her physical and emotional states of her inner and outer world.

The birth of a healthy child is the desire of every parent and the instinct of survival. Regular clinical examinations of a pregnant woman are very important for proper supervision and successful childbirth, where the main goal is to give birth to a healthy child and preserve health of the mother. A woman on average gives birth two to three times and needs to be adequately prepared for these events. How? By leading a healthy lifestyle, performing regular check-ups and getting expert advice from a selected gynecologist. Pregnancy and childbirth should be with a pleasant mood, joy and satisfaction created

by reading popular literature and publications on the internet about the usual and normal pregnancy.

In centers where such a possibility exists, it is recommended that pregnant women attend schools for psychophysical preparation for childbirth.

One of the most fateful moments in the life for most pregnant women is the act of childbirth itself. Countless literary and scientific works have been written about this phenomenal moment, because for almost all women, this is about circumstances that remind us that this is a stressful event accompanied by fear, especially when it comes to firstborns. There is no mother who does not face some sort of anxiety due to the possibility of complications and consequences during and after childbirth. However, it should not be forgotten that today almost every pregnant woman is educated and that the act of childbirth in modern medicine has become almost a routine procedure where the possibility of serious consequences is reduced to the lowest percentage of possible risk, especially if the pregnancy is medically monitored and insured.

Pregnancy is the time of constant development and change for both mother and the child. The purpose of preventive pregnancy examinations is to carefully observe and document data on fetal development and pregnancy events. Medical supervision is intended to eliminate possible dangers to the life and health of the mother or child and for timely detection and treatment of health disorders of high-risk pregnancies and births.

Examinations during pregnancy

A pregnant woman usually comes for a examinations in pregnancy after missing menstruation and getting a positive result of a home-pregnancy test, which is her first knowledge of being pregnant. Every pregnant woman has a legal right to appropriate medical examination, pregnancy supervision and follow up. A doctor should give pregnant women advice on necessary examinations, instructions on appropriate diet, oral health, vaccination against influenza, covid and the risk of HIV infection. A pregnant woman is issued her pregnancy booklet at her first preventive medical examination.

Professional supervision of a pregnant woman includes monthly clinical examinations and obligatory three to five ultrasound screenings. The first examination of a pregnant woman, especially when it comes to the first pregnancy, should be carefully performed and very detailed. In a pleasant atmosphere, her doctor devotes quite some time to perform the examination, have a conversation with the woman and to give her advice about the pregnancy

process. It is very desirable that the woman's partner also attends the examinations and the conversations, especially to attend ultrasound examinations that are done over the abdomen.

After the examination, the pregnant woman receives information about the examination calendar, expert ultrasound examinations, prenatal genetic diagnostics, the importance of a healthy diet and the dangers of gaining too much weight. Partners are educated about sexual intercourse during pregnancy, physical activity and the importance of psychophysical exercise during pregnancy, which is very important for childbirth preparation.

Normal pregnancy is a physiological process that lasts 280 days, 40 weeks or 10 lunar months of 28 days or 9 months according to the Julian calendar. The expected due date is calculated using Negel's rule: the first day of the last menstruation plus 7 days minus 3 months (e.g., the first day of the last menstrual cycle was May 10, 2020, so the expected due date – EDD is Feb. 17, 2021).

Pregnancy of 10 lunar months is divided into the first trimester, which lasts until the 12th week of pregnancy; the second trimester from the 13th to the 24th week and the third from the 25th week until delivery. The blastogenesis stage lasts from conception and the first two weeks of pregnancy. During this period, the embryo responds according to the "all or nothing" rule, which means that if the pregnant woman has been exposed to a harmful agent/drug, X-rays, infection, severe physical or mental stress, the pregnancy will either not survive, or not thrive, or the agent will not have any harmful effect on the fetus. The embryonic phase lasts until the 8th week of pregnancy and is divided into embryogenesis, morphogenesis and organogenesis. This phase is very sensitive, because numerous anomalies can appear during this time because this is when most tissues and organs differentiate and form. The fetal growth phase begins at 9 weeks and lasts until delivery. During the first 5 months, the fetus grows intensively and develops anatomically with most morphological characteristics, gaining weight proportionally. Ultrasound-monitored fetal size is biometrically up to week 24 of pregnancy approximate in all pregnant women, but from week 24 onwards, the differences are visible and genetic predispositions play a significant role. Fetal development ends by the week 35 of pregnancy and during this period fetus may be exposed to various harmful factors, but the possibility of developing an anomaly is extremely small.

During pregnancy, the cardiac output of a pregnant woman increases by 30% to 50%. The reason for this is the greater need for nutrition and oxygenation of the pregnant uterus, which increases 16 to 18 times the size of the

egg; then there's the skin's need for thermoregulation and increased maternal diuresis of the kidneys of fetal radioactive substances.

The heart rate increases from 70 to 90 beats per minute, which is normal during pregnancy. The serum volume and fluid in the blood also increase, but the number of red blood cells, erythrocytes, remains the same, which we call apparent anemia.

The size and shape of the uterus varies depending on the duration of the pregnancy. After the absence of the menstrual cycle, the uterus is the size of a goose egg; at 8 weeks gestation it is the size of a woman's fist, at 12 weeks the size of a man's fist, and at 16 weeks the size of a newborn's head.

Calendar of pregnancy examinations

Preventive examinations of a healthy pregnant woman with an orderly pregnancy, which is more common than not, are performed every month until the week 32 of pregnancy, followed by exams every 14 days until week 36. During the last month of pregnancy, examinations are performed weekly, until the expected date of delivery, usually at the maternity hospital. Term delivery can fall anywhere between 21 days before and 15 days after the expected due date – EDD. If the baby is not born until the expected due date, then examinations are performed more often: every other day until the 8th day, then every day until the 10^{th} or 12^{th} day after the EDD. If natural childbirth does not take place by then, the woman is hospitalized, and the birth is induced by one of then accepted methods. It is considered that a healthy pregnant woman with an orderly pregnancy and adequate supervision can carry-over up to 10 days after the expected date of delivery, without danger to the child. Of course, the pregnancy length has to be correctly calculated.

The first pregnancy exam and ultrasound screening is recommended between week 6 and 8 of pregnancy, when ultrasound can visualize the gestational sac, determine its size and location, visualize internal structures – yolk sac and number of embryos. An echo of the embryo is displayed in which the length is measured, and cardiac action is displayed. The pregnancy length in irregular menstruation is determined based on the ultrasound measurement of CRL (crown-rump length) and the embryo size, and thus the expected due date is calculated. When fetus size is 3 mm or more, a high-quality ultrasound and color Doppler transvaginally visualize the child's heartbeat. When vaginal examination in specula shows pregnancy with uterine bleeding, and transvaginal ultrasound diagnoses retrochorial hematoma, both of which are signs

of a threatened abortion, this requires rest with adequate therapy, intensive monitoring, and active follow-ups.

During this period, it is possible to diagnose an atypical location of the gestational sac, ectopic pregnancy as a pathological condition, which requires monitoring, medication therapy, Methotrexate amp and, if necessary, surgical treatment, primarily laparoscopic as minimally invasive one.

At the first exam, a detailed anamnesis is taken, the pregnancy length and the expected due date – EDD – are determined. Speculum examination is used to monitor vaginal discharge, changes in the vaginal wall and the cervix. An orderly discharge is sparse and whitish in color. The purity of the vaginal smear is determined by bacteriological analysis of vaginal swabs under a microscope, and the PAP-test is taken in pregnant women who have not had a cytological changes in the last year. A proven infection should be treated as soon as possible in order to prevent its spread to the fertile linings and the fetus. In high-risk pregnancies and based on local findings, it is necessary to take cervical swabs for chlamydia trachomatis, urea and mycoplasma, and for aerobic and anaerobic bacteria. If necessary, a bimanual palpation examination is performed.

Blood pressure must be measured each time, and after measurement, BMI – body mass index – is calculated.

Laboratory processing is usually done after two months, which represents the "pregnancy package" and includes CBC – complete blood count, BSL – blood sugar level, in the morning, before food and drink, blood iron levels and urine analysis. Inflammatory parameters and proteins in urine are monitored, and urine culture is performed if necessary.

It is necessary to determine the blood group and the Rh factor, perform testing for hepatitis B, HIV and hepatitis C, TORCH tests for rubella, which should be performed for every pregnancy as soon as possible by taking a blood sample.

If the pregnant woman is Rh-negative and her partner's blood type is Rh-positive, this is referred to as Rh-inconceivability and a Coombs sensitization test should be performed every two months, usually at the beginning of pregnancy, and at weeks 24 and 32.

Pregnant women who have a history of recurrent miscarriages or ectopic pregnancies, after undergoing adequate treatment before planning the next pregnancy, are advised to visit a gynecologist for an checkup as soon as missing the menstrual cycle. The same procedure is recommended if the

pregnancy was achieved by any of MAR methods, medically assisted reproduction – IVF/ICSI.

1st trimester screening – 12 to 14 hbd
(screening for Down syndrome and other chromosomal abnormalities)

Gestation screening of the first trimester from week 12 to 14, but optimally in week 13, which is the most important screening in pregnancies, can be performed quite successfully when in experienced hands and using high-tech 3D/4D ultrasound technology. This involves a detailed ultrasound examination of the fetus, where, under high magnification, nuchal translucency (thickness of the fold at the back of baby's neck) is measured in combination with transabdominal and transvaginal ultrasound examination while visualizing vitality, counting fetal movements, measuring the amount of amniotic fluid, measuring the location and structure of placenta, insertion and number of umbilical cord blood vessels, thus assessing pregnancy length, appearance of uterus and uterine and ovarian structure, cervicometry, fetal biometrics, head anatomy (symmetry, brain structures, ventricles, magna cistern, face and lip profile), spine and extremities (all bones of arms and legs, both hands and both feet), anatomy of the heart showing two ventricles and two atria, position, size, rhythm and heart rate), abdomen showing front abdominal wall, diaphragm, stomach, kidneys, bladder.

Ultrasound markers for chromosomal aberrations are certain changes that can be visualized by ultrasound scan. In a smaller or a larger percentage, they can indicate a genetic anomaly, but they can also be found in a completely healthy fetus. Because of their association with certain chromosomal aberrations, they are divided into **major** and **minor markers**. Major markers have a greater association with the possibility of genetic error and their visualization requires further diagnosis, while this is not the case with minor markers. Of course, with this ultrasound examination it is not possible to prove a genetic anomaly.

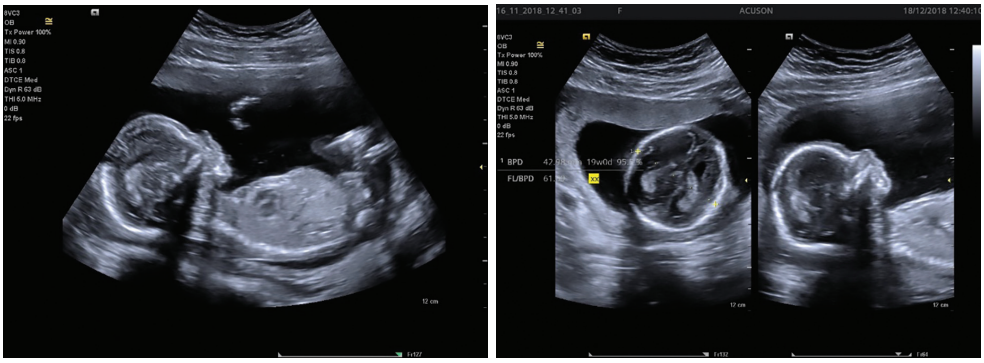


Fig 1. Transvaginal ultrasound, 2D sonography is a screening of the first trimester of pregnancy /fetal anatomy, section of the head with the structure of the brain, nuchal transparency, facial bones and nasal axis/

Major markers are: measurement of nuchal translucency, viewing nasal bones and their angle, measurement of facial angle, viewing the flow through the ductus venosus, viewing the flow through the tricuspid valve.

Minor ultrasound markers are: cyst of the choroid plexus (greater than 1.5 mm), hyperechoic focus in the heart, slow or fast heart rate, hyperechoic bowel, pyelon enlargement (greater than 1.5 mm), enlargement of the bladder, lack of one umbilical artery, shortening of long bones, lack of posterior joint on the little finger, omphalocoela (diaphragmatic hernia). 3D ultrasound screening allows correct, reliable and accurate measurement of all these markers, and thus are used in determining the possible risk of the most common genetic diseases (Down, Turner and Edwardson Syndrome).

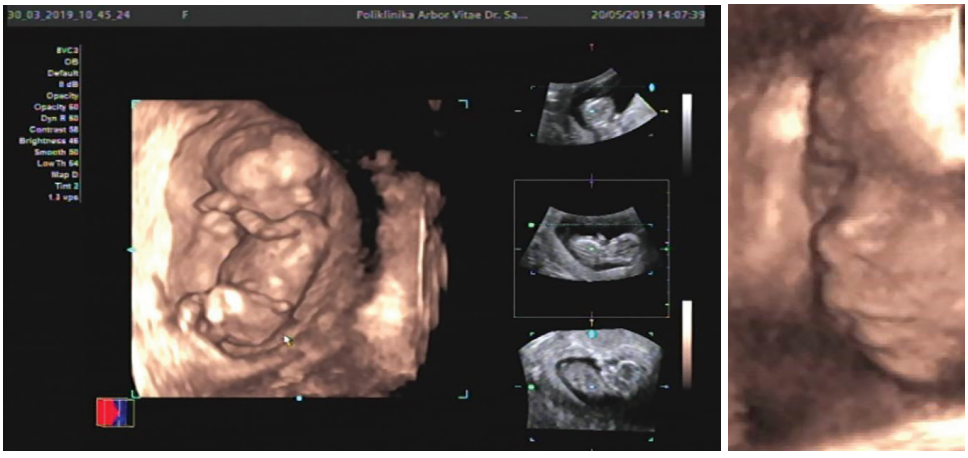


Fig 2. 3D imaging of fetus at 13hbd /human beta defined/ fetal face at 24 hbd

Genetic processing and counseling are planned if necessary, especially if indicated. They are recommended in following cases:

- one child with a genetic anomaly is already born,
- partner has a burdened family anamnesis, or
- one of the ultrasound markers for anomalies is shown on the ultrasound screening of the first trimester.

In case all of the above is in order, but woman's biological reproductive clock is running out and if she is 35 and older, genetic processing is definitely recommended.

Non-invasive prenatal tests are necessary in completing prenatal genetic diagnosis of a fetus. The results are very safe, simple, reliable and painless, they are obtained relatively quickly by simply drawing mother's vein blood already at week 10 of the pregnancy. There is no risk of miscarriage, and the results provide a reliable insight into the genetic health of the fetus.

Amniocentesis is an invasive method of taking a small amount of amniotic fluid by puncturing the abdomen while using transabdominal ultrasound between week 16 and 20 of pregnancy. In less than 2% of cases, this intervention can lead to spontaneous abortion.

Prenatal screening of fetal chromosomopathies in the first and second trimesters of pregnancy, or combined in both trimesters, shows that each is characterized by specific characteristics and success. Measured concentrations of biochemical markers, free 3 Human chorionic gonadotrophin (HCG) and pregnancy-associated plasma protein A (PAPP) are not expressed in absolute values, but are used to calculate the probability ratio even if they are within normal limits, with parameter being the woman's age and measured nuchal fold thickness (NT) which is always expressed in relation to the value of crown to rump before week 14, which can with high probability determine whether the embryo has any chromosomal disease.

2nd trimester screening – 20 to 24 hbd

(fetal growth, morphology, placental quality, umbilical cord flow, amniotic fluid)

Ultrasound examination is also performed in weeks 18-19 of gestation, when, in addition to routine fetal measurements, the so-called "soft-markers" are measured for chromosomopathy such as dilated renal fetal pyelon, developmental cysts in the choroid plexus, hyperechoic echoes of the heart, shortened thigh, etc.

The examination from week 20 to 24 of gestation is conducted as an expert 4D/3D ultrasound examination when the anatomy and morphology of the fetus with fetal echocardiography are examined in detail. Although the fetus is examined in detail from the very beginning and especially from week 12 of pregnancy, this is the best period for analyzing the morphology of all organ systems and the external appearance of the fetus. According to the protocol of conducting a normal pregnancy, this examination is one of the two most important ultrasound examinations during pregnancy.

Morphological analysis consists of four segments and is performed with 2D and 3D/4D ultrasound. The size of the fetus allows the analysis of the smallest anatomical details and thus eliminates the possibility of anomalies that can be detected by ultrasound. The external appearance of the fetus is analyzed (presence of cleft lip, facial symmetry, hand or foot deformities), spinal column, analysis of brain structures (cerebellum, brain chambers, corpus callosum, blood vessels of the base of the skull/lens cristalinum – eye lenses, color Doppler of the blood vessels of the base of the skull), analysis of abdominal organs (visualization of the stomach and the integrity of the diaphragm, observation of the urinary bladder, tripartite umbilical cord with two arteries, presence and appearance of both kidneys, analysis of the integrity of the anterior abdominal wall wall).

It is important to note that after week 20 of pregnancy, the ultrasound signs for Down syndrome on the fetus and in mother's blood are lost, as well as mongoloids who do not have a major anomaly, because they can practically no longer be detected. Larger amounts of adipose tissue in the abdomen make it difficult for ultrasound waves to pass, so it is sometimes not possible to perform a detailed ultrasound examination of the fetus in obese pregnant women.

3rd trimester screening – 30 to 34 hbd

(fetal growth, placental quality, umbilical cord flow, amniotic fluid and baby position)

Ultrasound examination in the period from week 30 to 34 of gestation is very important. In addition to routine measurements, color Doppler ultrasound examination are preformed of blood flow through the umbilical cord, and if necessary in high-risk pregnancies, the flow through the fetal aorta and blood vessels based on the fetal brain, aa.cerebri media. This examination determines the condition of the fetus and reveals early signs of baby's suffering, if

any. Examinations after this are then performed by cardiotocography – CTG every 15 days, and a month before EDD cardiotocography is performed every 7 days. Before the birth, an ultrasound and vaginal examination are routinely performed, baby's position is determined – which way is baby turned, the size is estimated and the weight of the fetus are measured, and the manner of delivery is assessed. Based on the recording of the fetal heart rate and the activity of the uterus, an assessment is made of the condition of the fetus and its possible endangerment. Prior to delivery cervical swabs are routinely performed, and coproculture if necessary.

If the birth does not follow the expected date, examinations are performed every other day until day 8 after the expected due date, and then every day until day 10 or 12, and if birth still does not follow, the woman is sent to the maternity hospital for induction of labor. Therefore, if a woman does not give birth naturally by the end of week 41 of gestation, examinations should be performed every day until delivery. A pregnant woman with a normal pregnancy can be overdue up to 10 days after the expected due date without any danger to the baby. If we are sure that the pregnancy length is correctly calculated, childbirth should be induced without any major difficulties using one of then accepted methods.

During the last trimester of pregnancy, special attention is paid to the signs of premature birth by cervicometry, fetal growth retardation, or accelerated growth. Blood pressure values are regularly monitored and hypertension is treated in a timely manner. Gestational diabetes detection by means of oral glucose tolerance test (OGTT) is done between week 24 and 28 of pregnancy. Chronic diseases with which the pregnant woman entered the pregnancy are monitored in order to avoid worsening or complications. In the period immediately before the birth, if necessary, a bimanual examination is performed, possibly also speculum examination.

Spouses should be encouraged to attend pregnancy school together with psychophysical exercises for pregnant women in order to adequately prepare her for childbirth, and their partners can attend the birth without major trauma. This is a great way to strengthen the bond between partners and represents the axis of one of the basic principles of the "Baby friendly Hospitals".

First signs of the onset of labor:

- rapture of fetal or amniochorionic membranes, RVP (premature rapture of membrane) is a sudden leaking of clear liquid,

- losing bloody mucous plug from the vagina or a more severe uterine bleeding,
- labor that occurs in a rhythm of ten minutes or more often, lasting half an hour or longer; after which they become more frequent and intense. These are rhythmic uterine contractions that are a sign of the beginning of the birth and the time when the woman should go to the maternity hospital.

Childbirth is divided into 4 childbirth stages, about which partners are educated in order to psychologically better prepare themselves for the actual act of childbirth, especially during the theoretical classes.

- First stage of childbirth – cervix dilation, which lasts 12 to 16 hours.
- Second stage of childbirth – the stage of squeezing out the fetus (baby delivery); in the firstborn it lasts 2 hours.
- Third stage of childbirth – pushing out the placenta and membranes, lasts 2 hours.
- Fourth stage of childbirth – early recovery and supervision in the delivery room, lasts 2 hours.

Most preventive examinations can be performed by midwives under the supervision of a gynecologist. Exceptions are ultrasound examinations performed exclusively by a gynecologist. Special attention must be paid to high-risk pregnancies! If the pregnant woman does not take adequate steps and decides otherwise, then she does so at her own risk, contrary to given advice and recommendations. The doctor should record everything with the patient's signature in order for her to be aware of the risk of overweight as well as the risk of certain diseases and conditions during pregnancy.

Hygiene and physical activity in pregnancy

Pregnancy comes with a variety of physiological, anatomical, and hormonal changes, all of which can affect the woman's oral health. During pregnancy, certain changes in the condition of the teeth and tissues of the oral cavity occur, but they can be prevented or controlled mainly by proper nutrition and the oral hygiene. Inflammation of the oral cavity and emergency painful conditions should be properly remedied as soon as possible, regardless of the stage of pregnancy. Radiological recordings should be avoided, especially in the first trimester.

Consultations to the pregnant woman by a gynecologist and dentist in certain cases are very desirable, and sometimes necessary, because optimal oral health is very important for the pregnant woman and the newborn. It is necessary to pay attention to the prevention and proper hygiene of the oral cavity, eating habits and the use medications that are proven to be safe for both mother and child.

Women who are planning to become pregnant or are already pregnant should be encouraged to seek oral health advice and have a check-up with a dentist.

Spouses are given information about the examination calendar, expert ultrasound examinations, prenatal genetic diagnostics, breast and perineal care during pregnancy, the importance of a healthy diet and the dangers of being overweight.

Sexual intercourse in a stable pregnancy is permitted with the use of a condom, protected intercourse or interrupted intercourse. Why? This is because sperm carries prostaglandin hormones that can cause uterine bleeding, contractions, miscarriages or, can later even cause premature birth. Prostaglandins were first discovered in sperm, while in a woman's body they exist in larger quantities. They are responsible for painful menstrual cramps, dysmenorrhoea, and prostaglandins are also "responsible" for labor and pushes, strong uterine contractions in childbirth.

Folic acid is recommended from conception and during the first three months of pregnancy and is very important for the preparation of mucous membranes and egg implantation and has a positive effect on the proper development of the fetal neurocerebral tube, which means the brain and spinal cord. From the third month of pregnancy, dietary supplements are added, since multi-vitamins are very important for the proper development of the newborn and for mother's health during pregnancy. For a healthy pregnancy, the diet should be balanced and rich in appropriate quantities of protein, carbohydrates and fats, as well as fruits and vegetables that contain the necessary vitamins and minerals. It is very important that a pregnant woman gains about a kilogram a month during pregnancy, leading to a total of 10 to 12 kilograms, but never over 15 kilograms. Every woman's weight gain varies, depending on the weight she had before pregnancy, diet during pregnancy and other factors. A big mistake pregnant women make is when they think that they need to "eat for two". The fact is that the caloric intake of a pregnant woman should increase during pregnancy, but it is not necessary to double the calorie intake; instead the intake should increase by several hundred calories by the end of

pregnancy. It is necessary to follow some simple rules in terms of the diet during pregnancy. Avoid eating "strong food", salty, as well as seeds, barbecue and dried meat that later, with increased weight, can cause hypertension in pregnancy with preeclampsia and eclampsia, which is extremely difficult and serious condition that can endanger the life of the child and the mother. It is very important to eat fresh fruits and vegetables, make fresh juices that contain unchanged levels of vitamins and nutrients.

Pregnancy and the cardiovascular system

A pregnant woman's heart beats for two – for the mother and the child. That is why it has to "work" a lot more than when the woman is not pregnant. Through the umbilical cord, the fetus receives blood from mother's body, and during its development, the pregnant woman's heart gradually increases its work. With the help of hormones the mother's body gets ready for a gradual increase in blood flow and the needs of the child.

The volume that the heart pumps every minute (minute volume of the heart) in pregnant women increases by approx. 30% – 50%. Heart rate and stroke volume also increase significantly. Pregnant women have about 40% more blood volume than non-pregnant women, which means that their heart needs much more power. During childbirth, pain and anxiety can lead to the secretion of stress hormones which further increase the heart rate. The cardiac output increases shortly before delivery by approx. 50%, and uterine contractions during childbirth further increase the volume of blood in mother's bloodstream by approx. 500 ml.

All this leads to numerous changes in the body of pregnant women that can cause certain pathological conditions. In pregnancy, varicose veins of the lower extremities often dilate due to an increase in the circulating volume of varicose veins and mechanical pressure of the fetus on the large veins within the mother's pelvis. Due to the increase in thrombotic activity, the risk of thrombosis and embolism in pregnant women is increased, but with adequate compression therapy this risk can be significantly reduced.

A common occurrence in pregnancy is arterial hypertension, which can lead to a very serious danger for mother and child. This condition appears in approx. 10% – 15% of pregnant women and requires timely and effective drug therapy.

The development of operative and minimally invasive methods in cardiology and cardiac surgery of children and adults has led to an increase in the

chances of survival of these patients, so that today we are more often faced with pregnant women who have previously known complex cardiac diagnoses. The older age of the pregnant woman, which is common, leads to a higher number of comorbidities even before pregnancy. Therefore, every pregnant woman is recommended to perform regular monitoring of vital parameters such as blood pressure and pulse, regular laboratory testing in consultation with a competent gynecologist, and in case of pathology, a cardiologist is certainly engaged for further diagnosis and treatment.

Women with known cardiovascular diseases and current therapy should definitely consult a cardiologist when planning a pregnancy. Numerous heart medications can adversely affect pregnancy and the fetus, so therapy is being switched to medications that have been shown not to have a detrimental effect on fetal development. A pregnant woman with cardiovascular disease performs regular cardiac check-ups, which is especially important during pregnancy.

Pregnancy-independent arterial hypertension is defined as high blood pressure that exists before pregnancy or blood pressure greater than 140/90 mmHg diagnosed in the first half of pregnancy and lasting at least 3 months after delivery. This is often a mild to moderate hypertension. In 1–5% of all pregnancies, arterial hypertension occurs as a result of primary (multifactorial causes) or secondary (other diseases) hypertension, which is often predisposed to older and obese women. The prognosis for mother and child depends significantly on maternal kidney function. Women who have high blood pressure before pregnancy are 5 times more likely to give birth to a premature baby of low birth weight. Data from the literature show that 4% of maternal mortality is caused by placental abruption due to hypertension.

Hypertension without the presence of protein in the urine is called gestational hypertension; conversely, if more than 300 mg of protein is found in the urine in 24 hours, this is preeclampsia (or gestosis) which is a life-threatening condition. Regardless of drug therapy, and depending on the level of blood pressure, the age of the pregnancy and additional maternal and fetal risk factors, strict monitoring will be required with limited activity until bed rest. Blood pressure above 170/110 mm Hg in pregnant women is considered an emergency and requires immediate hospitalization. Differential diagnostic consideration should be given to the occurrence of high blood pressure after week 20 of pregnancy, which disappears within 6 weeks of delivery. Due to the increasing prevalence of maternity in old age and the increased risk of

giving birth to children small for their gestational age, further studies of arterial hypertension independent of pregnancy are needed.

If a form of tachycardia is present, it is necessary to reduce the dose of adrenaline in the local anesthetic or apply a pure anesthetic. An increase in heart rate is accompanied by an increase in stroke volume and higher O2 consumption, which often results in pronounced heart tones and possible functional heart murmurs in the form of premature arterial and ventricular beats. It is important that such findings are not misdiagnosed because they disappear soon after birth, and do not require antibiotic prophylaxis, which is indicated in the event that such heart murmurs were present before pregnancy.

School for pregnant women

Pregnancy is a normal physiological process in which exercising and physical activity can be started or continued. Exercise during pregnancy is recommended but adapted to the condition of the pregnant woman's body. The goal is to improve woman's physical shape during pregnancy, at birth and puerperium postpartum in order to ease childbirth and accelerate recovery and the return of a good psychosomatic state after childbirth. This combined program of preparation for childbirth dates back to 1995 and is known as "Lamaze", named after a French doctor.

Before a pregnant woman decides to exercise, she should first request a written permission from her gynecologist that her pregnancy is in order and that there are no contraindications to exercising during pregnancy. If the pregnancy is in order, exercise will be approved and supported. Otherwise, until the pregnancy stabilizes, the woman can attend school, listen to lectures and watch other pregnant women exercise, all which can be very helpful during childbirth. It is very important for a pregnant woman to attend school and start her preparations in a group.

Pregnant women go through prenatal, birth and postpartum preparation, which consist of:

1. Theoretical part – lectures on the physiology and anatomy of a normal pregnancy, childbirth, postpartum recovery, breastfeeding and newborn care.
2. Practical part – breathing exercises and techniques, getting to know the place and staff of the maternity hospital where the birth is planned and thus try to avoid the fear of the unknown.

Lectures should be thematic, prepared by gynecologists, midwives, physiotherapists, pediatricians and psychologists with selected chapters on the anatomy and physiology of pregnancy, childbirth and postpartum periods. The school can be attended by pregnant women accompanied by their partners, but also by a person who has a positive impact on the pregnant woman and who will eventually attend the act of childbirth. Preparations usually last one month, two to three times a week, each 45-60 minutes and are carried out in small groups in adequate clothes and footwear for exercise.

Exercise can be started from the very beginning when the pregnancy is stable. If a pregnant woman has nausea, vomiting, dizziness or feels generally weak, she should consult a gynecologist and delay the start of exercise until her general condition improves. With a good general condition and a normal pregnancy, you can start exercising with the written approval of the attending gynecologist, and under the professional supervision of an educated midwife or physiotherapist.

There is also a small number of pregnant women who decide to exercise independently at home with literature and videos.

Basic rules of exercise in pregnancy:

1. Always exercise before meals or two to three hours after meals.
2. Empty your bladder before exercising.
3. Exercise clothes must be comfortable, cozy and made of natural fabrics, with short socks up to the ankle, so as not to compromise the circulation of the lower extremities.
4. Practice on mats and hard surfaces in an airy room with an open window.
5. A pregnant woman can self-monitor her heart rate (preferably in the lower third of her forearm) and, if necessary, her blood pressure.
6. At the beginning, it is recommended to exercise two to three times a week for 45 to 60 minutes, in series of 3 to 5 times.
   According to the program developed by a physiotherapist or an educated midwife, the number of repetitions of certain exercises is set according to the anamnesis and current assessment of the woman's functional status during pregnancy.
7. Mobile phones must be turned off and all other irritating factors that can prevent continuity of exercise must be eliminated.

After childbirth, the muscles and the pelvic floor are relaxed and the ligaments that secure the uterus are stretched, so there is a possibility that the

uterus drops through, prolapses, or tilts towards the back. A preventive measure is to rest and avoid strenuous physical exertion. While still in the hospital, we recommend that the mother does exercises to strengthen the pelvic floor muscles! These exercises can be done in bed simply by briefly squeezing the vagina and colon several times and then relax (contraction-relax), as well as Koegel exercises. Exercises are performed in the morning and evening, 3 to 5 series with 8-12 repetitions, with a break of one minute. You should try to increase the amount of exercise, so that the training lasts 10-15 minutes two to three times a day.

Relaxation exercises are done in a calm and warm atmosphere and in a suitable room, usually after exercising. The pregnant woman takes a comfortable position and relaxes her entire body – until complete relaxation, or a certain part of the body – partial relaxation. After a couple of deep inhales and exhales, the eyes close and part by part of the body relaxes, starting from the toes and feet to the top of the head. This relaxes the whole body. If we want to partially relax any part of the body, we then first contract a certain muscle group, and then relax them. These exercises are most pronounced during the first and second stage of childbirth, when the mother relaxes between labor or stress, relaxing the whole body and the pelvic floor. This provides a sufficient amount of oxygen that is necessary to achieve an easier and faster birth. Exercises can be performed daily until delivery.

Breathing exercises

Every person breathes in a different way. Most men use the abdominal muscles more, unlike women who use the pectoral muscles.

Chest breathing is performed by placing a hand on the chest and lightly exhale through the mouth, then begin to deeply inhale through the nose and exhale through the mouth pronouncing the letter “Sh” or “S”.

Exhaling must last longer than inhaling. This type of breathing is used by pregnant women only in the initial exercises to notice the difference between chest and abdominal breathing. When a pregnant woman inhales air through her nose, the diaphragm lowers to allow as much space as possible for the lungs to expand, and on exhalation it frees up space for the abdominal cavity and retreats to the starting position.

Abdominal breathing is for the first stage of childbirth and can be done throughout this stage if it is comfortable for the woman. The air is exhaled slowly through the mouth and the abdomen relaxes, air then is inhaled through the nose and continuously exhaled through the mouth pronouncing the letter

"Sh" or "S", with the abdomen retracted. The described breathing is applied during labor in order to achieve the best possible concentration of the mother and reduce the feeling of labor pains.

Short and shallow breathing or so-called panting, is used during the first stage of childbirth when abdominal breathing is no longer comfortable for the woman giving birth. This is usually when labor is more intense and when deep breathing causes a "collision" of the diaphragm and uterus, which causes severe pain. This type of breathing is fast and "superficial" as if the air does not go below the chest. In the breaks between labor, the mother should relax as much as possible. Breathing applied at the end of the first stage of labor is a combination of short and shallow breathing interrupted by a single exhale and inhale, which makes it easier for the woman to control the urge to push when this time has not yet come. In the second stage of childbirth, the woman in labor should follow the instructions of the midwife and the physician. In the act of giving birth, all the forces that direct the child towards the exit through the birth canal should be used. During childbirth, the mother lies on her back, kneels or squats and completely relaxed begins to push. At the beginning of the push, she exhales deeply, then inhales and holds her breath as much as possible, at the same time bending her head and her chin toward her chest and upper body with strong tension, as if wanting to quickly urinate or defecate. The bottom of the pelvis should be relaxed so as not to create resistance to the passage of the baby. All pushing forces are directed in the same direction. In the lower part, the support is the pelvic part of the spine, and in the upper part, the diaphragm, which lowers when you inhale deeply and pushes the uterus down, and the contraction of the abdominal muscles acts as a force from the front. The thighs are bent at the knee and hip all the way to the abdomen, as this takes up the proper axis of the child's passage through the small pelvis. When the mother can no longer hold her breath, she exhales through her mouth and if the push still lasts, she inhales again quickly and presses while the push lasts, and when it stops, complete relaxation follows. This saves the strength needed for the next stage of stress and completion of labor. It is important to point out that during the birth, the woman should not push before going into labor in the narrow sense of the word, and before the conditions for pushing are met and the external cervix is completely dilated and opened, all under the supervision and instructions of a doctor or midwife. Proper breathing in the first stage of birthgiving and pushing the baby in the second stage significantly shorten and alleviate labor.

References

1. Balić i saradnici, *Perinatologija*, Univerzitet u Tuzli, Tuzla, 2007.
2. Dražančić, A., *Porodništvo*, Zagreb, Školska knjiga, 1995.
3. Kurjak, A. i sar., *Ginekologija i perinatologioja I i II*, Varaždinske Toplice, Golden Time, 1995.
4. Kurjak, A. i Latin, V., *U susret roditeljstvu*, Tonimir, Varaždinske Toplice, 1998.
5. Kurjak, A., Stavljenić-Rukavina, A., Pavelić, K., *Prenatalna dijagnostika i terapija*, Tonimir, Varaždinske Toplice, 1998.
6. Kuvačić I., Škrablin-Kučić S., *Perinatologija danas*, Nakladni zavod Matice hrvatske, Zagreb, 2003.
7. Martius, G., Breckwoldt, M., Pfleiderer, A., *Lehrbuch der Gyanakologie und Geburtshilfe*, Georg Thieme Verlag Stuttgart-New York, 1994.
8. Mladenović-Bogdanović, Z., Mladenović-Mihailović, A., *Ginekologija i akušerstvo*, Beograd, Zavod za udžbenike i nastavna sredstva, 2001.

Chapter VI
RESEARCH PROJECT CARDIOVASCULAR DISEASES AND ORAL HEALTH – EFFECT OF ORAL HEALTH OF PREGNANT WOMEN ON CHILDREN'S CRDIOVASCULAR HEALTH

Prof. Senka Mesihović-Dinarević, MD, PhD
Prof. Lutvo Sporišević, MD, PhD
Anes Jogunčić, MD

Introduction

Adequate oral health reflects on and affects general health and quality of life. The oral cavity is an integral part of the human body and thus there is a great connection between oral health and systemic health. Not only do some systemic diseases such as diabetes, osteoporosis, HIV infection, trisomy 21 have a predisposition to periodontitis, but vice versa. Susceptibility to some systemic diseases is higher in patients with periodontitis than in healthy people: chronic periodontitis is a risk factor for future cardiovascular diseases, pregnant women with chronic periodontitis have more frequent preterm birth and lower birth weight. The explanation of the pathophysiological mechanisms of periodontal focus and systemic diseases is associated with increased levels of circulation of proinflammatory cytokines and prostaglandins originating from periodontal disease, gram-negative bacteria and their substances such as endotoxins emerging from subgingival biofilms. The dominant problems of everyday dental practice are: caries, periodontal diseases, occlusal anomalies, the relationship between oral and general health and a holistic approach to the patient. Caries and periodontal disease are of infectious etiology, and therefore the prevention of caries and periodontal diseases also means the prevention of odontogenic foci. Periodontal pocket is a risk factor for the occurrence or worsening of systemic – focal disease, because there is an always present infection; the flora of the pocket is diverse, massive, virulent and penetrates the soft membrane of the pocket, the pocket is under constant

mechanical stimulation during chewing, swallowing and speech, which all favors the penetration of bacteria into the circulation and the formation of transient bacteremia.

Interdisciplinary cooperation in eliminating the potential negative effects of periodontal infection will result in better systemic health.

Caries and periodontal disease – the most common and significant oral diseases, can cause and complicate many diseases – diseases of the cardiovascular system (infectious endocarditis, atherosclerosis, myocarditis and heart attack), respiratory system (pneumonia, chronic obstructive pulmonary disease, bronchial asthma, and lung abscess), neurological diseases (cerebral infarction and brain abscess), diabetes mellitus, rheumatoid arthritis, Alzheimer's disease, as well as other diseases (1, 2, 3, 4, 5).

Atherosclerosis is the basis for all cardiovascular diseases. There are studies that confirm that choral periodontitis increases the level of systemic inflammation when expressed by measuring C reactive protein (CRP) and other biomarkers. Periodontal pathogens can directly infect vascular endothelium and atherosclerotic plaque causing inflammation. Then, they can produce various virulent factors (adhesions, hemolysis) that have detrimental effects on the vascular system resulting in platelet adhesion and aggregation; in addition, lipid accumulations are formed and, along with cholesterol deposits, they contribute to the formation of atheromas. Treatment of chronic periodontitis reduces systemic inflammatory factors.

Pregnancy is a condition in which complex physical and physiological changes occur, all of which have significant effects on many organ systems. High levels of circulating estrogen during pregnancy have been associated with a high incidence of gingivitis and gingival hyperplasia (6). It is estimated that approximately 40% of pregnant women have some form of periodontal disease (5, 7).

Offenbacher et al. (1996) were the first to point out the possible connection between periodontal disease in pregnant women and the risk of giving birth to children of low gestational age or low birth weight (5). Numerous researchers point to the possible connection between periodontal disease in pregnant women and the risk of premature birth, and the birth of children with low birth weight (8, 9, 10, 11, 12). Studies show that pregnant women with periodontal disease have a 2-7 times higher risk of prematurity (8, 13). Morre et al. have found a large number of fetal deaths among mothers with periodontal disease (14).

Other authors have not found a link between the oral health of mothers and the risk of giving birth to premature babies or babies of low birth weight (15, 16).

However, focal infection can affect prematurity (birth before 37 weeks of gestation) and weight loss in newborns (weight <2,500 grams). Bacteremia of periodontal pathogens by transplacental route can lead to intrauterine infection. Proinflammatory cytokines release endotoxins lipopolysaccharides (LPS) that precipitate in preterm birth. Therefore, dentists should motivate, educate and instruct pregnant women to have a higher level of oral hygiene and to fix all orodental lesions in dental therapeutic procedures, especially periodontal pockets, for this reduces the number of premature births.

It is believed that gram-negative anaerobic bacteria present in periodontal tissues may be a source of endotoxin and lipopolysaccharides, leading to increased levels of inflammatory mediators – interleukin 6 (IL-6), interleukin 8 (IL-8), interleukin - 1 beta (IL-1β), and prostaglandin E (PGE) and tumor erosion factor – alpha (TNF-α), which are transmitted to the uterus, cervix and placenta causing prematurity or the birth of children of low birth weight (1, 7, 17). Jeffcoat et al., while investigating the association between periodontal disease in pregnant women and preterm birth in a group of 1,313 pregnant women, found that moderate to severe periodontal disease — diagnosed in early pregnancy — was associated with an increased risk of prematurity, independent of other traditional prematurity risk factors (18).

It has been found that mothers who gave birth to preterm infants or children with low birth weight had significantly elevated levels of PGE in gingival fluid compared to mothers who had term births or babies of desirable birth weight (17).

During pregnancy, there is an increased tendency to caries due to increased acidity of the oral cavity, increased consumption of refined sugars and insufficient oral hygiene (19). The tendency to caries during pregnancy is enhanced by periodic vomiting of pregnant women, which increases the acidity of the oral cavity, allowing the growth of cariogenic bacteria, demineralization of teeth and the progression of caries (19). Microorganisms and their toxins in pulp lesions caused by deep caries produce IL-1β, PGE and TNF-α, and as in periodontal disease, they cause premature birth or the birth of children of low birth weight (20, 21).

Cariogenic bacteria in children are most often transmitted by direct transmission through maternal saliva (5). Mothers who have a high titer of *Streptococcus mutans* in their saliva will largely transfer these bacteria to the

baby – vertical transfer, creating the preconditions for early childhood caries. Significant predictors of early childhood caries are certainly the time and frequency of bacterial transmission, children's tendency to susceptibility of bacterial accumulation on teeth, composition and flow of children's saliva, and the amount of refined sugar in baby food (1, 5, 22).

The incidence of premature births or low birth weight infants is between 5–18%, which depends on the geographical area or population characteristics (23). Considering the causes of premature births, or newborns of low birth weight are not known in more than 50% of cases, and in 50% of cases the most important causes are considered to be: socioeconomic factors, acute and chronic maternal diseases, multiple pregnancy, obstetric conditions and genetic diseases (23, 24).

Due to the immaturity of the organic systems, preterm infants and newborns of low birth weight fall under the group of endangered infants – where complications due to prematurity are the leading cause of death in children under five year of age (23, 24). It is very important to discover the risk factors that can determine the risk of prematurity or the birth of newborns of low birth weight, where by knowing the risk factors, it is possible to significantly eliminate or reduce the risk of giving birth to premature infants or children of low birth weight and reduce the rate of perinatal mortality or possible complications.

Premature babies or low birth weight newborns show a higher incidence of cardiovascular risk factors (obesity, hypertension and dyslipidemia) and type 2 diabetes mellitus (25). Animal and epidemiological studies show that intrauterine elevated glucocorticoid levels cause lifelong programming of the hypothalamic-pituitary-adrenal axis, which plays a key role in increasing the incidence of cardiovascular risk in premature and low birth weight infants (26).

There is a hypothesis on the possible connection between chronic inflammation (*Chlamydia pneumoniae*, *Helicobacter pylori*, *Cytomegalovirus*, *Ebstein-Barr* virus, etc.) and atherosclerotic cardiovascular disease, but the precise pathogenesis is not completely clear (27, 28).

In addition to the role of the oral microbiome (microbiome: all microorganisms, their genome and interaction in a given environment) as a risk factor for prematurity or the birth of low-birth-weight infants, oral microorganisms may also be the cause of chronic inflammation that may be a risk factor for atherosclerotic (29, 30).

Adequate prenatal care should also include the protection of the oral health of pregnant women, and the pregnant women should be reminded of

the importance of practicing regular oral hygiene and the need for periodic or, if necessary, more frequent dental examinations. Possible dental interventions, such as radiography of the teeth, are best suited after the end of organogenesis, or in 2nd or 3rd trimester of pregnancy (5, 7, 31).

We believe that in the daily practice there is not enough screening of the oral health status of pregnant women, where screening the oral health status of as many pregnant women as possible, including assessment of oral hygiene, could identify pregnant women with caries or periodontal disease.

Timely dental treatment could reduce the incidence of caries and periodontal disease in pregnant women, and possibly reduce the incidence of prematurity and low birth weight infants, early childhood caries and predictors of premature atherosclerotic cardiovascular risk (increase in body mass index, blood pressure and carotid intima-media complex thickening).

2. Research hypotheses and objectives

2.1. Research hypotheses

In this study, we set the following hypotheses:

H_1 – A considerable number of pregnant women have inadequate oral health.

H_2 – Insufficient number of visits to the dentist, inadequate oral hygiene and consumption of unhealthy foods lead to the occurrence of caries and periodontal disease in pregnant women.

H_3 – In a certain number of pregnant women with poor oral health status, pregnancy results in births of premature and/or babies of low birth weight.

H_4 – In the cohort of children who were born prematurely or had low birth weight, a certain number of children aged three (4) have a higher body mass index, and a higher value of systolic and diastolic blood pressure, as well as carotid intima-media complex thickening with incipient signs of cardiovascular disease.

H_5 – There is an inappropriate knowledge, opinion and practice of pregnant women and practitioners (dentists and gynecologists) about the state of oral health and its impact on pregnancy and the overall health of newborn babies.

Knowledge, opinion and practice of both pregnant women and colleagues (dentists and gynecologists) about the state of oral health and its impact on pregnancy and overall health of newborn child, is quite poor in the Balkans and the genesis of oral health problems in our region.

2.2. Research objectives

Insufficient insight into possible pathological implications of the oral health status of pregnant women on the premature manifestation of cardiovascular risk factors in children has started research, by which we want to:

1) evaluate the general health condition and life habits of pregnant women:
– measure the body mass index of pregnant women – data in medical files
– determine whether pregnant women have a certain chronic disease (cardiovascular disease, diabetes mellitus, kidney and other chronic diseases) or whether they are taking any medication
– analyze eating habits, physical activity, as well as the presence of smoking and alcohol consumption in pregnant women
– determine the course of pregnancy, and whether there were any complications during the pregnancy.

2) determine the basic characteristics of oral health protection during pregnancy:
– frequency of visits of pregnant women to the dentist
– adequacy of oral hygiene
– oral health status of pregnant women.

3) analyze the basic characteristics of the newborn:
– evaluate gestational age and birth weight of newborns
– analyze the method of delivery (natural or caesarean section).

4) determine the basic characteristics of the general pediatric condition and the oral health status of children:
– analyze children's eating habits (diet in infancy, whether dietary guidelines are followed in children)
– determine the body weight and length/height of children
– calculate the body mass index of children
– determine the value of blood pressure in children
– determine carotid artery intima-media complex thickening using the ultrasound method
– determine when the child's first visit to the dentist was
– assess the oral health status of children
– determine the impact of the oral health status of mothers on the oral health status of children.

5) determine the knowledge, opinion and practice of pregnant women, as well as practitioners (dentists and gynecologists) about oral health, the impact of oral health on pregnancy and the health of a newborn baby
6) determine the predictors of maternal oral health status
7) determine the correlation between the oral health status of mothers with gestational age and the birth weight of newborns
8) determine the correlation of maternal oral health status with predictors of premature cardiovascular risk in children (overweight, elevated systolic and diastolic blood pressure, as well as increased carotid artery intima-media complex thickening determined by carotid artery ultrasound).

3. Respondents and methods

3.1. Area of research

The survey would be conducted in the Federation of Bosnia and Herzegovina – Canton Sarajevo and the Republic of Croatia (Zagreb and Split), considering the proportional distribution of respondents.

3.2. Respondents

The minimum number of respondents required for adequate statistical analysis of the research variable is 385, with an error of 5% and 95% confidence interval, determined by a statistical calculator (32).

The research is designed as a cohort study – it will include mothers/pregnant women, who will be selected by random selection (randomized sampling).

The research will be conceived as a multidisciplinary approach – cooperation of gynecologists and obstetricians, dentists, pediatricians, radiologists and cardiologists, for three or four years.

During the usual gynecological and obstetric examination (1st trimester, and if necessary 2nd and 3rd trimester of pregnancy) pregnant women would be suggested to consult a dentist in order to assess the status of oral health.

Based on the insight into the health documentation of pregnant women, the general health condition will be assessed – pregnant women with cardiovascular diseases diabetes mellitus, kidney diseases or any other chronic diseases will not be included in the research. Survey testing will assess the life habits of pregnant women (eating habits, physical activity,

alcohol consumption, drugs and smoking).

After birth, children would be classified into term newborns and premature infants, infants of desirable body weight and infants of low body weight and would be monitored until the third or fourth year of life.

During systematic examinations (first month of birth, first year and third and fourth year), pediatricians would then evaluate the basic characteristics related to pregnancy and childbirth, analyze children's eating habits, anthropometric parameters, check the blood pressure, while radiologists would check the value of the carotid artery intima-media complex thickening, and cardiologists would evaluate using echocardiogram the hemodynamic status of children.

The research would include children in good health, which means that children with congenital anomalies or certain chronic diseases would be excluded from the study.

Dentists would assess the dental health status of pregnant women and children and evaluate the adequacy of oral hygiene of pregnant women and children.

The research will be based on the principles of the 1975 Declaration of Helsinki and its amendments from 2008.

In order to implement the ethical and bioethical principles of research, the consents of the relevant Ethics Committees/Commissions will be sought.

Voluntary participation by pregnant women and their children will be confirmed by signing an informed consent.

3.3. Research methods

After signing the informed consent, and getting acquainted with mothers/pregnant women using the research methodology, we would perform the following on mothers/pregnant:

– surveying,
– dental examination.

For children we would perform the following:

– surveying
– anthropometric measurement
– checking blood pressure values
– measuring carotid artery intima-media complex thickening using two-dimensional color doppler ultrasound

– two-dimensional Color Doppler echocardiographic evaluation of the cardiovascular system
– dental examination.

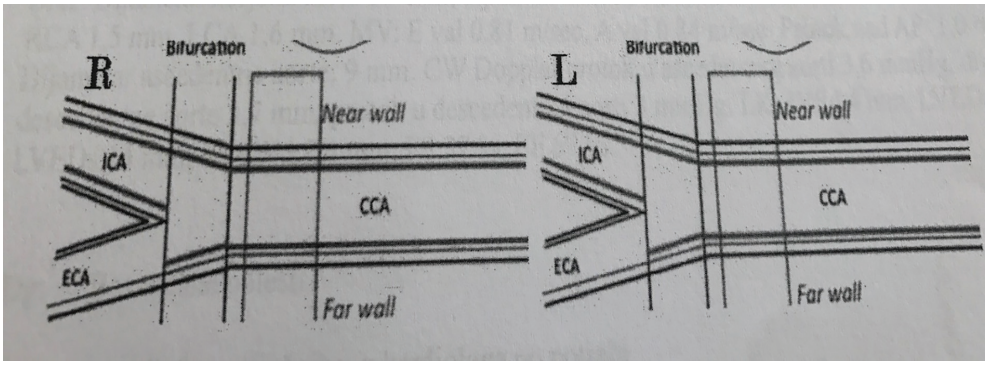


Figure no.1. Schematic diagram of measuring the carotid artery intima-media complex thickening by Color Doppler ultrasonography; CCA common coronary artery, LCA left carotid artery, ECA external carotid artery; R – right; L – left

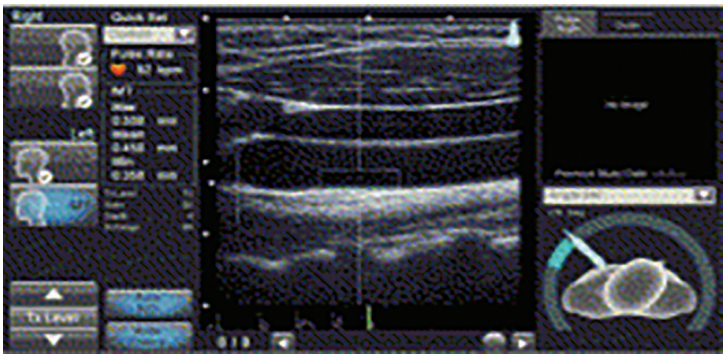


Figure no. 2. Ultrasonography of carotid arteries A

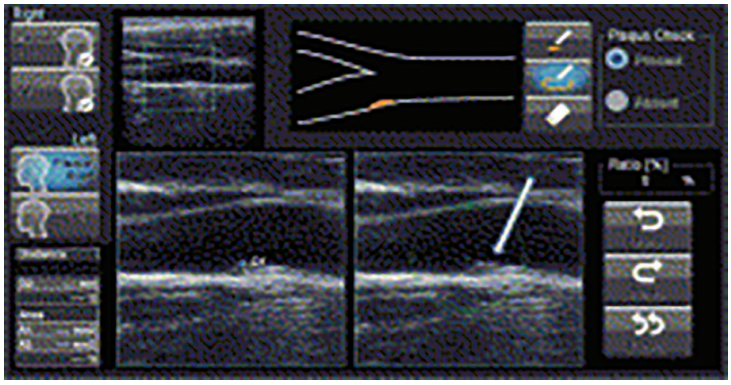


Figure no. 3. Ultrasonography of carotid arteries B.

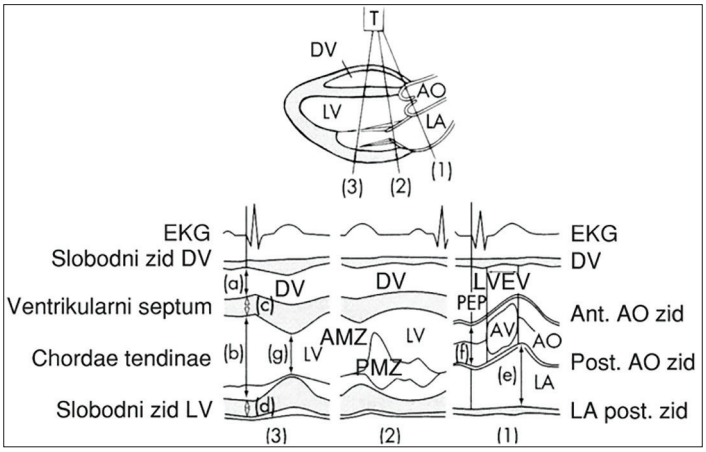


Figure no. 4. Cross section of the left side of the heart through the parasternally long and short axis; a – dimensions of DV; b – end-diastolic dimensions LV; c – thickness of ventricular septum, d –thickness of posterior wall; e – dimension LA; f – aortic dimension; g – systolic dimensions LV, AMZ – anterior mitral valve; LV EV – LV ejection time, PEP – pre-ejection period.

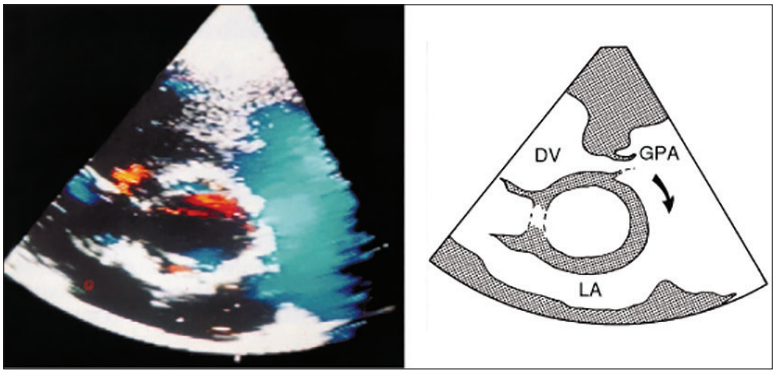


Figure no. 5. Color Doppler: short axis of systole transverse: flow through the main pulmonary artery (GPA); DV – right ventricle; LA – left atrium

3.3.1. Surveying of mothers/pregnant women

Each respondent will have her own encrypted ID number.

A survey questionnaire that would be adapted to this research would contain the following:

– general data (mother's age, city, educational status, employment status and socio-economic status of the family);

- data from personal anamnesis (mother's health condition: whether she suffers from a chronic disease, whether the mother is taking certain medications, data on pregnancy, number of previous births, the manner of giving birth, TM, TV, BMI)
- data on eating habits (number of daily meals, consumption of fruits, vegetables and other foods, consumption of sweets and other foods with refined sugars and consumption of soft drinks);
- data on harmful habits (smoking, narcotics and alcohol);
- data on physical activity;
- data on oral health (when was the last visit to the dentist before pregnancy, in what trimester of pregnancy she visited the dentist, knowledge, opinion and practice of oral hygiene, whether the mother was advised to maintain dental health ...).

QUESTIONNAIRE

"THE IMPACT OF PREGNANT WOMEN'S ORAL HEALTH ON CHILDREN'S CARDIOVASCULAR HEALTH"

Questionnaire for the mother

IDB	|__|__||__|				
Survey date:	|__|__| / |__|__| / 2017.				
Health institution:					
City/Town:					
Country:					
Contact telephone:	E-mail:				
1. GENERAL INFORMATION					
1.1. Your year of birth:					
1.2. Your educations status:	Primary school ☐	High School ☐	Junior College ☐	University ☐	☐ Other:
1.3. Your work status:	Employed ☐		Unemployed ☐		
1.4. According to your estimation, your family economic status is:	Below average ☐		Average ☐		Above average ☐
1.5. Besides this child, you:	Do not have other children ☐		I have younger child(ren) (state number) ☐ ___		I have older child(ren) (state number) ☐ ___
2. INFORMATION ON PREGNANCY					
2.1. How did the pregnancy go?	Good ☐		Complications ☐ (which:)		
2.2. Diagnosed illnesses during pregnancy?			None ☐	Rare/mild ☐	Often/severe ☐
2.3. Do you consume alcohol during pregnancy?	Yes ☐		Sometimes ☐		No ☐
2.4. Do you smoke during pregnancy?	Yes ☐		Sometimes ☐		No ☐
Do you take medications during pregnancy?	Yes ☐		No ☐		
**If you answered "Yes", please state which medications:*					
3. EVALUATION OF ORAL HEALTH KNOWLEDGE (Please provide only one answer for each question!)					
3.1 In your opinion, how often do you need to brush your teeth?	At least 1x day ☐	At least 2x day ☐	After each meal ☐	Not necessary to brush teeth every day ☐	I don't know ☐
3.2. How long should you brush your teeth?	Up to 1 min ☐	1-3 minutes ☐	More than 3 minutes ☐	I don't know ☐	
3.3. Is it necessary to use dental floss to thoroughly clean your teeth?	Yes ☐	No ☐	I don't know ☐		
3.4. Does toothpaste need to contain fluoride?	Yes ☐	No ☐	I don't know ☐		
4. EVALUATION OF THE OPINION ON ORAL HEALTH (Please provide only one answer for each question)					
4.1. Can the condition of the teeth and oral cavity have a negative impact on your general health?	I agree ☐	I don't agree ☐	I am not sure ☐		
4.2. Regular control of teeth and oral cavity is important to prevent caries and periodontal diseases?	I agree ☐	I don't agree ☐	I am not sure ☐		
4.3. Poor state of your dental health can lead to premature birth or the birth of a child of low birth weight?	I agree ☐	I don't agree ☐	I am not sure ☐		

4.4. Poor state of your dental health can lead to your' child having dental problems or some other diseases?	I agree ☐	I don't agree ☐	I am not sure ☐
4.5. Are regular dental checkups necessary during pregnancy?	I agree ☐	I don't agree ☐	I am not sure ☐
4.6. Dental interventions are safe during pregnancy?	I agree ☐	I don't agree ☐	I am not sure ☐

5. EVALUATION OF ORAL HEALTH PRACTICE
(Please provide only one answer for each question!)

5.1. How often do you brush your teeth?	In the morning only ☐	In the evening only ☐	In the morning and in the evening ☐	After every meal ☐	I do not brush my teeth every day ☐
5.2. How long do you brush your teeth?	1 minute ☐		1-3 minutes ☐	>3 minutes ☐	
5.3. Do you also use dental floss in addition to tooth brush and toothpaste?	Yes ☐	No ☐			
5.4. Do you use antibacterial mouth wash?	Yes ☐	No ☐			
5.5. Do you use chewing gum?	Yes ☐	No ☐			
5.6. If you use chewing gum, state which chewing gum you use?	Chewing gum with xylitol ☐	Chewing gum with sugar ☐	Chewing gum without sugar ☐	I use any chewing gum ☐	
5.7. How many times did you have a regular visit to the dentist over the past year?	1x ☐	2x ☐	I did not visit a dentist ☐	☐ I cannot remember	
5.8. Most usual reason to visit a dentist is?	Regular dental check-up ☐	Tooth pain ☐	Tooth extraction ☐	Fixing a tooth ☐	Other reasons ☐ State:
5.9. How many daily meals do you have?	1-2 meals ☐	3 meals ☐	4 meals ☐	5 meals ☐	>5 meals ☐

5.10. How often do you consume the following foods?

Food	≥ 2 per day	1x per day	Few times a week	1x week	Rarely or never
Milk or dairy products					
Fruit					
Vegetables					
Fruit juice					
Non-alcohol beverages					
Sweets (sugar, candy)					
Sweets (cakes, cookies, chocolate)					
Honey, marmalade, various spreads					
Toffee					
Chips, sticks and other snack					
Meat					
Fish					
Eggs					

5.11. My source of information on oral health is most often:	My dentist ☐	Means of public information (newspapers, radio, TV) ☐	Internet (web pages) ☐	Friends, acquaintances ☐

Signature:

_____

Thank you for participation!

ID NUMBER OF THE PREGNANT WOMAN:	
NUMBER OF PATIENT'S HEALTH RECORDS:	
EXAMINATION DATE:	

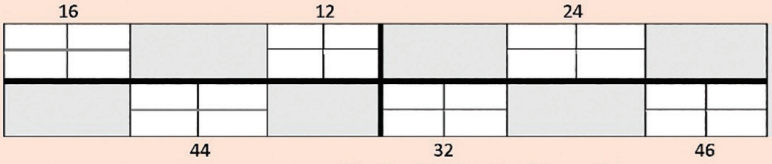
A. GENERAL RISK PARAMETERS:

1. FORM OF FLUORIDE USED:	In drinking water ☐	Tablet from 4th month of pregnancy ☐	Tablet occasionally ☐	Did not use ☐
2. MOTHER'S ORAL HEALTH:	0 - Neg. ☐	1 – Treated mouth ☐	2 - Untreated mouth ☐	
3. FATHER'S ORAL HEALTH:	0 - Neg. ☐	1 – Treated mouth ☐	2 - Untreated mouth ☐	

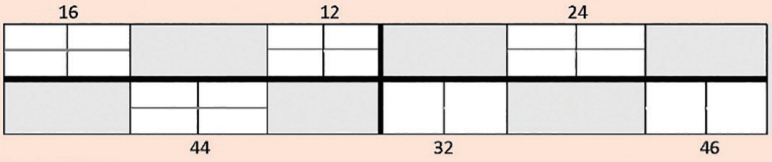
B. SPECIFIC RISK PARAMETERS:

B1 ***Oral hygiene assessment***
Plaque index (Silness & Loe)

Prior to health education intervention



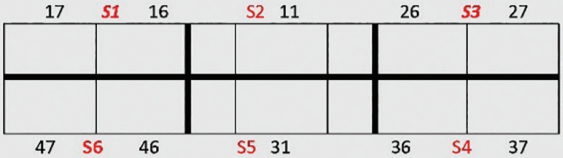
After health education intervention



0 – No plaque
1 - Along the edge of the gingiva (detection – using a probe or staining)
2 - In gingival sulcus / pocket or visible on tooth and gingival margin
3 - Large

B2 – ***Periodontal assessment and necessary treatments***
CPITN (*Community Periodontal Index of Treatment Needs*)

Prior to health and education intervention

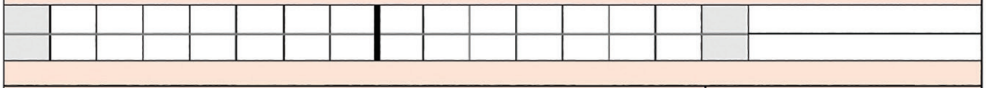


0- Healthy parodontium
1- Bleeding (probing <3,5mm)
2- Limestone (probing <3,5mm)
3- Periodontal pocket (4-5 mm)
4 – Periodontal pocket (>6mm)

0- No need for treatment
1- Instruction by OH
2- 1+Scraping, polishing of the root
3- 1+ Scraping, polishing of the root
4- 1 Scraping, polishing of the root, periodontal surgery

After health and education intervention:

B3 - ***Status of the tooth***
KEP index



K – Caries **E** – Tooth extracted **P** – Seal	**KEP =**

QUESTIONNAIRE

"THE IMPACT OF PREGNANT WOMEN'S ORAL HEALTH ON CHILDREN'S CARDIOVASCULAR HEALTH "

Questionnaire for the child

IDB	|__|__||__|					
Survey date:	|__|__| / |__|__| / 2017					
Health institution:						
City/Town:						
Country:						
Contact telephone:	E-mail:					
1. GENERAL INFORMATION						
1.1. Your child's date of birth:						
1.2. Child's sex:	Boy ☐		Girl ☐			
2. INFORMATION ON MOTHER'S PREGNANCY AND LABOR (Please provide only one answer for each question!)						
2.1. Pregnancy in weeks?						
2.2. Child was born:	On time ☐	Preterm ☐	Premature ☐			
2.3. Were there complications during pregnancy?	N ☐	Y ☐	Which:			
2.4. How did birth end?	Natural ☐	C-section ☐	Forceps ☐	Vacuum extraction ☐		
2.5. Were there complications during labor?	N ☐	Y ☐	Which:			
2.6. **APGAR score**	1 minute		5 minutes			
2.7. **Birth weight (BW) of the child**		**Birth length (BL) of the child**				
3. INFORMATION ON INFANT PERIOD (Please provide only one answer for each question!)						
3.1 Did the child have any of the following during the first year of life?						
- Congenital heart disease?	No ☐	Yes ☐				
- Other chronic diseases?	No ☐	Yes ☐				
*If your answer to the question above was "Yes", please state which diseases:						
3.2. Was your child on a natural diet / breastfeeding during the first year of life?	Did not breastfeed or breastfed only a couple of months ☐					
	Exclusive breastfeeding 6 months with continued breastfeeding and introduction of non-dairy foods after 6 months of age (fruits, vegetables, meat...) ☐					
	Combination of breastfeeding and milk formula and introduction of non-dairy foods after 4 months of age ☐					
	Milk formula and introduction of non-dairy foods after 4 months of age ☐					
EVALUATION OF ORAL HEALTH KNOWLEDGE (Please provide only one answer for each question)						
4.1. If the mother has caries or poor oral health – can this have an impact on the occurrence of caries in children?	Yes ☐	No ☐	I don't know ☐			
4.2. Is it necessary to treat caries in young children?	Yes ☐	No ☐	I don't know ☐			
4.3. When should a child make a first visit to the dentist?	Between 6 and 12 months of child's life ☐					
	When child is 1 ☐					
	When child is 2 ☐					
	When child is 3 ☐					
	When child should start first grade of school ☐					
	I don't know/I am not sure ☐					

5. EVALUATION OF THE OPINION ON ORAL HEALTH (Please provide only one answer for each question!)			
5.1. Can children with caries in early childhood later have a high chance of having caries of permanent teeth?	Yes ☐	No ☐	Not sure ☐
5.2. Can frequent and prolonged night meals with milk formula lead to childhood caries?	Yes ☐	No ☐	Not sure ☐
5.3. Can frequent and prolonged feeding of sweetened beverages (tea, juice) leas to caries in children?	Yes ☐	No ☐	Not sure ☐
5.4. Can mother's kisses and her tasting baby's food with the same spoon cause caries in children?	Yes ☐	No ☐	Not sure ☐

6. EVALUATION OF ORAL HEALTH PRACTICE (Please provide only one answer for each question!)	
6.1. Before brushing baby's teeth, did you clean your baby's gums or mouth with a piece of gauze soaked in water or special moist paper tissue – after baby's last meal for the day?	Daily ☐ Seldom ☐ Never ☐
6.2. When did you start brushing your child's teeth with toothpaste containing fluoride?	Immediately after teething ☐ (baby's month:) At the age of (state the month) ☐ Deciduous teeth do not have to be brushed ☐ I don't know ☐
6.3. How many times per day do you brush your child's teeth with fluoride toothpaste?	In the morning only ☐ In the evening only ☐ In the morning and in the evening ☐ Sometimes during a week ☐ I do not brush child's teeth ☐

6.4. At what age (months) did child have its first visit to a dentist?		None ☐
6.5. During the past year, how many times did the child visit a dentist?	1x ☐ 2x ☐ None ☐	Numerous (number) ☐
6.6. Most frequent reasons to visit a dentist?	Regular dental check-up ☐ Tooth pain ☐ Tooth extraction ☐ Fixing a tooth ☐	Other reasons ☐ State:
6.7. How many daily meals do you have?	1-2 meals ☐ 3 meals ☐ 4 meals ☐ 5 meals ☐	>5 meals ☐
6.8. What drink does the child most often consume?	Milk ☐ Water ☐ Tea ☐	Juice ☐

6.9. How often does the child consume the following foods?

Food	≥ 2 per day	1x per day	Few times a week	1x week	Rarely or never
Milk or dairy products					
Fruit					
Vegetables					
Fruit juice					
Non-alcohol beverages					
Sweets (sugar, candy)					
Sweets (cakes, cookies, chocolate)					
Honey, marmalade, various spreads					
Toffee					
Chips, sticks and other snack					
Meat					
Fish					
Eggs					

6.10. My source of information on oral health is most often:	My dentist ☐	Means of public information (newspapers, radio,	Internet (web pages) ☐	Friends, acquaintances ☐

3.3.2. Dental examination: diagnosing initial caries, periodontal examination of the gingival pocket depth and an overall examination of the oral cavity (detailed clinical parameters for the evaluation of dental status will be defined according to WHO recommendations).

3.3.3. *Surveying the children*

Each respondent (child) will have its own encrypted ID number.
A survey questionnaire that would be adapted to this research would contain the following:

- general data (child's age and sex, city);
- data from personal anamnesis (gestational age, birth weight (BW), birth length (BL), child's health)
- data on eating habits (natural or artificial nutrition in infancy, practicing dietary guidelines, excessive consumption of fruit juice, cakes and sweets);
- data on physical activity;
- data on oral health (Prior the planned pregnancy, did you purposely fix all pathological processes in the oral cavity? When you made an appointment with the dentist, did you point out that you were pregnant? X-rays of low-dose dental X-rays are absolutely contraindicated in all stages of pregnancy; During pregnancy you should not take out a tooth and have local anesthesia?; During pregnancy you increased the level of oral hygiene?; How many preventive dental examinations are recommended during pregnancy?; My gynecologist did not recommend dentist intervention with local anesthesia?; At what age was the first visit to the dentist?; Do you practice oral hygiene?; Was the mother advised to maintain the child's dental health before planning a pregnancy?).

3.3.4. *Anthropometric measurement*

Anthropometric measurement will include measuring body weight and body height while following the usual standard guidelines of anthropometric measurement.

We will calculate the body mass index of respondents using WHO Anthro software (33), and the obtained values will be compared according to the guidelines of the WHO - Body Mass Index – for gender and age (34, 35).

3.3.5. ***Measuring blood pressure in children***
At the age of three (four), we will measure the value of children's blood pressure according to the standardized procedure using the auscultation method (Riva-Rocci-Korotkoff) with an appropriate cuff.

3.3.6. Measuring intima-media complex using ultrasound method, two-dimensional Color Doppler ultrasonography

3.3.7. Two-dimensional Color Doppler echocardiographic evaluation of the cardiovascular system.

3.3.8. Dental examination to diagnose initial caries, periodontal examination to diagnose the depth of the gingival pocket and a comprehensive examination of the oral cavity.

3.4. Evaluation of variables

In addition to the evaluation of the educational status of mothers, additional evaluation will be done in terms of socio-economic status of families, working status of mothers, and certain clinical variables of mothers/pregnant women and children.

3.4.1. *Classification of children's gestational age and birth weight*

Children with gestational age <37 weeks will be classified as preterm babies, and those with birthweight <2,500 g will be classified as low birth weight children.

3.4.2. *Classification of oral health (for mothers and children – milk dentication)*

Based on common dentistry classifications, fellow dentists will supplement the exams with dental status, periodontal status, gingival bleeding, etc.

3.4.3. *Classification of body mass index of children*

Using WHO criteria (34, 35).

3.4.4. *Classification of blood pressure in children*

After measuring blood pressure (3x), we will calculate the mean of systolic and diastolic blood pressure, and it will be compared with standardized

criteria for evaluating blood pressure in children and adolescents – according to the Fourth Report on Diagnosis, Treatment and Evaluation of High Blood Pressure in Children and Adolescents (36, 37).

3.4.5. *Classification of carotid artery intima-media complex*

Based on the usual classification of carotid blood vessel intima-media complexes using the ultrasound method.

3.4.6. *Classification of possible early changes/diseases of the cardiovascular apparatus using the ultrasonic two-dimensional Color Doppler echo sonographic method*

3.5. Statistical data processing

The data obtained from the survey will be entered into a database (MS Access or MS Office) and will be evaluated by an appropriate statistical program in consultation with a statistician, who will use appropriate parametric and non-parametric tests in statistical data processing.

In the first phase of statistical processing, which is the presentation of sample characteristics, standard methods of descriptive statistics will be used (graphs, measures of central tendency, measures of dispersion).

We will then examine the strength of the correlation between maternal oral health status and all other variables (gestational age, family economic status, level of education, possibly whether mother lives in urban/suburban or rural area, body mass index, eating habits, alcohol consumption, smoking, regularity of visits to a dentist, and regular oral hygiene practices).

We will also determine the strength of the correlation between the oral health status of mothers and the risk of premature birth and the incidence of children of low birth weight. In this context, we will evaluate whether some other variables are predictors of the incidence of premature babies or children of low birth weight.

The statistical significance of the differences between the values of anthropometric variables, the values of systolic and diastolic blood pressure, and possibly the thickness of the carotid artery intima-media complex, the variables in term infants with the desired birth mass vs. children born prematurely and children of lower birth weight. We will determine whether the status of oral health of mothers and the premature birth of children and

birth of children of low birth weight is a predictor of elevated values of body mass index, blood pressure and thickening of the carotid artery intima-media complex.

4. Expected results

The results of the research will show that a certain number of mothers have a poor (inappropriate) oral health status due to insufficient practice of oral health hygiene, poor practice of appropriate dietary guidelines and insufficient visits to the dentist.

The research will determine that a certain number of mothers with poor oral health status give birth to premature babies and children of low birth weight.

We expect that children of mothers with poor oral health status at the age of 3 (4) also have poorer oral health status compared to children whose mothers with good oral health status.

The group of children, born prematurely or born with low birth weight, at the age of 3 (4) years have a higher body mass index for their age and sex, higher systolic and diastolic blood pressure and greater thickness of carotid intima-media complex compared to the desired values of these parameters in term babies and babies with desirable birth weight with possible incidental indications of cardiovascular disease including atherosclerotic, compared to the control group.

Anonymous survey for the dentist and the gynecologist:

- As a dentist, I avoid applying local anesthesia with adrenaline to pregnant women in all months of pregnancy?
- I avoid any type of X-ray in pregnant women ?
- Pulling out a tooth under pain in pregnant women is not recommended during pregnancy?
- I avoid treating gingivitis in pregnant women at all stages of pregnancy?
- Trepanation of the tooth causing acute odontogenic infection and incision of the abscess are not recommended when woman is pregnant?

Study timeline:

Pregnant woman – gynecologist – dentist – pediatrician – radiologist – cardiologist – epidemiologist

References

1. Pezelj-Ribarić i sur. Oralno zdravlje – uvjet za opće zdravlje. Rijeka; Medicinski fakultet Sveučilišta u Rijeci; 2013.
2. Teles R, Wang CY. Mechanisms involved in the association between periodontal diseases and cardiovascular disease. Oral Dis 2011;17:450–461.
3. Zoellner H. Dental infection and vascular disease. Semin Thromb Hemost 2011;37:181–192.
4. Kamer AR, Craig RG, Dasanayake AP, Brys M, Glodzik-Sobanska L, de Leon MJ. Inflammation and Alzheimer's disease: possible role of periodontal diseases. Alzheimers Dement 2008;4:242–250.
5. Boggess KA, Edelstein BL. Oral health in women during preconception and pregnancy: implications for birth outcomes and infant oral health. Matern Child Health J 2006; 10 (5 Suppl):S169-174.
6. Hemaltha V, Manigandan T, Sarumathi T, Aaarthi Nisha V, Amudhan A. Dental considerations in pregnancy − a critical review on the oral care. J Clin Diagn Res 2013; 7:938.
7. American College of Obstetricians and Gynecologists. Oral health care during pregnancy and through the lifespan. Committee Opinion No. 569. Obstet Gynecol 2013;122:417–422.
8. Offenbacher S, Katz V, Fertik G, Collins J, Boyd D, Myynor G i sur. Periodontal infection as a possible risk factor of preterm low birth weight. J Periodontal 1996;67:1103-1113.
9. Soroey M, Avanbadejo P, Savage K, Oluwole A. Association between periodontal disease and pregnancy outcomes. Odontostomatol. Trop. 2015; 38 (152):5-16.
10. Turton M, Africa CW. Further evidence for periodontal disease as a risk indicator for adverse pregnancy outcomes. Int Dent J. 2016 Dec 17. doi: 10.1111/idj.12274.
11. Trivedi S, Lal N, Singhal R. Periodontal disaease during pregnancy. J Orofacial Sci 2015; 7:67.
12. Govindaraju P, Venugopal S, Shivakumar MA, Sethuraman S, Ramaiah SK, Mukundan S. Maternal periodontal disease and preterm birth: A case-control study. J Indian Soc Periodontol. 2015;19(5):512-515. doi: 10.4103/0972-124X.164751
13. Reza Karimi M, Hamissi JH, Naeini SR, Karimi M. The Relationship Between Maternal Periodontal Status of and Preterm and Low Birth Weight Infants in Iran: A Case Control Study. Glob J Health Sci. 2015 ;8(5):184-188. doi: 10.5539/gjhs.v8n5p184.
14. Moore S, Ide M, Coward PY, Randhawa M, Borkowska E, Baylis R, Wilson RF. A prospective study to investigate the relationship between periodontal disease and adverse pregnancy outcome. Br Dent J. 2004 Sep 11;197(5):251-258.
15. Ali TB, Abidin KZ. Relationship of periodontal disease to pre-term low birth weight infants in a selected population--a prospective study. Community Dent Health. 2012; 29(1):100-105.
16. Davenport ES, Williams CE, Sterne JA, Murad S, Sivapathasundram V, Curtis MA. Maternal periodontal disease and preterm low birthweight: case-control study. J Dent Res. 2002;81(5):313-318.
17. Offenbacher S, JaredHL, O′Reilly PG, Wells SR, Salvi GE, Lawrence HP et al. Potential pathogenic mechanism of periodontitis pregnancy complications. Ann Perriodontol 1998; 3:233-250.

18. Jeffcoat MK, Guers NC, Reddy MS, Cliver SP, Goldenberg RL, Hauth JC. Periodontal infection and preterm birth: results of a prospective study. J Am Dent Assoc 2001; 132:875-880.
19. Silk H, Douglass AB, Douglass JM, Silk L. Oral health during pregnancy. Am Physician 2008; 77:1139-1144.
20. Haake SK, Newman MG, Nisengard RJ, Sanz M: Periodontal microbiology. Clinical Periodontology. Edited by: Newman MG, Takei HH, Carranza FA. 2002, Philadelphia: Saunders, 96-112.
21. Nair PNR: Pathogenesis of apical periodontitis and the causes of endodontic failures. Crit Rev Oral Biol Med. 2004, 15: 348-381.
22. Škrinjarić I. Prevencija oralnih bolesti u djece: U: Bralić I. i sur. Prevencija bolesti u dječjoj dobi. Medicinska naklada. Zagreb, 2014;412-431.
23. World Health Organization. Preterm birth. Fact sheet. Reviewed November 2016. http://www.who.int/mediacentre/factsheets/fs363/en/ (pristup 10.1.2017.),.
24. Mardešić D., Benjak V. Nedonošče. U: Mardešić D. i sur. Pedijatrija. Školska knjiga; Zagreb, 2016;389-397.
25. Crispi F, Bijnens B, Figueras F, Bartrons J, Eixarch E, Le Noble F et al. Fetal growth restriction results in remodeled and less efficient hearts in children. Circulation 2010; 121 (22): 2427-2436.
26. Barker DJ. Human growth and cardiovascular disease. Nestle Nutr Work-shop Ser Pediatr program 2008; 61:21-38.
27. Mitchell RN, Schoen FJ. Atherosclerosis. U: Kumar V, Abbas AK,Fausto N, Aster JC, (ur.). Robbins & Cotran Pathologic Basis of Disease, 8 izd. Philadephia: WB Saunders; 2010;1020-35.
28. Al-Ghamdi A, Jiman-Fatani AA, El-Banna H. Role of Chlamidia pneumoniae, helicobacter pylori and cytomegalovirus in coronary artery disease. Pak J Pharm Sci 2011; 24(2):95-101.
29. Bearfield C, Davenport ES, Sivapathasandarem V, Allaker RP. Possible association between amniotic fluid micro-organism infection and microflora in the mouth. BJOG. 2002;109:527-533.
30. Dunlop AL, Mulle JG, Ferranti EP, Edwards S, Dunn AB, Corwin EJ. The Maternal Microbiome and Pregnancy Outcomes that Impact Infant Health: A Review. Advances in neonatal care: official journal of the National Association of Neonatal Nurses. 2015;15(6):377-385. doi:10.1097/ANC.0000000000000218.
31. Boggess KA, Urlaub DM, Moos MK, Polinkovsky M, El-Khorazaty J, Lorenz C. Knowledge and beliefs regarding oral health among pregnant women. J Am Dent Assoc 2011; 142(11):1275-1282.
32. Glaziou Philippe. Samsize. Computer sample size and power. Version 06.2003. Dostupno s URL: http://sampsize.sourceforge.net/ (pristup 10. 1. 2017).
33. WHO. Child growth standards. WHO Anthro (version 3.2.2., January 2011) http://www.who.int/childgrowth/software/en/
34. World Health Organization. BMI-for - age BOYS. Birth to 5 years (percentiles) Dostupno s URL: http://www.who.int/childgrowth/standards/cht_bfa_boys_p_0_5.pdf?ua=1 (pristup 10. 1. 2017).
35. World Health Organization. BMI-for - age GIRLS . Birth to 5 years (percentiles)
Dostupno s URL: http://www.who.int/childgrowth/standards/cht_bfa_girls_p_0_5.pdf?ua=1 (pristup 10. 1. 2017)

36. Baylor College of medicine. USDA/ARS Children's Nutrition Research Center, Houston, Texas. Age-based Pediatric Blood Pressure Reference Charts. Dostupno s URL: https://www.bcm.edu/bodycomplab/Flashapps/BPVAgeChartpage.html (dostupno 10. 1. 2017).
37. National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. The Fourth report on the diagnosis, evaluation and treatment of high blood pressure in children and adolescents. Pediatrics 2004; 114 (2 Suppl 4 th Report) 555-576. (dostupno 10. 1. 2017).

Chapter VII
PROJECT PUBLICATIONS

Journal of Cardiovascular Diseases & Diagnosis

Mesihović-Dinarević, J Cardiovasc Dis Diagn 2017, 5:3
DOI: 10.4172/2329-9517.1000268

Opinion Article OMICS International

Prevention of Cardiovascular Disease from an Early Age

Senka Mesihović-Dinarević*
Policlinic Eurofarm, Sarajevo, Bosnia and Herzegovina

Introduction

Atherosclerosis is the most frequent disease of arteries characterized by lumen reduction of blood vessel due to local thickening of internal blood vessel by plaque/atheroma [1-3]. It is now one of the leading causes of death in developed countries. Of the ten most common causes of death, diseases of the heart and blood vessels, as a result of atherosclerosis, accounts for six of them. Atherosclerosis begins in childhood, the patient goes a long time without developing symptoms, increasing with age and at about 50 years of age, atherosclerosis seriously begins to threaten health. As a cardiovascular disease, atherosclerosis is an interdisciplinary problem that is treated by: cardiologists, neurologists, epidemiologists, nutritionists etc.

Pathophysiology

Pathophysiology of this disease concerns damaged cells that line the inner surface of the arteries the endothelium, due to chemical or mechanical damage [4]. Elevated blood cholesterol, smoking, or elevated homocysteine are examples of chemical and mechanical damage to the cells as well as high blood pressure, damage of the catheter during diagnostic procedures or even infections. Hypertension causes the formation of plaque in places where electricity hits the wall of the blood vessel and creates vortices, namely: the aortic arch, bifurcation, arteries, initial parts of the heart or coronary arteries, but also long-term or frequent spasms and immunological mechanisms lead to endothelium damage. The defect site develops inflammation and damaged endothelial cells secrete a variety of substances that attract other cells in the environment, cholesterol, platelets, smooth muscle cells, and by various interactions do accumulate in the walls of arteries. The first stage of the development of atherosclerosis occurs in the form of a "fatty streak." It is totally reversible, which means that with cessation of activities associated with harmful pathogens, endothelial cells can recover completely. However, if exposure to adverse events continues, atherosclerotic plaque grows further narrowing lumen. Consequently, reduced blood flow and tissue oxygen supply become insufficient. In the blood vessel, itself due to reduced elasticity, an increase of blood pressure occurs [5]. Elevated blood pressure can lead to: bursting in blood of the court or its stratification with the formation of aneurysms or plaque, which can calcify and slim down the wall of the vessel with the ability of forming a clot. For atherosclerotic disease, itself plaque composition rather than its size is much more important. Plaque is primarily built of lipids, has a thin cap, hat plaque, and is easier to shoot. If thrombi are formed they can clot arteries. In contrast, larger plaque with a hard cap, which contains less fat, can rarely explode, because it is more stable.

Important risk factors

The most important risk factors for the development of atherosclerotic disease are: hyperlipidaemia, hypertension, smoking, diabetes, high fibrinogen, male sex at a younger and middle age, menopause in women taking oral contraceptives or hormone replacement therapy only with the presence of other risk factors, excessive weight, increased levels of homocysteine, physical inactivity, heredity and immune response in some diseases [6,7].

Consequences of atherosclerosis

The Consequences of atherosclerosis are: coronary or ischemic heart disease, especially myocardial infarction, cerebrovascular disease and cerebrovascular accidents (80% of all heart attacks and stroke due to atherosclerosis), the narrowing or blockage of peripheral arteries, carotid arteries, particularly the legs, which can even lead to the development of gangrene [8].

The process of hypertension starts in childhood. Etiopathogenetically it is multifactorial, a possible course and repercussions for health are longstanding and irreversible [9]. Normotension offers important data in contribution to health and increased blood pressure in childhood represents the site for preventive paediatric action. In a study which included 500 children, a correlation of birth weight and blood pressure in the paediatric population was conducted at the Paediatric clinic of Clinical University Centre of Sarajevo, during April-June 2003 [10]. The conclusion was that blood pressure measurement in children could serve for the detection of cardiovascular disease precursors' ages 8 to 9. The correlation of birth weight and systolic pressure exists, but not significantly. The main factors that influence birth weight are: sex (boys were heavier than girls up to 98 g $p<0.05$), gestational age (preterm were lighter for 600 g $p<0.001$), and smoking of pregnant mothers (newborns were for 219 g of lower birth weight in relation to mothers who did not smoke $p<0.01$). Obese participants (important hypertension factor) have increased systolic blood pressure for 5.38 mmHg in relation to those participants with normal blood tension ($p<0.01$).

Dislipoproteinaemias and repercussions on the myocardium and blood vessels in the paediatric population, represent an imperative for modern investigation. Basic investigation of lipoproteins, apolipoprotein's metabolism, the biology of the atheromatosus process development in cells, and the role of genetics in the development of disease of coronary arteries is necessary in the field of preventive cardiology. Arteriosclerosis, multifactorial in its etiopathogenesis, course and repercussions, demands action from a team of physicians with the aim of early detection and treatment of dislipoproteinemias and the reduction of the development of risk factors for coronary disease. As atherosclerosis is one of the leading causes of death in society, it represents a responsibility for all paediatricians who should do a screening of lipid levels for all children aged two with a positive family history, as well as children in schools. Dislipoproteinemia is detectable in neonatal age, so the data from Sarajevo's study from 1991, one of the first investigations in the field of preventive cardiology in Europe, points to an elevation of total cholesterol levels, as well as an increase of apo B lipoprotein fraction [11]. In this study, the lipoprotein serum

***Corresponding author:** Senka Mesihović-Dinarević, Policlinic Eurofarm, Sarajevo, Bosnia and Herzegovina, E-mail: dsenka@bih.net.ba

Received March 27, 2017; **Accepted** April 17, 2017; **Published** April 21, 2017

Citation: Mesihović-Dinarevi S (2017) Prevention of Cardiovascular Disease from an Early Age. J Cardiovasc Dis Diagn 5: 268. doi: 10.4172/2329-9517.1000268

Citation: Mesihović-Dinarevi S (2017) Prevention of Cardiovascular Disease from an Early Age. J Cardiovasc Dis Diagn 5: 268. doi: 10.4172/2329-9517.1000268

level was evaluated in 163 patients without positive family history of cardiovascular risk factors. The control group was comprised of 32 healthy children. In children with cardiovascular disease (congenital heart disease, rhythm disorders, rheumatic fevers), in relation to the control group, an increase of c lipid fraction (triglyceride and LDLP) with a decrease of protective fraction of HDL with statistical significance was proven, adding to increased risk for cardiovascular diseases.

Since there is no specific cure for atherosclerosis, the best way to avoid this disease is prevention. In the United States and Western Europe, where risk factors have been preventively eliminated for a long time, mortality rates "fell" below 50%. Prevention included avoiding risk factors: instead of obesity subjects should have normal body weight according to sex, age and height, work out or quick walk at least half an hour each day, because 40% of our bodies are comprised of skeletal muscles that are designed to move [6]. The primary intention of prevention is to preclude the occurrence of risk factors for atherosclerosis, and the secondary is to prevent the development or aggravation of the illness along with the reduction or control of existing risks. Primary prevention should begin as early as possible, even in childhood, creating a healthy diet, eliminating smoking, regular physical activity, which will prevent or at least slow the development of atherosclerosis. In modern medicine, there are a growing number of studies that show that children are overweight, which is certainly an adolescent risk factor for many chronic diseases including: cardiovascular, diabetes type 2, orthopaedic and psychological illnesses. The epidemic of obesity is one of the most serious health problems of today. During the past two decades, the prevalence of obesity in European countries has increased threefold. Fifty percent of adults today are overweight and a third of the European population is obese. Statistics from the Centre for Disease Control and Prevention /CDC/ also speak to the tripling of the number of obese people in the last 20 years [12]. Sixteen percent of children and adolescents aged 6-19 years are overweight. Approximately 60% to 85% of obese children become obese adults, leading to an earlier and more frequent occurrence of chronic non-communicable disease. Though genetic and hormonal factors are possible causes of children being overweight and obese, excessive food intake and low physical activity are undoubtedly the main reasons for the emergence of obesity. Sitting in front of TV and computer whilst consuming calorie rich fast foods and sweetened beverages create long-term imbalances between the introduction and consumption of energy in the body. The result of this imbalance is being overweight [13,14]. Parameters for the most precise estimate of obesity is the body mass index (BMI), which is the ratio of body weight and the square of body height in kg/m^2. Obese people have a BMI greater than the 95^{th} percentile. Factors related to the start of obesity are: a modified diet, reduced physical activity, and increased inactivity. The alarming trend of the expanding epidemic of obesity, particularly an increase in prevalence among young people, presents each community with a problem that has enormous economic and social consequences [15-20]. Global measures for the prevention of obesity for the countries of the European region are given in the European Charter of countering Obesity in 2006 [21].

Finding the most effective preventive measures for obesity in each country requires accurate epidemiological data on the number of obese children and adolescents, and their dietary habits and activity, which was one of the goals important research carried out in 2008-2010 in Canton Sarajevo [14]. The results of this massive study of risk factors for cardiovascular disease (the largest of it's kind in Bosnia and Herzegovina), which was carried out in Canton Sarajevo, from the earliest ages-children in kindergartens, primary and secondary school students and the working age population, practically ages 0-65, a total of 42,828 respondents were surveyed. Through results from this research, we got the data on: risk factors for cardiovascular disease and atherosclerosis, including the level of physical activity in school environments, and the possibility of prevention, diagnosing and treating to this problem using a modern approach through cognitive behavioural aspects. For the assessment of the nutritional state of children and adolescents we used the body mass index, the degree of nutrition is obtained automatically based on CDC criteria: BMI<5 percentile malnutrition. BMI: 5 and 85 percentile normal BW, BMI: 85-95 over nutrition, BMI greater than 95 percentile obesity. The representative sample of students in elementary and secondary schools in Canton Sarajevo were selected *via* random sample selection. The number of respondents in all elementary (1-8) and secondary (1-4) grades was balanced. Pupils were interviewed in written form. The survey forms were originally designed and included questions about their habits in food intake (frequency, quantity and types) and fluids, and the frequency and intensity of physical activity. The survey forms for primary and secondary schools contained similar questions but were adapted to the age group of specific subjects: lower elementary grades, higher grades of elementary school and secondary school students. Measurements of anthropometric parameters: height and weight, was done for all subjects. Height was measured using a vertical scale in centimetres (cm), and the results are rounded to 0.5 cm. Body weight was measured by electronic floor scales in kilograms (kg), and the results are rounded to 0.5 kg. The research team consisted of two physicians and two graduate nurses. The research was concluded by 2 teams. Subjects voluntarily participated in the survey and measurements the data after being input into the information system was made anonymous from all subjects. The survey and measurements of anthropometric parameters was performed in a total of 3608 students from Canton Sarajevo of which: 2329 were from 9 elementary schools and 1279 from 6 high schools. The results were: about 1/4 of children in the first 4 years are obese, and in higher classes 1/5 of pupils. According to the results of the questioner a majority children do not eat healthy food at home. There is a problem at school concerning eating habits: pupils from lower classes eat food from school and a majority eat food from bakeries (43.31%). Physical activity was documented in 19.92% of younger children. In the older groups of pupils there is a greater percentage of pupils who sit in front the TV and PC for up to 2 hours (30.56%) they were also sitting during learning which means the majority of the day. A great number of pupils (58.15%) eats sweets every day between meals (Tables 1-6).

Conclusion

In Conclusion, the question raised is: what to do about the prevention of cardiovascular disease? Why do schools need to worry about health? As a society, we value good health. Good health is necessary for effective learning. Healthy students become healthy, productive citizens. Schools are the places where we spend most of our youth so we have to initiate a change. The teamwork of an environmental society and new policies are needed. As a priority, we should create a place for physical activity and nutrition in schools; develop funded prevention programs and a systematic approach to the problem. Point to the problem of obesity in an adequate manner, and create partnerships with value to the social community in creating a healthy lifestyle. Schools can provide: quality physical education classes, healthy nutrition campaigns, parenting education, psychosocial education/intervention with nutrition strategy. Prevention is the key! It is necessary to establish dialogue in cardiovascular medicine. Prevention of obesity consists of nutrition conducted according to modern guidelines in relation to the input of: carbohydrates, fats, proteins, vitamins and fluids. It is necessary to

Citation: Mesihović-Dinarevi S (2017) Prevention of Cardiovascular Disease from an Early Age. J Cardiovasc Dis Diagn 5: 268. doi: 10.4172/2329-9517.1000268

School class	Total number of students	M	F	BMI classification			
				Under Weight (%)	Normal weight (%)	Over weight (%)	Obesity (%)
I-IV Elementary School	1077	546	531	T: 20,86	T: 55,26	T: 12,28	T: 11,58
				M: 7,72	M: 28,68	M: 7,47	M: 6,77
				F: 13,14	F: 26,58	F: 4,81	F: 4,81
V-VIII Elementary School	1252	680	572	T: 9,16	T: 69,80	T: 13,07	T: 8,00
				M: 4,65	M: 37,98	M: 7,49	M: 3,69
				F: 4,51	F: 31,82	F: 5,58	Ž: 4,31
I-IV High School	1279	531	748	T: 6,76	T: 80,43	T: 9,55	T: 3,24
				M: 1,31	M: 34,15	M: 5,18	M: 1,47
				F: 5,45	F: 46,28	F: 4,37	F: 1,77
All schools	3608	1757	1851	T: 12,49	T: 68,74	T: 11,86	T: 6,86
				M: 4,63	M: 33,60	M: 6,71	M: 1,32
				F: 7,86	F: 35,14	F: 5,15	F: 5,54

Table 1: BMI classification of students according to grades, schools and gender.

School and class	Homemade sandwich (%)	Sandwich bought at school (%)	Food from the bakery (%)	Snacks (%)	'I dont eat at school' (%)
I-IV Elementary School	30,69	44,63	5,04	17,68	1,98
V-VIII Elementary School	16,57	24,62	42,67	10,96	5,27
I-IV High School	2,70	41,09	42,01	8,89	5,37
All schools	16,65	36,78	29,90	12,57	4,20

Table 2: Distribution of the quality nutrition of students in school.

School class	Water (%)	Juices (%)	Milk (%)	Sodas (%)
I-IV Elementary School	50,88	23,19	23,37	2,6
V-VIII Elementary School	54,94	21,71	12,45	11,87
I-IV High School	49,35	16,77	13,19	20,72
All schools	51,82	20,65	16,43	11,05

Table 3: Distribution of types of beverages that students drink during the day.

School class	Candys every day (%)	Sometimes and rarely (%)
I-IV Elementary School	30,89	59,11
V-VIII Elementary School	64,53	33,47
I-IV High School	80,85	19,15
All schools	58,15	31,24

Table 4: Distribution of prevalence of candy consuming.

School class	Every day activity (%)	Activity only on sport class (%)	Activity 2-3x per week (%)	Rarely (%)
I-IV Elementary School	19,92	39,05	40,36	0,00
V-VIII Elementary School	36,42	27,56	24,52	11,50
I-IV High School	46,89	29,19	18,08	5,65
All schools	31,07	31,93	27,65	8,51

Table 5: Distribution of the degree of sports activities.

School class	< 1 hour (%)	1-2 hours (%)	2-3 hours (%)	3 hours (%)
I-IV Elementary School	23,60	36,62	18,51	20,89
V-VIII Elementary School	13,81	30,56	27,74	27,96
I-IV High School	18,70	33,59	23,12	24,42

Table 6: Distribution of the length of time spent in front of computer and TV.

maintain regular physical activity, both in school and in free time. It is also necessary to promote of continuous education about healthy eating and a healthy lifestyle (activity, not smoking) in all primary and secondary schools in the country, the engagement of teams of family doctors to monitor the nutritional status of school children and youth.

References

1. Berenson GS, Blonde CV, Faris RP (1979) Cardiovascular disease risk factor variable during the first year of life. Am J Dis Child 133: 1049-57.
2. Berenson GS, Srinivasan SR, Hunter SM, Nicklas TA, Freedman DS, et al. (1989) Risk factors in early life as predictors of adult heart disease: The Bogalusa heart study. Am J Med Sci 298: 141-151.
3. Geer JC, McGill, He Strong JP (1961) The fine structure of human atherosclerotic lesions. Am J Pathol 38: 263-269.
4. Dinarević S (1994) The pathogenesis of atherosclerosis-a review. Brit J Cardiol 67: 241-246.
5. Moore S (1985) Pathogenesis of atherosclerosis. Metabolism 34: 13-16.
6. Dhuper S, Buddhe S, Patel S (2013) Managing cardiovascular risk in overweight children and adolescents. Paediatr Drugs 15: 181-190.
7. Berenson GS, Srinivasan SR, Bao W, Newman WP III, Tracy RE, et al. (1998) Association between multiple cardiovascular risk factors and atherosclerosis in children and young adults. The Bogalusa Heart Study. N Engl J Med 338: 1650-1656.
8. Newman WP, Freedman DS, Voors AW, Gard PD, Srinivasan SR, et al. (1986) Relation of serum lipoprotein levels and systolic blood pressure to early atherosclerosis. The Bogalusa Heart Study. New Eng J Med 314: 138-144.
9. National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents (2004) The fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents. Paediatrics 114: 555-76.
10. Dinarević S, Mulaosmanović V (2005) Primary prevention of Hypertension in Sarajevo Children: Role of Adiposity. 29th UMEMPS Congress Union of Middle Eastern and Mediterranean Paediatric Societies, pp. 154-156.
11. Dinarević S, Mesihović H, Simeunović S, Zulić I (1994) Dyslipoproteinaemia in Children with Heart Disease. Intercontinental Cardiol 3: 126-9.
12. Centers for Disease Control and Prevention (2015) Over weight and Obesity: Data & Statistics. Accessed on: April 3, 2017.
13. Kapur G, Ahmed M, Pan C, Mitsnefes M, Chiang M, et al. (2010) Secondary hypertension in overweight and stage 1 hypertensive children: A Midwest Paediatric Nephrology Consortium report. J Clin Hypertens 12: 34-39.
14. Dinarević S, Hasanbegović S (2010) Problem of obesity in children and youth in Canton Sarajevo. Pediatr Res 68: 1091.
15. WHO Europe (2007) The challenge of obesity in the WHO European Region and the strategies for response. Copenhagen: WHO Regional Office for Europe.

Citation: Mesihović-Dinarevi S (2017) Prevention of Cardiovascular Disease from an Early Age. J Cardiovasc Dis Diagn 5: 268. doi: 10.4172/2329-9517.1000268

16. Daniels SR, Arnett DK, Eckel RH, Gidding SS, Hayman LL, et al. (2005) Overweight in children and adolescents: Pathophysiology, consequences, prevention and treatment. Circulation 111: 1999-2012.

17. Berenson GS, Wittingly WA, Tracy RE, Newman WP, Srinivasan SR, et al. (1992) Atherosclerosis of the aorta and coronary arteries and cardiovascular risk factors in persons aged 6 to 30 years and studied at necropsy (The Bogalusa Heart Study). Am J Cardiol 70: 851-858.

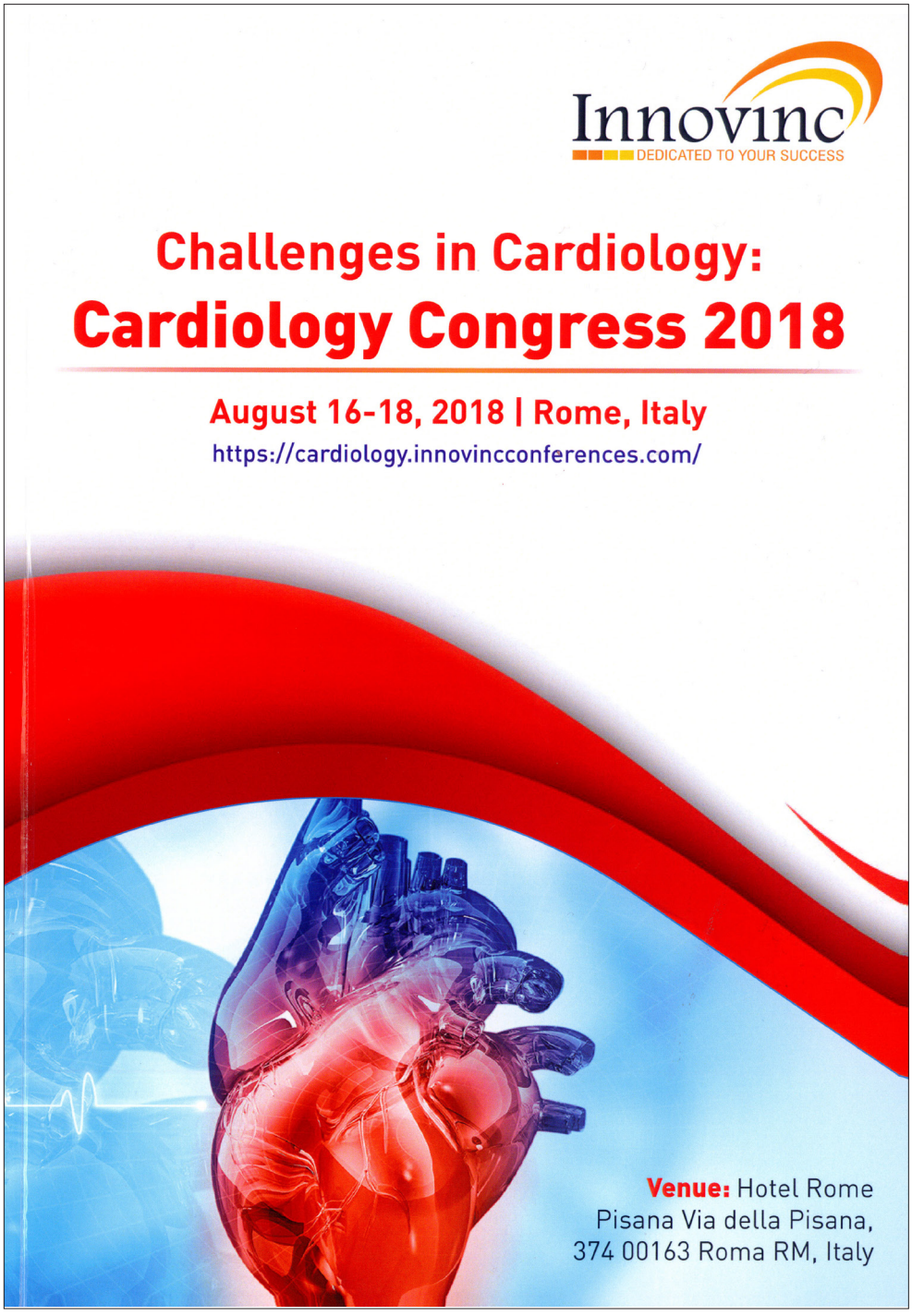
18. McNiece KL, Gupta-Malhotra M, Samuels J, Bell C, Garcia K, et al. (2007) National High Blood Pressure Education Program Working Group: Left ventricular hypertrophy in hypertensive adolescents: Analysis of risk by 2004 National High Blood Pressure Education Program Working Group staging criteria. Hypertension 50: 392-5.

19. Torrance B, McGuire KA, Lewanczuk R, McGavock J (2007) Overweight, physical activity and high blood pressure in children: a review of the literature. Vasc Health Risk Manag 3: 139-149.

20. Genovesi S, Antolini L, Giussani M, Federico P, Sara G, et al. (2008) Usefulness of waist circumference for the identification of childhood hypertension. J Hypertens 26: 1563-70.

21. http://www.euro.who.int/document/E89567.pdf 15–17 November 2006.

Citation: Mesihović-Dinarevi S (2017) Prevention of Cardiovascular Disease from an Early Age. J Cardiovasc Dis Diagn 5: 268. doi: 10.4172/2329-9517.1000268


Innovinc
DEDICATED TO YOUR SUCCESS
Challenges in Cardiology:
Cardiology Congress 2018
August 16-18, 2018 | Rome, Italy
https://cardiology.innovincconferences.com/
Venue: Hotel Rome
Pisana Via della Pisana,
374 00163 Roma RM, Italy

Challenges in Cardiology:
Cardiology Congress 2018
August 16-18, 2018 | Rome, Italy

Innovinc
DEDICATED TO YOUR SUCCESS

The challenges of detecting risk factors for the development of atherosclerosis

Senka Mesihović-Dinarević, *Lutvo Sporišević, Berislav Topić, Sanja Jurišić, Senad Saric, Britt Gritt, Vjekoslav Krželj, Anes Jogunčić, Samir Prohić and Aida Ramić*

Policlinic Eurofarm, Sarajevo, Committee for Cardiovascular Pathology, Academy of Sciences and Arts Bosnia and Herzegovina

The most frequent disease of the arteries is atherosclerosis which is characterized by lumen reduction of blood vessels due to local thickening of internal blood vessels caused by plaque / atheroma [1-3]. Atherosclerosis is now one of the leading causes of death in developed countries. The most important risk factors for the development of atherosclerotic disease are: hyperlipidaemia, hypertension, smoking, diabetes, high fibrinogen, excessive weight and physical inactivity [4,5]. Some authors pointed out the possible connection between parodontal disease in pregnant women with risk of preterm delivery, newborns of low gestational age with low birth masses and possible cardiovascular diasese [6-10]. Bearing this in mind, there is ongoing study in the Balkan region with the aim of investigating more predictors of early cardiovascular risk /increased body mass index, high values of blood pressure and thickening of intima-media carotids complex/ in comparison to children whose mothers had good oral health during pregnancy. Preliminary study data: mean age of 43 pregnant women is 30.7+/-5.7 years, 90.3% pregnancy runs properly, KEP index:12.32+/-5.7, plak index 0.312, restored teeth 65.62%; eating habits: 48.4% dairy products, fruit 64.5%, vegetables 22.6%, meat 41.9%, fish in 35.2%. Regular dental therapy can decrease frequency of caries, peridontal disease in pregnant women, the frequency of prematurity, low birth weight (with all it's potential complications, decreasing financial costs of neonatal intensive care management and cardiovascular repercussions on newborn's health). A cardiovascular-oral health data base for the Balkan region can be used as a geographic, demographic and epidemiologic source of information for the detection and identification of new potential risk factors of individuals for preterm delivery and possible atherosclerosis. Primary prevention of atherosclerosis should begin as early as possible, during pregnancy, in childhood, creating a healthy way of life, which will be able to prevent or at least slow the development of atherosclerosis.

References

1. Berenson GS, Blonde CV, Faris RP: Cardiovascular disease risk factor variable during the first year of life. American Journal of Disease in Children, 1979; 133:1049-1057.
2. Berenson GS, Srinivasan SR, Mac D et al: Risk factors in early life as predictors of adult heart disease: The Bogalusa heart study, Am.J.Med.Sci.1989; 298:141-151.
3. Geer JC, McGill, He Strong JP: The fine structure of human atherosclerotic lesions, An. J. Pathol. 1961; 38:263-9.
4. Dhuper S, Buddhe S, Patel S. Managing Cardiovascular Risk in Overweight Children and Adolescents. Paediatric Drugs, 2013, 15(3):181-90. doi: 10.1007/s40272-013-0011-y.
5. Berenson GS, Srinivasan SR, Bao, Newman WP, III, Tracy RE, Wattigney WA. Association between multiple cardiovascular risk factors and atherosclerosis in children and young adults. The Bogalusa Heart Study. N Engl J Med 1998; 338:1650–6.
6. Offenbacher S, Katz V, Fertik G, Collins J, Boyd D, Myynor G at all. Periodontal infection as a possible risk factor of preterm low birth weight . J Periodontal 1996;67:1103-1113.

7. Soroey M, Avanbadejo P, Savage K, Oluwole A. Association between periodontal disease and pregnancy outcomes. Odontostomatol. Trop. 2015; 38 (152):5-16.
8. Turton M, Africa CW. Further evidence for periodontal disease as a risk indicator for adverse pregnancy outcomes. Int Dent J. 2016 Dec 17. doi: 10.1111/idj.12274.
9. Trivedi S, Lal N, Singhal R. Periodontal disease during pregnancy. J Orofacial Sci 2015; 7:67.
10. Govindaraju P, Venugopal S, Shivakumar MA, Sethuraman S, Ramaiah SK, Mukundan S. Maternal periodontal disease and preterm birth: A case-control study. J Indian Soc Periodontol. 2015;19(5):512-515. doi: 10.4103/0972-124X.164751

Biography

Senka Mesihović-Dinarević was born in 1958-Sarajevo.Faculty of Medicine Sarajevo 1982. 1982-2016 worked at the Paediatric Clinic-Clinical University Centre Sarajevo. MSc 1985, paediatrician age 30, subspecialty in paediatric cardiology: Sarajevo, Belgrade, London. PhD 1991, Professor of Paediatrics 2006. 1994. Member of AEPC, 1995. BPCA.1995-2011, lecturer: London MRCP: 2003-2016 Director of Paediatric Clinic. 2000 FESC, 2008 Member of Academy of Sciences and Arts of Bosnia and Herzegovina, 2009. Chairman of the Committee of Cardiovascular pathology, Honorary Doctorate of Letters, Cambridge England 2014. 2016. Member of the European Academy of Science and Arts; over 477 papers, cited 218 times in the ICI Web of Science.

Vol.1 No.1 Septembar 2018. Udruženje kardiologa u Bosni i Hercegovini (Knjiga Abstrakta) pp. 1-178

Udruženje kardiologa u Bosni i Hercegovini
The Association of Cadiologists of B&H

8. KONGRES UDRUŽENJA KARDIOLOGA U BiH

ISSN

Knjiga Abstrakta

Izdavač:
Udruženje kardiologa u Bosni i Hercegovini
71000 Sarajevo
Bosna i Hercegovina

Glavni urednik:

Prof. dr sc. Mirza Dilić,
Redovni profesor, Medicinski fakultet Univerziteta u Sarajevu

Recenzenti:

Prof. dr sc. Zumreta Kušljugić,
Redovni profesor, Medicinski fakultet Univerziteta u Tuzli

Prof. dr sc. Šekib Sokolović
Redovni profesor, Medicinski fakultet Univerziteta u Sarajevu

Dizajn i štampa:
Mirbergraf d.o.o. Sarajevo

Tiraž:
300

Nacionalna i univerzitetska biblioteka, Bosne i Hercegovine, Sarajevo

ISSN 2566-4719 (print)

Knjiga Abstrakta; Udruženje kardiologa u Bosni i Hercegovini

ORAL AND CARDIOVASCULAR HEALTH- THE CHALLENGES OF DETECTING RISK FACTORS FOR THE DEVELOPMENT OF ATHEROSCLEROSIS

Senka Mesihović-Dinarević*, Lutvo Sporišević, Berislav Topić, Sanja Jurišić, Senad Saric, Grit Kirsten-Sarić, Vjekoslav Krželj, Anes Jogunčić, Samir Prohić, Aida Ramić

Policlinic Eurofarm, Sarajevo, Committee for Cardiovascular Pathology, Academy of Sciences and Arts, Sarajevo, Bosnia and Herzegovina

The most frequent disease of the arteries is atherosclerosis which is characterized by lumen reduction of blood vessels due to local thickening of internal blood vessels caused by plaque/atheroma /1-3. / As a cardiovascular disease, atherosclerosis is an interdisciplinary problem that is treated by: cardiologists, neurologists, epidemiologists, nutritionists etc. Atherosclerosis is now one of the leading causes of death in developed countries. It begins in childhood, goes a long time without manifestings symptoms, increasing with age it begins to seriously threaten health. The most dangerous risk factors for the development of atherosclerotic disease are: hyperlipidaemia, hypertension, smoking, diabetes, high fibrinogen, excessive weight and physical inactivity /4,5/. Some authors pointed out the possible connection between parodontal disease in pregnant women with the risk of preterm delivery, newborns of low gestational age with low birth masses and possible cardiovascular diasese. Bearing this in mind, there is now an ongoing study in the Balkan region with the aim of investigating more prominent predictors of early cardiovascular risk/increased body mass index, high values of blood pressure and the thickening of the intima-media carotids complex in comparison to children whose mothers had good oral health during pregnancy /6-10/. Regular dental therapy/care can decrease the frequency of the occurance of caries and peridontal disease in pregnant women, the frequency of prematurity and low birth weight (with all it's potential complications, decreasing the financial costs of neonatal intensive care management and the cardiovascular repercussions on newborn's health). A cardiovascular-oral health data base for the Balkan region can be used as a geographic, demographic and epidemiologic source of information for the detection and identification of new potential risk factors of individuals for preterm delivery and possible atherosclerosis. Primary prevention of atherosclerosis should begin as early as possible, during pregnancy, in childhood, creating a healthy way of life, which will be able to prevent or at least slow the development of atherosclerosis.

Journal of Cardiovascular Diseases & Diagnosis

Dinarevic et al. J Cardiovasc Dis Diagn 2018, 6:6
DOI: 10.4172/2329-9517.1000342

Research Article Open Access

The Challenges of Detecting Risk Factors for the Development of Atherosclerosis

Dinarević SM*, Topić B, Jurišić S, Prohić S, Sporišević L, Saric S, Sarić GK, Krželj V, Jogunčić A and Ramić A

Committee for Cardiovascular Pathology, Academy of Sciences and Arts, Sarajevo, Bosnia and Herzegovina

Abstract

The most frequent disease of the arteries is atherosclerosis which is characterized by lumen reduction of blood vessels due to local thickening of internal blood vessels caused by plaque/atheroma. As a cardiovascular disease, atherosclerosis is an interdisciplinary problem and one of the leading causes of death in developed countries. It begins in childhood, goes a long time without manifesting symptoms, increasing with age it begins to seriously threaten health. The most dangerous risk factors for the development of atherosclerotic disease are: Hyperlipidaemia, hypertension, smoking, diabetes, high fibrinogen, excessive weight and physical inactivity.

Keywords: Atherosclerosis; Hyperlipidaemia; Hypertension; Myocardial infarction; Parodontal disease

Introduction

The primary intention of prevention of atherosclerosis is to preclude the occurrence of risk factors for atherosclerosis, and the secondary is to prevent the development or aggravation of the illness along with the reduction or control of existing risks. Primary prevention should begin as early as possible, even in childhood, creating a healthy diet, eliminating smoking, regular physical activity, which will prevent or at least slow the development of atherosclerosis. The consequences of atherosclerosis are: coronary or ischemic heart disease, especially myocardial infarction, cerebrovascular disease and cerebrovascular accident (80% of all heart attacks and brain due to atherosclerosis), narrowing or blockage of peripheral arteries, carotid arteries. Since there is no specific cure for atherosclerosis, the best way to prevent this disease, is prevention.

Some authors pointed out the possible connection between parodontal disease in pregnant women with the risk of preterm delivery, new-borns of low gestational age with low birth masses and possible cardiovascular disease [1-7].

Oral health

Appropriate oral health reflects and influences general health and the quality of life. The oral cavity is an integral part of the human organism and therefore there exists a great connection between oral health and systemic health. Not only do some systemic diseases such as diabetes, osteoporosis, HIV infection, trisomy 21 have a predisposition for periodontitis but an opposite applies. Susceptibility to certain systemic disease is higher in patients with periodontitis than in healthy people: chronic periodontitis is a risk factor for future cardiovascular disease, pregnant women with chronic periodontitis have more frequent have preterm birth and new-borns have a low birth weight. The explanation for the pathophysiological mechanisms of paradont focus and systemic disease is associated with elevated levels of circulating pro-inflammatory cytokines and prostaglandins derived from: diseased parodont, gram negative bacteria and their endotoxin-like substances, that appear from subgingival biofilms immediately entering the bloodstream. The dominant problems of everyday dental practice are: caries, periodontal disease, occlusal abnormalities, the relationship of oral and general health and a holistic approach to the patient. Caries and periodontal disease are of an infectious aetiology therefore the prevention of dental caries and periodontal disease means preventing odontogenic focuses. A periodontal pocket is a risk factor for the development or worsening of systemic - focal disease, because the infection is always present in it; a pocket flora is various, massive, virulent and penetrates the soft wall of the pocket, the pocket is under constant mechanical stimulation during chewing, swallowing and speech, all of which favour the penetration of bacteria into circulation and the formation of transient bacteremia. Dental caries and periodontal disease are the most common and significant oral disease, they can cause and aggravate numerous other disease: of the cardiovascular system (infective endocarditis, atherosclerosis, myocarditis and myocardial infarction), of the respiratory system (pneumonia, chronic obstructive pulmonary disease, bronchial asthma and pulmonary abscess), neurological disorders (cerebral infarction and cerebral abscess), diabetes mellitus, rheumatoid arthritis, Alzheimer's disease, and other illnesses) [8]. Interdisciplinary cooperation in the elimination of potential negative effects of periodontal infections will result in better systemic health Atherosclerosis is the basis for all cardiovascular disease. Periodontal pathogens can directly infect the vascular endothelium and atherosclerotic plaque causing inflammation. Then, they are capable of producing a variety of virulence factors (adhesions, haemolysis), which have adverse effects on the vascular system resulting in platelet aggregation and adhesion; in addition, lipid clusters are formed with deposits of cholesterol that contribute to atheroma formation. The treatment of chronic periodontitis reduces systemic inflammation factors.

Pregnancy

Pregnancy is a state in which there are complex physical and physiological changes, which have important effects on multiple systems of organs. High levels of circulating oestrogen during pregnancy are associated with high incidence of gingivitis and gingival hyperplasia or certain forms of periodontal disease [9]. It is believed that approximately 40% of pregnant women have a certain form of periodontal disease [8-10]. Offenbacher et al. first suggested a possible link between periodontal disease and risks for child delivery of a low

***Corresponding author:** Dinarević SM, Committee for Cardiovascular Pathology, Academy of Sciences and Arts, Sarajevo, Bosnia and Herzegovina, Tel: +387 33 560-700; E-mail: dsenka@bih.net.ba

Received October 01, 2018; **Accepted** October 25, 2018; **Published** October 28, 2018

Citation: Dinarević SM, Topić B, Jurišić S, Prohić S, Sporišević L, et al. (2018) The Challenges of Detecting Risk Factors for the Development of Atherosclerosis. J Cardiovasc Dis Diagn 6: 342. doi: 10.4172/2329-9517.1000342

Citation: Dinarević SM, Topić B, Jurišić S, Prohić S, Sporišević L, et al. (2018) The Challenges of Detecting Risk Factors for the Development of Atherosclerosis. J Cardiovasc Dis Diagn 6: 342. doi: 10.4172/2329-9517.1000342

gestational age or small birth weight [11]. Many researchers suggest a possible link between periodontal disease in pregnant women with a risk for preterm delivery, respectively, the birth of babies with low birth weight. Researches show that in pregnant women with periodontal disease there is a 2-7 times higher risk for prematurity. Morre et al. found a large number of foetal deaths among mothers with periodontal disease [12]. However, a focal infection may affect prematurity (birth before 37 weeks gestation) of neonates and neonatal reduction in weight (weight <2500 gm). Bacteraemia of periodontal pathogens trasplacentary can lead to intrauterine infection. Proinflammatory cytokines release the (LPS) endotoxin that precipitates in premature labour. LPS - bacterial lipopolysaccharides, are the major molecular component of the outer membrane of Gram-negative bacteria and serve as a physical barrier providing the bacteria protection from its surroundings. That is why dentists need to motivate, educate and instruct pregnant women towards a higher level of oral hygiene and to repair all dento-oral lesions in dental therapeutic procedures, especially periodontal pockets, thereby reducing the number of premature births. It is believed that the Gram-negative anaerobic bacteria, present in the periodontal tissue, can be a source for endotoxin and lipopolysaccharides, that lead to high levels of inflammatory mediators - interleukin- 6 (IL-6), interleukin 8 (IL-8), Interleukin - 1 beta (IL-1β), and prostaglandin E2 (PGE2) and tumor necrosis factor-alpha (TNF-α), which are transferred to the uterus, cervix and placenta causing premature birth or the birth of children of a small birth weight. Jeffcoat et al. whilst investigating the connection between periodontal disease of pregnant women and preterm birth in group of 1313 pregnant women, found that a moderate to severe form of periodontal disease, diagnosed in early pregnancy, was associated with an increased risk for premature delivery, independently of other traditional risk factors for prematurity [13]. During pregnancy, there is an increased susceptibility to caries due to: the increased acidity of the oral cavity, the increased consumption of refined sugars and poor oral hygiene [14]. Caries bacteria in children are usually transmitted by direct transmission through the mother's saliva. Mothers with high titres of Streptococcus mutants in their saliva are going to substantially transmit the bacteria to their baby – by vertical transmission, creating conditions for early childhood caries. Of course, the time and frequency of the transmission of bacteria, the child's preference for the accumulation of bacteria on its teeth, the composition and flow of the child's saliva, the amount of refined sugar in the baby's food, are all significant predictors of early children's caries [15]. The incidence of births of premature infants and new-borns of a small birth weight is between 5-18%, depending on the geographical area and population characteristics. Due to the immaturity of their organ systems, premature babies and infants of a small birth weight are among in vulnerable group of infants - complications due to prematurity are the leading cause of death in children under five years of age [16]. It is very important to determine risk factors that can lead to the risk of the prematurity of new-borns and new-borns of a small birth weight, i.e. with knowledge of the risk factors, it is possible to substantially eliminate or reduce the risk of premature baby birth or the birth of children with a small weight and to decrease the rate of perinatal mortality and possible complications. Preterm children or infants of a small birth weight exhibit a higher incidence of cardiovascular risk factors (obesity, hypertension, dyslipidaemia), and type 2 diabetes mellitus [16]. Animal and epidemiological studies indicate that conditions of elevated levels of glucocorticoids intrauterine during life, programme the hypothalamus-pituitary-adrenal gland axis that plays a key role in the higher incidence of cardiovascular risk in premature infants and children of a small birth weight [17]. Apart from the role of microbiome mouth (microbiome - all microbes, their genome and mutual interaction in a particular environment) as a risk factor for premature delivery or the birth of new-born of small birth weight, it is possible that the microorganisms of the oral cavity condition chronic inflammation that can represent an atherosclerotic cardiovascular risk factor. Adequate prenatal care should include oral health care of pregnant women, i.e. for pregnant women, there is a need to point out the importance of practicing regular oral hygiene and the need for periodic or as many as or as frequently as needed dental check-ups. The sufficient screening/screening of oral health status of pregnant women is not carried out in daily work, so with screening status of oral health in a greater number of pregnant women, including the assessment of oral hygiene, we would be able to timely identify pregnant women who have dental caries respectively periodontal disease [18]. With timely dental treatment we could reduce the incidence of dental caries and periodontal disease in pregnant women and may reduce the incidence of preterm delivery and the birth of new-borns of a small birth weight, an early childhood caries and predictors of early atherosclerotic cardiovascular risk (increased body mass index, blood pressure and thickening of the carotid intima-media complex). In a cohort of children, who are preterm or have a low birth weight, a certain number of children age 3 have a greater body mass index, a higher value of systolic and diastolic blood pressure, as well as a thickening of the intima-media complex of the carotid artery with incipient signs of cardiovascular system disease [19].

Insufficient insight into the possible pathological implications of the oral health status of pregnant women to premature expression of cardiovascular risk factors in children, initiated this research.

The impact of oral health of pregnant women on the cardiovascular health of children is a Project within the South-eastern European region that runs by the Committee of the Cardiovascular Disease Department of Medical Sciences of Academy of Arts and Sciences of Bosnia and Herzegovina. During 2017, the first phase of research was completed according to plan/lasted for 12 months. In this study 43 pregnant women from Bosnia and Herzegovina and Croatia were included.

The Project's Common Goals are to Give Answers to

Does and in what capacity the oral health of pregnant women influence pregnancy? Does insufficient oral health of pregnant women (periodontal disease and certain forms of caries) influence gestational age, birth mass of children or oral and cardiovascular health of new-born's, infants and small children? Is chronic inflammation of the oral cavity (periodontal disease and caries) in pregnant women a atherosclerotic and cardiovascular risk factor, that is; do preschool children whose mothers during pregnancy had periodontal disease and/or caries, have a more prominent predictor of early cardiovascular risk (increased body mass index, high value of blood pressure and thickening of intima–media carotids complex) in comparison to children whose mothers during pregnancy had good oral health?

To achieve these goals, we are conducting the research that can last up to 48 months, using a multidisciplinary approach which includes: A gynaecologist, a dentist, a paediatrician, a radiologist, a cardiologist, nutritionists, epidemiologists and statistics. These examinations integrated research from 3 respected centres in Bosnia and Herzegovina and Croatia using combined experience and skills. The aim of this research is to investigate more prominent predictors of early cardiovascular risk increased body mass index, high values of blood pressure and the thickening of the intima-media carotids complex in comparison to children whose mothers had good oral health during pregnancy.

Citation: Dinarević SM, Topić B, Jurišić S, Prohić S, Sporišević L, et al. (2018) The Challenges of Detecting Risk Factors for the Development of Atherosclerosis. J Cardiovasc Dis Diagn 6: 342. doi: 10.4172/2329-9517.1000342

We are presenting the data on the I phase of this Project conducted in: Sarajevo, Mostar, and Split. The plan is to the finish project in 2019 the II phase, and in 2020 the III phase.

The Survey is Designed as a Cohort Study

It included mothers/pregnant women selected by random selection (randomized sampling). During regular gynaecological and obstetric-examination (being I trimester, if necessary, II and III trimester of gestation) a suggestion was given to pregnant women to do their dental examination in order to assess their oral health status. The general health status of the pregnant women was determined on the basis of an assessment of their medical records. The research did not include: Pregnant women with cardiovascular diseases, diabetes mellitus, kidney disease or any chronic illnesses. The survey testing assesses the habits of pregnant women: eating habits, physical activity, alcohol consumption, drugs and smoking.

II phase: The children would be evaluated as new-borns, preterm infants, new-borns of a desirable body weight and new-born of a small birth weight, they would be followed up to their third or fourth year of life. During the systematic review (the first month of life, the first year, the third and fourth year of life) paediatricians should evaluate: the basic characteristics related to pregnancy and childbirth, analysis of the eating habits of children, anthropometric parameters, determine blood pressure values and while radiologists determine the value of complex intima-media carotid artery a cardiologist by echocardiography would evaluate the hemodynamic status of the respondents. The study would include children of proper health conditions, i.e. children with congenital anomalies or certain chronic illnesses would be excluded from the study. Dentists would judge the status of dental health of pregnant women and children and evaluate the appropriateness of the oral health of pregnant women and children. The research is based on the principles of the Helsinki Declaration from 1975 and its amendments in 2008. In order to implement the principles of ethical and bioethical research consent/approval of the appropriate ethics committees/commissions is required. Voluntary inclusion of pregnant women and children is confirmed by signing an informed consent form.

Materials and Methods

After signing the informed consent form i.e. informing mothers/pregnant women, by research methodology the following tests are conducted I phase: - survey testing - dental examination. Evaluation of general health conditions and life habits of pregnant women, determining the basic core characteristics of oral health protection during pregnancy.

N	**43**
Age (mean)	30.7 ± 5.7
Pregnancy status	
Normal	39 (90.70%)
With complications	4 (9.30%)
Education status	
High school	8 (18.60%)
Senior high school	4 (9.30%)
University education	31 (72.10%)
Diseases during pregnancy	
Without	37 (86.05%)
Rare/Lighter illnesses	4 (9.3%)
With bigger complications	2 (4.65%)
How often do you brush your teeth?	
At least 2 × per day	27 (62.8%)
After each meal	16 (37.2%)
How long it takes to brush your teeth?	
Between 1 and 3 min	28 (65.12%)
Longer than 3 min	14 (32.56%)
At most one minute	1 (2.32%)
When do you brush your teeth?	
After each meal	7 (16.3%)
In the morning	1 (2.3%)
In the evening	3 (6.98%)
In the morning and in the evening	32 (74.42%)
The most common reason for dental visit	
Tooth repair	35%
Regular control	53%
Dental pain	12%
How many times did you visit a dentist last year?	
1 ×	23%
2 ×	46%
Not remembering	12%
Didn't visit a dentist	19%

Table 1: Dental status.

Fruit	
>2 per day	65%
1 × per day	30%
Several times per week	5%
Milk and milk products	
>2 per day	33%
1 × per day	49%
1 × per week	0%
Several times per week	9%
Rarely or never	9%
Vegetables	
1 × per day	58%
>2 per day	23%
1 × per week	5%
Several times per week	14%
Juices	
2+ per day	25%
1 × per day	26%
1 × per week	14%
Several times per week	7%
Rarely or never	28%
Sweets	
1 × per day	28%
1 × per week	5%
2+ per day	23%
Several times per week	28%
Rarely or never	16%
Meat	
2+ per day	25%
1 × per day	26%
1 × per week	14%
Several times per week	14%
Rarely or never	21%
Fish	
2+ per day	5%
1 × per day	9%
1 × per week	46%
Several times per week	14%
Rarely or never	26%

Table 2: Eating habits.

Citation: Dinarević SM, Topić B, Jurišić S, Prohić S, Sporišević L, et al. (2018) The Challenges of Detecting Risk Factors for the Development of Atherosclerosis. J Cardiovasc Dis Diagn 6: 342. doi: 10.4172/2329-9517.1000342

KEP index	12.32 ± 5.729		Plaque index		0.3125 ± 0.405	
	S1	S2	S3	S4	S5	S6
A healthy periodental	42.90%	82.10%	39.30%	53.60%	71.40%	35.70%
Bleeding	42.90%	14.30%	46.40%	35.40%	25%	53.60%
Calculus	7.10%	3.60%	7.15%	7.20%	3.60%	10.70%
Periodontal pocket (4-5 mm)	7.10%		7.15%	3.80%	--	--

Table 3: KEP index.

IDB	|__|__||__|					
Date	|__|__| / |__|__| / 2017.					
Institution:						
City:						
State:						
Telephone:	Mail:					
1. GENERAL DATA						
1.1. Birth year						
1.2. Your educational status	Primary school ☐	High school ☐	Higher school ☐	Faculty ☐	☐ Other:	
1.3. Your workings status	Employed ☐		Unemployed ☐			
1.4. According to your estimation, your family's economical status is:	Below the average ☐		Average ☐		Above average ☐	
1.5. In addition to this child, you:	You have no other children ☐	I have a younger child / children (specify how much)☐ ___			I have an older child / children (how many) ☐	
2. PREGNANCY DATA						
2.1. How does pregnancy go?	Orderly ☐	With complications ☐ (name them:)				
2.2. Diagnosed illnesses during pregnancy?	Without ☐	Rearly ☐	Often ☐			
2.3. Do you drink alcohol during pregnancy?	Yes ☐	Sometimes ☐	No ☐			
2.4. Do you smoke during pregnancy?	Yes ☐	Sometimes ☐	No ☐			
Do you use drugs (medicine) during pregnancy?	Yes ☐	No ☐				
*Please name them:						
3. EVALUATION OF KNOWLEDGE ON ORAL HEALTH (Mark one answer to the questions below!)						
3.1 In your opinion, how often you need to brush your teeth?	At least once per day ☐	At least 2x per day ☐	After every meal ☐	It isn't necessary to brush teeth every day ☐	I don't know ☐	
3.2. How long it takes to brush your teeth?	At most 1 min ☐	1-3 minutes ☐	Longer than 3 min ☐	I don't know ☐		
3.3. Is it for thorough cleaning of the teeth necessary to use dental floss?	Yes ☐	No ☐	I don't know ☐			
3.4. Is it necessary that the toothpaste contains fluoride contains fluorine?	Yes ☐	No ☐	I don't know ☐			
EVALUATION OF ATTITUDES ABOUT ORAL HEALTH (Mark one of the questions below)						
4.1. Condition of the tooth and the oral cavity have a negative impact on your overall health?	I agree ☐	I disagree ☐	I'm not sure ☐			
4.2. Regular inspection of the teeth and oral cavity is important for the prevention of dental caries and periodontal disease?	I agree ☐	I disagree ☐	I'm not sure ☐			
4.3. Inappropriate state of your dental health can lead to premature birth or having a baby low birth weight?	I agree ☐	I disagree ☐	I'm not sure ☐			
4.4. Inappropriate state of your dental health can lead to problems with dental health of your child or some other disease?	I agree ☐	I disagree ☐	I'm not sure ☐			
4.5. Regular dental examinations are necessary during pregnancy?	I agree ☐	I disagree ☐	I'm not sure ☐			
4.6. Dental interventions are safe during pregnancy?	I agree ☐	I disagree ☐	I'm not sure ☐			
5. EVALUATION OF PRACTICE ON ORAL HEALTH (Mark one of the questions below!)						
5.1. How often do you brush your teeth?	Only in the morning ☐	Only before sleep at night ☐	In the morning and in the night ☐	After every meal ☐	I don't brush teeth every day ☐	

Citation: Dinarević SM, Topić B, Jurišić S, Prohić S, Sporišević L, et al. (2018) The Challenges of Detecting Risk Factors for the Development of Atherosclerosis. J Cardiovasc Dis Diagn 6: 342. doi: 10.4172/2329-9517.1000342

5.2. How long do you brush your teeth?	1 minute ☐	1-3 minutes ☐	>3 minutes ☐		
5.3. Do you use dental floss?	Da ☐	Ne ☐			
5.4. Do you use antibacterial mouthwashes?	Da ☐	Ne ☐			
5.5. Do you use chewing gum?	Da ☐	Ne ☐			
5.6. If you use chewing gum, specify which chewing gum you are using?	Chewing gum with xylitol ☐	Chewing gum with sugar ☐	Chewing gum without sugar ☐	I use any kind of chewing gum ☐	
5.7. How many times did you have a regular visit to the dentist last year?	1x ☐	2x ☐	I did not visit dentist ☐	I can not remember ☐	
5.8. The most common reason to visit a dentist is?	regular inspection of the dental health ☐	because of dental pain ☐	tooth extraction ☐	tooth repair ☐	due to other reasons☐ Please, specify:
5.9. How many daily meals do you have?	1-2 ☐	3 meals ☐	4 meals ☐	5 meals ☐	>5 meals ☐

5.10. How often do you consume the following foods?

Grocery	≥ 2 daily	1x day	Several times per week/weekly	1x per week	Rarely or never
Milk or dairy products					
Fruit					
Vegetables					
Fruit juices					
Non-alcoholic drinks					
Sweets (sugar, sweet)					
(Cakes, Biscuits and Chocolate)					
Honey, jam and various spreads					
Candies					
Chips, sticks and other snacks					
Meat					
Fish					
Eggs					

5.11. The most common source of information on tooth health and oral cavity I find out?	From dentist ☐	From medias ☐	Internet (web pages) ☐	Friends and society☐
Signature: _____	Thank you very much for your time!			

Figure 1: Questionnaire for mother: The impact of oral health of pregnant women on the cardiovascular health of children.

Techniques of research

Originally created questionnaires for mothers/pregnant women and children (general data, data from personal history, data on eating habits, data on harmful habits, data on physical activities and data on oral health); determination of initial caries, periodontal examination with complete examination of the oral cavity in mothers and children according to WHO recommendations; determination of body mass and height, calculation of body mass index; determination of blood pressure values in children; determination of carotid complex of intima-media artery by 2D Colour Doppler ultrasonography; 2D Colour Doppler echocardiography evaluation of the cardiovascular system; data base creation in MS Access or MS Office; evaluation of variables by statistical programs in consultation with statisticians; design and development of a web based data collection system for research data entry and analysis.

Survey sheets were originally designed, they include questions about their habits in food intake (frequency, quantity and types) and fluids with a Questioner of dental status in mothers (Figures 1-3).

Anonymous questionnaire for gynecologists and dentists

As a dentist, I avoid the application of local anaesthesia with adrenalin to pregnant women during all months of pregnancy? I avoid any kind of X-raying pregnant women? In pregnancy the extraction of a tooth under pain is not recommended? I avoid therapy of gravidity gingivitis in pregnant women in all phases of pregnancy? Trepanation of teeth, the cause of acute dentogen infection, and incisions are not recommended in pregnant women? The Study Workflow: Pregnant women-gynaecologist-dentist- radiologist- cardiologist-epidemiologist.

Research Data

Preliminary study data I phase (2017-18): Mean age of 43 pregnant women is 30.7 ± 5.7 years; 90.7% pregnancy ran properly; complication detected in 9.3%.

During pregnancy: 86.05% mothers had no new disease diagnosed.

Citation: Dinarević SM, Topić B, Jurišić S, Prohić S, Sporišević L, et al. (2018) The Challenges of Detecting Risk Factors for the Development of Atherosclerosis. J Cardiovasc Dis Diagn 6: 342. doi: 10.4172/2329-9517.1000342

ID NUMBER				
HEALTH CARD NUMBER				
DATE OF EXAM				
A. GENERAL RISK PARAMETERS				
1. COURSE OF PREGNANCY	0 - Normal ☐	1 - Maintained ☐		
2. WEIGHT DURING PREGNANCY	0 - Normal ☐	1 - gained weight over 13 kg ☐	2 - Lost weight ☐	
3. VOMITING, AS AN ACCOMPANYING SYMPTOM OF PREGNANCY:	0 - Rarely/Never ☐	1 - Daily/Often ☐		
4. Dietary regimen during pregnancy:				
4a) milk and dairy products:	0 - Everyday - often ☐	1 - Rarely ☐		
4b) meat-fish-eggs:	0 - Everyday - often ☐	1 - Rarely ☐		
4c) fruit - vegetables:	0 - Everyday - often ☐	1 - Rarely ☐		
4d) sweets (**sugar**, honey, sweet, candy, chocolate, cakes, etc.)	0 - Rarely/Never ☐	1 - Often ☐	2 - Daily ☐	
5. MEDICINE TAKEN IN PREGNANCY	0 - Without ☐	1 - Rarely ☐	2 - Frequent ☐	
6. DIAGNOSED DISEASE DURING PREGNANCY:	0 - Without ☐	1 - Rarely/Smaller ☐	2 -Frequent ☐	
7. FLUOR USED IN THE FORM	0 - Drinking water ☐	1 - Pills from 4. month of pregnancy ☐	2 - Occasionally Pills ☐	3 - Not used ☐
8. DELIVERY:	0 - As scheduled ☐	1 - Early ☐	2 - Prematurity ☐	
9. CHILDS WEIGHT AT BIRTH:	0 - Above 2,5 kg ☐	1 - Less than 2,5 kg ☐		
10. MOTHER'S ORAL HEALTH	0 - Without Illness ☐	1 - Repaired ☐	2 - Non repaired ☐	
11. FATHER'S ORAL HEALTH:	0 - Without Illness ☐	1 - Repaired ☐	2 - Non repaired ☐	
Risk zone	Low Risk	0-8 points		
	Middle Risk	9-16 points		
	High Risk	17-23 points		
B. SPECIFIC RISK PARAMETERS:				
Before health-education interventions				
After the health-education intervention				
0 - No plaque 1 - On the edge of the gingival (probe, staining) 2 - In the gingival sulcus or pocket (visible) 3 - Large quantity				Risk Zone: PI < from Low risk PI from to Middle risk PI > from High risk
B4 - Tooth Status (TS)				
Before health-education interventions				
After the health-education intervention				

Citation: Dinarević SM, Topić B, Jurišić S, Prohić S, Sporišević L, et al. (2018) The Challenges of Detecting Risk Factors for the Development of Atherosclerosis. J Cardiovasc Dis Diagn 6: 342. doi: 10.4172/2329-9517.1000342

H - healthy tooth is present C - Caries R - Tooth root P - Plum CT - Cured tooth E - Tooth removed	Risk zone TS < from Low risk TS from to Middle risk TS > from High risk

Figure 2: Questionaries' of dental status in mothers.

IDB	|__|__||__|			
DATE	|__|__| / |__|__| / 201_.			
INSTITUTION:				
City:				
State:				
Telephone:	Mail:			
1. GENERAL DATA				
1.1. Child's birth date				
1.2. Sex:	Male ☐	Female ☐		
2. INFORMATION ABOUT PREGNANCY AND BIRTH (Mark one of the questions below!)				
2.1. Duration of pregnancy in weeks / weeks?				
2.2. Child was born	At time ☐	Earlier ☐	Prematurity ☐	
2.3. Were there any complications during pregnancy?	No ☐	Yes ☐	Name complications:	
2.4. How is delivery done?	Natural ☐	Cesarean section ☐	Forces ☐	Vacuum extraction ☐
2.5. Was there any complications during delivery?	No ☐	Yes ☐	Name complications:	
2.6. APGAR score	1 minute		5 minute	
2.7. Birth weight (BW) of the child		Birth length (BL) of the child		
3. ABOUT INFANT PERIOD (Mark one of the questions below!)				
3.1 Did your child in first year of life had any				
-congenital heart disease?	No ☐	Yes ☐		
-other chronic illnesses?	No ☐	Yes ☐		
* If your answer to the previous question was "Yes" to indicate which illnesses:				
3.2. Did your child have any natural feeding / breastfeeding during the first year of life?	Not breastfeeding or is breastfeeding a few months ☐ Exclusive breastfeeding for six months while continuing breastfeeding and the addition of non-milk foods after 6 months of age (fruits, vegetables, meat ...) ☐ The combination of breast feeding infant formula containing non-milk foods after 4 months of age ☐ Milk formula containing non-milk foods after 4 months ☐			
EVALUATION OF ORAL HEALTH KNOWLEDGE (Give one of the questions below)				
4.1. If the mother has cavities or inappropriate oral health - states can affect the appearance of cavities in children?	Yes ☐	No ☐	I don't know ☐	
4.2. Is it necessary to treat tooth decay in young children?	Yes ☐	No ☐	I don't know ☐	
4.3. When children should had the first visit to the dentist?	Between 6 and 12 months of the child's life ☐ In the 1st child's year ☐ In the 2nd childhood year ☐ In the 3rd child's year ☐ When a child needs to go to the first grade ☐ I do not know / I'm not sure ☐			
5. EVALUATION OF ATTITUDE ABOUT ORAL HEALTH (Mark one of the questions below!)				
5.1. Children with early childhood caries later may have a high probability for the decay of permanent teeth?	Yes ☐	No ☐	I'm not sure ☐	
5.2. Do you frequent and prolonged night meals with milk formula can lead to the child's caries?	Yes ☐	No ☐	I'm not sure ☐	
5.3. Does frequent or prolonged administration of sweetened beverages (tea, juice) can lead to baby's caries?	Yes ☐	No ☐	I'm not sure ☐	

Citation: Dinarević SM, Topić B, Jurišić S, Prohić S, Sporišević L, et al. (2018) The Challenges of Detecting Risk Factors for the Development of Atherosclerosis. J Cardiovasc Dis Diagn 6: 342. doi: 10.4172/2329-9517.1000342

5.4. Does the mother's kisses, or tasting food over same spoon can cause children's caries?	Yes ☐	No ☐	I'm not sure ☐	
6. EVALUATION OF PRACTICE ON ORAL HEALTH (Mark one of the questions below!)				
6.1. Have you cleaned gingivas or mouth with piece of gauze swelled in water or paper after the last children's meal?	Daily ☐ Rarely ☐ Never ☐			
6.2. When did you begin brushing your child's teeth with fluoride paste?	Immediately after the eruption of teeth ☐ (month of life:) At the age of (specify in months) ☐ Milk teeth - should not be brushed ☐ I do not know ☐			
6.3. How many times a day do you brush your child's teeth with flourid paste?	Only in the morning ☐ Only in the evening ☐ In the morning and in the vening ☐ Weekly ☐ Don't brush teeth ☐			
6.4. At what age (months of life) did the child have the first visit to the dentist?				Never ☐
6.5. In the previous year, how many times child had dental visits?	1x ☐	2x ☐	None ☐	Multiple ☐
6.6. The most common reason to visit a dentist is?	Regular control ☐	Dental pain ☐	Tooth removal ☐	Tooth repair ☐	Other reasons ☐ Name it:
6.7. How many daily meals do you have?	1-2 ☐	3 ☐	4 broka ☐	5 ☐	>5 ☐
6.8. Specify which liquid usually takes a child?	Milk ☐	Water ☐	Tee ☐	Natural juice ☐	

6.9. How often child consumes following foods?

Food	≥ 2 daily	1x daily	Several times a week / weakly	1x per week	Rearly or never
Milk or dairy products					
Fruit					
Vegetables					
Fruit juice					
Non-alchoholic drinks					
Sweets (sugar,sweet)					
Cakes, Biscuits, Chocolate					
Hney, jam					
Candies					
Chips, sticks and other snakcs					
Meat					
Fish					
Eggs					

6.10. The most common source of information on tooth health and oral cavity I find out?	From a dentist ☐	The media ☐	Internet (web) ☐	Friends, acquaintance ☐
Do you competent pediatrician recommended to take your child to the dentist?				Da ☐ Ne ☐
Signature: _____	Thank you very much!			

Figure 3: Childs questionnaire: The impact of oral health of pregnant women on the cardiovascular health of children.

Only 9.3% of women in pregnancy had rare/lighter illnesses and 4.65% of respondents had bigger complications. Educational status: High school finished 8 (18.60%) mothers, senior high school: 4 (9.30%), university education: 31 (72.10%) pregnant women.

Eating habits: 49% dairy products: daily; fruit 65%: two or more times per day; vegetables 23%: Two or more times per day; meat 51%: daily; with 14% more that eats meat several times per week; fish in 46%: once a week; in 26% rarely or never.

KEP (Cavities/Tooth extraction/seal) index: 12.32 ± 5.7; plaque index 0.312; repaired teeth 65.62%; non-repaired teeth 12.5% (Tables 1-3).

Expected results and their significance

The results of this research will show that a certain number of mothers have an inappropriate oral health status due firstly to insufficient oral hygiene, not adhering to appropriate eating guidelines and insufficient visits to the dentist. Using this research, we are going to show that a certain number of mothers with a bad oral health status deliver preterm new-born's and new-born's with low birth weight. We expect that children whose mothers had a bad oral health status age 3 have a worse oral health status in comparison to children whose mothers had a good oral health status. The group of children who are preterm or born with a low birth weight, age 3/4/years, would have a greater body mass index for their age and sex, greater values of blood pressure and greater thickening of the intima-media complex in comparison to the desired values of these parameters for term new-born's and new-borns of a desirable birth weight, with possible incipient signs of cardiovascular system disease including atherosclerotic, in comparison to the control group.

Citation: Dinarević SM, Topić B, Jurišić S, Prohić S, Sporišević L, et al. (2018) The Challenges of Detecting Risk Factors for the Development of Atherosclerosis. J Cardiovasc Dis Diagn 6: 342. doi: 10.4172/2329-9517.1000342

Result

Regular dental therapy can decrease the frequency of the appearance of caries, periodontal disease in pregnant women, the frequency of prematurity, low birth weight with all its potential complications, decrease the financial costs of neonatal intensive care management and cardiovascular repercussions on a new-born's health.

Discussion and Conclusion

The results so far indicate to the awareness of pregnant women of the importance of oral health and its influence on child development. However, it is necessary to wait until the end of the study to see definitive results, the impact of mother's oral health on the developing foetus. The presented cardiovascular-oral health data base for the Balkan region can be used as a geographic, demographic and epidemiologic source of information for the detection and identification of new potential risk factors of individuals for preterm delivery and possible atherosclerosis development. Primary prevention of atherosclerosis should begin as early as possible, during pregnancy, in childhood, by creating a healthy way of life, which will be able to prevent or at least slow the development of atherosclerosis.

Conflict of Interest

None declared.

References

1. Berenson GS, Blonde CV, Farris RP, Foster TA, Frank GC, et al. (1979) Cardiovascular disease risk factor variables during the first year of life. Am J Dis Child 133: 1049-1057.
2. Berenson GS, Srinivasan SR, Hunter SM, Nicklas TA, Freedman DS, et al. (1989) Risk factors in early life as predictors of adult heart disease: The Bogalusa heart study. Am J Med Sci 298: 141-151.
3. Dinarević S (1994) The pathogenesis of atherosclerosis: A review. Br J Cardiol 67: 241-246.
4. Berenson GS, Srinivasan SR, Bao W, Newman WP, Tracy RE, et al. (1998) Association between multiple cardiovascular risk factors and atherosclerosis in children and young adults. N Engl J Med 338: 1650-1656.
5. Dinarević SM (2017) Prevention of cardiovascular disease from an early age. J Cardiovasc Dis Diagn 5: 2-5.
6. Friedewald VE, Kornman KS, Beck JD, Genco R, Goldfine A, et al. (2009) The American Journal of Cardiology and Journal of Periodontology editors' consensus: Periodontitis and atherosclerotic cardiovascular disease. J Peridontol 80: 1021-1032.
7. Teles R, Wang CY (2011) Mechanisms involved in the association between peridontal diseases and cardiovascular disease. Oral Dis 17: 450-461.
8. Boggess KA, Edelstein BL (2006) Oral health in women during preconception and pregnancy: Implications for birth outcomes and infant oral health. Matern Child Health 10: 169-174.
9. Hemalatha VT, Manigandan T, Sarumathi T, Aarthi Nisha V, Amudhan A (2013) Dental considerations in pregnancy: A critical review on the oral care. J Clin Diagn Res 7: 948.
10. Committee Opinion No. 569 (2013) Oral health care during pregnancy and through the lifespan. American College of Obstetricians and Gynecologists. Obstet Gynecol 122: 417-422.
11. Offenbacher S, Katz V, Fertik G, Collins J, Boyd D, et al. (1996) Periodontal infection as a possible risk factor for preterm low birth weight. J Periodontal 67: 1103-1113.
12. Moore S, Ide M, Coward PY, Randhawa M, Borkowska E, et al. (2004) A prospective study to investigate the relationship between periodontal disease and adverse pregnancy outcome. Br Dent J 197: 251-258.
13. Jeffcoat MK, Geurs NC, Reddy MS, Cliver SP, Goldenberg RL, et al. (2001) Periodontal infection and preterm birth: Results of a prospective study. J Am Dent Assoc 132: 875-880.
14. Silk H, Douglass AB, Douglass JM, Silk L (2008) Oral health during pregnancy. Am Physician 77: 1139-1144.
15. Škrinjarić I (2014) Prevention of oral diseases in children: U: Bralić I. et al. Prevention of pediatric disease, Medical publication, Zagreb pp: 412-431.
16. D. Mardešić, Benjak V Nedonošče (2016) Pediatrics: Schoolbook; In: Mardešić D (ed.) Zagreb pp: 389-397.
17. Crispi F, Bijnens B, Figueras F, Bartrons J, Eixarch E, et al. (2010) Fetal growth restriction results in remodeled and less efficient hearts in children. Circulation 121: 2427-2436.
18. Barker D (2008) Human growth and cardiovascular disease. In the window of opportunity: Pre-pregnancy to 24 months of age. Nestle Nutr Work-shop Ser Pediatr program 61: 21-38.
19. Boggess KA, Urlaub DM, Moos MK, Polinkovsky M, El-Khorazaty J, et al. (2011) Knowledge and beliefs regarding oral health among pregnant women. J Am Dent Assoc 142: 1275-1282.

Paediatr Croat. 2019; 63 (Supl 1): 1-5

Pregled
Review

MOGUĆI NOVI FAKTOR RIZIKA ZA PREMATURITET I KARDIOVASKULARNE BOLESTI U DJECE

SENKA MESIHOVIĆ-DINAREVIĆ, LUTVO SPORIŠEVIĆ, BERISLAV TOPIĆ, VJEKOSLAV KRŽELJ, SANJA JURIŠIĆ, GRIT KIRSTEN-SARIĆ, SENAD SARIĆ, ANES JOGUNČIĆ, SAMIR PROHIĆ, AIDA RAMIĆ*

Parodontna bolest je kronična upalna, imunološki posredovana, bolest visoke učestalosti koja je povezana s aterosklerotskom kardiovaskularnom bolesti i mnogim sistemskim bolestima. Ako se parodontna bolest ne prepozna pravovremeno ili neadekvatno liječi, može dovesti do nastanka aterosklerotskih lezija i kliničke ekspresije aterosklerotske kardiovaskularne bolesti. Nedostatan uvid u moguće patološke implikacije statusa oralnog zdravlja u trudnica za nastanak ateroskleroze kao i prijevremenog poroda, inicirao je međunarodni znanstveno-istraživački projekt, koji se realizira u Bosni i Hercegovini, Republici Hrvatskoj i Njemačkoj, u periodu 2017.-2019./2020. godine, pod nazivom "Utjecaj oralnog zdravlja trudnica na kardiovaskularno zdravlje djece". Svrha projekta je evaluirati povezanost oralnog zdravlja s kardiovaskularnim zdravljem i općim zdravljem, uz osvrt na moguću pojavu prijevremenog poroda i rađanja djece niske porođajne mase. Istraživanje će utvrditi da li je trudnička parodontna bolest mogući novi faktor rizika za preuranjenu kardiovaskularnu bolest u djece. Također se želi ukazati na značaj pravilne higijene usne šupljine i redovitih stomatoloških pregleda trudnica u sprječavanju ili smanjenju pojave trudničke parodontne bolesti i utjecaja na komplikacije trudnoće i mogući preuranjeni kardiovaskularni rizik.

Deskriptori: RIZIK, ATEROSKLEROZA, PREMATURITET

Uvod

Temeljnu ulogu u iniciranju, progresiji i komplikacijama kardiovaskularnih bolesti ima ateroskleroza koja se karakterizira suženjem lumena krvne žile zbog lokalnog zadebljanja unutrašnje stjenke krvne žile uslijed formiranja ateroma (1). Jedan od temeljnih razloga što su bolesti uvjetovane aterosklerozom, i dalje jedan od vodećih uzroka obolijevanja i smrti diljem svijeta, je nedovoljno provođenje preventivnih aktivnosti (2, 3). Primarna prevencija ateroskleroze, koja treba početi još u trudnoći i ranoj dječjoj dobi, uključuje promicanje zdravog stila življenja (zdrava ishrana, izbjegavanje pušenja i izloženosti duhanskom dimu i primjerena tjelesna aktivnost) što će spriječiti ili odložiti nastanak faktora rizika za razvoj aterosklerotske bolesti. Sekundarna prevencija uključuje probir aterosklerotskih faktora rizika što omogućuje pravovremeno otkrivanje djece s povećanim rizikom za razvoj ateroskleroze kako bi se odgovarajućim preventivnim i terapijskim aktivnostima usporila ili odložila aterosklerotska bolest. S obzirom da ne postoji specifični lijek za aterosklerozu, najbolji način sprječavanja ateroskleroze i njenih komplikacija je edukacija i preventivne aktivnosti stanovništva (4).

Osim povezanosti oralnih bolesti sa sistemskim oboljenjima, neki autori ukazuju na moguću poveznicu između parodontne bolesti u trudnica s rizikom prijevremenog poroda i rađanja djeteta niske porođajne mase kao i mogućom preuranjenom kardiovaskularnom bolesti u djece (1, 5-8). Cilj ovoga rada je evaluacija povezanosti oralnog zdravlja s kardiovaskularnom bolesti, prezentiranje utjecaja trudničke parodontne bolesti na mogući prijevremeni porod i rađanje djeteta niske porođajne mase, utjecaja lošeg trudničkog oralnog zdravlja na pojavu faktora rizika za aterosklerozu u djece, kao i prikaza temeljnih aspekata aktualnog međunarodnog znanstveno-istraživačkog projekta pod nazivom "Utjecaj oralnog zdravlja trudnica na kardiovaskularno zdravlje djece".

Povezanost oralnog zdravlja s aterosklerotskom kardiovaskularnom bolesti

Oralne bolesti spadaju među najučestalije kronične nezarazne bolesti tokom cjelokupnog života (9). Oralno zdravlje, ključni je indikator blagostanja i kvalitete života, te je povezano s općim zdravljem (9, 10). Nepravovremeno dijagnosticirana i liječena parodontna bolest prelazi u kroničnu upalnu, imunosno posredovanu bolest karakteriziranu propadanjem parodontnog ligamenta i pripadajuće alveolarne kosti. Najznačajnije parodontopatogene bakterije (Aggregatibacter actinomycetetemcomitans,

*Odbor za kardiovaskularnu patologiju
Odjeljenje medicinskih nauka ANU BiH

Adresa za dopisivanje:
Prof. dr. sc. Senka Mesihović-Dinarević,
Akademkinja
Odbor za kardiovaskularnu patologiju
Odjeljenje medicinskih nauka ANU BiH
71000 Sarajevo, Bistrik 7, Bosna i Hercegovina
E-mail: dsenka@bih.net.ba

Porphyromonas gingivilas, Tannarella forsythia, Treponema deneticola i Fusobacterium nucleatum) nagomilavaju se u parodontnom džepu uzrokujući imunosni odgovor koji dovodi do oštećenja potpornih struktura i gubitka zuba (11). Povezanost oralnih bolesti i općeg zdravlja je složena i višestruka, tj. oralne bolesti imaju utjecaja na opće zdravlje, kao što i sistemske bolesti utječu na oralno zdravlje (9, 12, 13). Najveći broj oralnih bolesti dijele zajedničke faktore rizika, uključujući nezdravu prehranu bogatu šećerima, pušenje duhana i prekomjerna konzumacija alkohola, s kardiovaskularnim bolestima, zloćudnim tumorima, kroničnim bolestima dišnog sistema i dijabetes melitusom (9, 10).

Osim navedenih riziko faktora, smatra se da u nastanku parodontne bolesti značaj mogu imati i nasljedni faktori rizika. Znanstvenici smatraju da varijacije DNA sekvenci imaju učinak na individualni rizik za razvoj parodontne bolesti jer su utvrdili da uslijed varijacija genskih sekvenci može biti onemogućena aktivnost alfa defenzina, antimikrobnog peptida prisutnog u neutrofilnim granulocitima, odgovornih za uništenje parodontopatogenih bakterija (14). Munz M. i sur. otkrili su genske lokuse udružene sa sklonosti za agresivnu i kroničnu parodontnu bolest, gdje uslijed poremećaja u prirođenoj i stečenoj imunosti dolazi do parodontne bolesti (14). Najučestalije oralne bolesti, karijes i parodontna bolest, mogu izazvati i pogoršati mnogobrojna sistemska oboljenja kao što su: infektivni endokarditis, miokarditis, koronarna srčana bolest, infarkt miokarda, cerebrovaskularna bolest, pneumonija, kronična opstrukcijska bolest pluća, dijabetes melitus, komplikacija trudnoće (preeklampsija, mrtvorođenost i spontani pobačaj), rađanja djece prije termina i niske porođajne mase, osteoporozu, kronična bubrežna bolest i druga oboljenja (9, 12, 13, 15-17).

Aterosklerotska kardiovaskularna bolest spada među vodeće uzroke obolijevanja, prijevremene smrti i disabiliteta diljem svijeta. Osim nemodificirajućih, modificirajućih i netradicijskih faktora rizika, smatra se da u nastanku ateroskleroze značaj može imati i kronična upala uvjetovana određenim mikroorganizmima (18, 19). Njemački patolog Virchow (1948.), američki znanstvenik Ross (1986.) i švedski znanstvenik Hansson (2009.) smatraju da je ateroskleroza upalna bolest, tj. kronični upalni odgovor stjenke krvne žile na različite forme oštećenja endotela (20, 21). Mnogobrojna istraživanja ukazuju na povezanost parodontne bolesti i aterosklerotske kardiovaskularne bolesti (11, 22, 23). Povišene vrijednosti bioamarkera upale, C-reaktivnog proteina (CRP) faktora tumorske nekroze-alfa (TNF-alfa) i interleukina 6 (IL-6) kod pacijenata s udruženom parodontnom bolesti i aterosklerotskom kardiovaskularnom bolesti, ukazuju da je parodontna bolest mogući faktor rizika za aterosklerotsku kardiovaskularnu bolest (12). Sumarno govoreći, aterosklerotski proces uključuje dislipidemiju, endotelijalnu disfunkciju i permeabilnost i nakupljanje lipoproteina u intimi krvne žile (11).

Pojedinci s predominacijom Aggregatibacter actinomycetetemcomitans, Porphyromonas gingivilas, Tannarella forsythia i Treponema deneticola u zubnom plaku, imaju dva puta veću koncentraciju malih, gustih LDL-čestica (sd-LDL) i apolioproteina B (apoB) u serumu vs. pojedinaca koji nemaju parodontnu bolest (11, 24). Endotelijalna disfunkcija temeljni je faktor u razvoju ateroskleroze, a disfunkcionalan endotel pokazuje protrombogeni, proinflamatorni i proateregeni potencijal. Virulentne parodontopatogene bakterije produciraju lipopolisaharide koji stimuliraju Tool-like receptore (TLR) prisutne na endotelijalnim stanicama, a u daljnjem tijeku aterogeneze dolazi do povećanog nivoa endotelijalnih adhezijskih molekula i TNF-alfa (11). Endotelijalne adhezijske molekule privlače makrofage u subendotelijalni prostor, a zajedno sa TNF-alfa i parodontopatogenim bakterijama djelujući na mehanizme prirođene imunosti, povećavaju permeabilnost endotela (11, 12, 23). Veoma patogena bakterija Aggregatibacter actinomycetetemcomitans uslijed proizvodnje toksičnog proteina leukotoxina (LtxA) može dovesti do endotelijalne apoptoze i povećanog broja endotelijalnih adhezijskih molekula promovirajući endotelijalnu permeabilnost (25).

Određene bakterije u zubnom plaku produciraju protein toplinskog šoka (HSP) koji uvjetuje stvaranje protutijela, te uslijed ukrštene rezistencije s endotelom, dolazi do endotelijalne disfunkcije, po tipu autoimune bolesti i iniciranja aterogeneze (23, 26). Disfunkcionalan endotel postaje permeabilan za lipoproteine i makrofage, trombocite i T- limfocite. Hemotaktični faktori iz endotelijalnih stanica i makrofaga induciraju nakupljanje većeg broja monocita koji fagocitiraju lipoproteine i pretvaraju se u pjenaste stanice, te se formira početna aterosklerotska lezija, masna pruga. Parodontopatogene bakterije zajedno s trombocitnim faktorom rasta (PDGF) i lipoproteinima induciraju migraciju glatkih mišićnih stanica, koje stvaraju gusti ekstracelularni matriks, iz medije u intimu krvne žile (11). Kronično upalno stanje uvjetovano parodontopatogenim bakterijama u interakciji s ostalim faktorima rizika uvjetovat će perzistiranje imunološko-inflamatornih procesa dovodeći do nastanka uznapredovalih aterosklerotskih lezija, tj. nastanka fibrolipidne nakupine (aterom) koji se sastoji od središnje lipidne jezgre koja je prekrivena fibroznom kapom. Ako se javi komplikacija plaka javit će se klinička simptomatologija aterosklerotske kardiovaskularne bolesti. Navedeno ukazuje na značaj preventivnih aktivnosti u očuvanju i unaprjeđenju oralnog zdravlja, a time i kardiovaskularnog i općeg zdravlja stanovništva.

Utjecaj parodontne bolesti na trudnoću

Povišena vrijednost cirkulirajućih gestacijskih hormona tijekom trudnoće uzrokuje visoku prevalenciju gingivitisa i hiperplazije gingive (27). Mnogobrojni autori navode moguću udruženost parodontne bolesti trudnica s rizikom prijevremenog poroda i rađanja djeteta niske porođajne mase (28-31). Smatra se da približno 40% trudnica ima određenu formu parodontne bolesti (16, 32). Trudnice sa parodontnom bolesti pokazuju 2-7 puta veću učestalost prijevremenog poroda (28, 33). Morre i sur. ukazuju da trudnice sa parodontnom bolesti su imale veliki broj fetalnih smrti (34). Istražujući povezanost parodontne bolesti trudnica i prijevremenih poroda Jeffcoat

i sur. utvrdili su da su umjereni ili teški oblik parodontne bolesti u ranoj trudnoći bili udruženi s prijevremenim porodom, neovisno o drugim poznatim faktorima rizika za prijevremeni porod (35).

Virulentne parodontopatogene gram - negativne anaerobne bakterije prisutne u zubnom plaku proizvode lipopolisaharide, djeluju kao endotoksini, kao i drugi toksični produkti koji uzrokuju povišene vrijednosti markera upale poput: interleukina (IL-6, IL-8 i IL-1b), TNF-alfa i prostaglandina E_2 (PGE_2), koji cirkulacijom dospijevaju do maternice i posteljice dovodeći do komplikacija trudnoće (spontani pobačaj i mrtvorođenost) kao i prijevremenog poroda i rađanja djece niske porođajne mase (32, 35, 36). Majke prijevremeno rođene djece ili djece niske porođajne mase imale su značajno povišenu vrijednost PGE_2 u gingivalnoj tekućini vs. majkama terminski rođene djece ili djece poželjne porođajne mase (36).

Osim parodontne bolesti tokom trudnoće može se javiti i veća prevalencija karijesa što je uvjetovano smanjenim pH usne šupljine, izraženijim konzumiranjem rafiniranih šećera i neprimjerene oralne higijene (37). Smatra se da virulentne parodontopatogene gram-negativne anaerobne bakterije, kao i kod parodontne bolesti, mogu produciranjem IL-1b, TNF-alfa i PGE_2 dovesti do prijevremenog poroda i rađanja djece niske porođajne mase kod trudnica s težim oblicima karijesa (32, 35). Uzroci prijevremenog poroda u više od 50% slučajeva nisu poznati, a kao mogući uzroci između ostaloga, navode se socioekonomski faktori, akutna i kronična oboljenja majki, višeplodna trudnoća, porodničarski uzroci, nasljedna oboljenja i placentarni uzroci (38).

Bitno je utvrditi moguće faktore rizika za prijevremeni porod i rađanja djece niske porođajne mase jer je na taj način moguće znatno smanjiti učestalost prijevremenog poroda i rađanja djece niske porođajne mase, čime se smanjuje stopa perinatalne smrtnosti i moguće perinatalne komplikacije. Prijevremeno rođena djeca i novorođenčad niske porođajne mase imaju veću učestalost faktora rizika za kardiovaskularnu bolest vs . terminski rođenoj djeci i djeci poželjne porođajne mase (39). Povišena vrijednost glukokortikoida tijekom intrauterinog perioda uvjetuje u postnatalnom periodu programiranje osovine hipotalamus-hipofiza-nadbubrežna žlijezda što ima temeljnu ulogu u većoj učestalosti faktora rizika za kardiovaskularne bolesti u prijevremeno rođene djece i djece niske porođajne mase vs. terminski rođenoj djeci i djeci poželjne porođajne mase (40).

Smatramo da se u svakodnevnom praktičnom radu nedovoljno provodi probir statusa oralnog zdravlja trudnica. Probirom statusa oralnog zdravlja mogli bi se pravovremeno procijeniti održavanje oralne higijene i identificirati trudnice koje imaju karijes ili parodontnu bolest. Pravovremenim stomatološkim liječenjem može se smanjiti učestalost oralnih bolesti kod trudnica, a u kontekstu gore navedenih razmatranja, mogla bi se smanjiti učestalost prijevremenog poroda i rađanja djece niske porođajne mase. te spriječiti ili smanjiti preuranjeno ispoljavanja faktora za aterosklerotsku kardiovaskularnu bolest.

Znanstveno-Istraživački projekt:
"Utjecaj oralnog zdravlja trudnica na kardiovaskularno zdravlje djece"

S obzirom na to da trudnice i liječnici nedovoljno pažnje posvećuju oralnom zdravlju trudnica, kao i da je nedostatno znanje o utjecaju neprimjerenog oralnog zdravlja trudnica na tijek trudnoće i moguću preuranjenu pojavu rizika za aterosklerotsku kardiovaskualrnu bolest, iniciran je međunarodni znanstveno-istraživački projekt, pod nazivom "Utjecaj oralnog zdravlja trudnica na kardiovaskularno zdravlje djece". Aktualno kohortno istraživanje (prva faza istraživanja završena, druga faza u tijeku) se realizira u Bosni i Hercegovini, Republici Hrvatskoj i Njemačkoj, tijekom 2017.-2019./2020. godine. Između ostalog, ciljevi ovog istraživanja su: utvrditi da li trudnička parodontna bolest utječe na gestacijsku dob i porođajnu masu djece, kardiovaskularno zdravlje dojenčadi i male djece, utvrditi da li je trudnička parodontna bolest faktor rizika za aterosklerotsku kardiovaskularnu bolest, kao i da li predškolska djeca čije su majke imale trudničku parodontnu bolest imaju izraženije prediktore prijevremenog kardiovaskularnog rizika (povećan indeks tjelesne mase, viša vrijednost krvnog tlaka i zadebljanje kompleksa intima-media kariotidnih arterija) vs. djeci čije su majke imale primjereno trudničko oralno zdravlje (4).

U istraživanje su uključene majke i djeca isključivo urednog zdravstvenog stanja. Tokom regularnih pregleda trudnica, prvi odnosno drugi ili treći trimestar trudnoće, stomatološkim pregledom utvrđeno je oralno zdravlje trudnica. Uključujući opći pedijatrijski pregled i stomatološki pregled, skupina djece bit će praćena do njihove treće odnosno četvrte godine života (4). Djeca će biti klasificirana prema njihovoj gestacijskoj starosti i porođajnoj masi, a bit će im određen krvni tlak, ultrazvučnim pregledom procijenjena debljina kompleksa intima-media karotidne arterije, a ehokardiografskim pregledom utvrđen hemodinamski status djece (4). Upitnicima su analizirane životne navike i primjerenost oralne higijene majki i djece.

Smatramo da će istraživanje utvrditi da određeni broj majki uslijed nezdravih životnih navika, nepravilne oralne higijene i nedovoljnih posjeta stomatologu ima parodontnu bolest, kao i da rađaju djecu niže gestacijske dobi i niske porođajne mase sa svim svojim mogućim komplikacijama, što bi smanjilo financijske troškove neonatalne intenzivne njege i terapije kao i kardiovaskularne reperkusije zdravlja novorođenčeta. Određena skupina djece s nižom gestacijskom dobi starosti i niskom porođajnom masom će u dobi od tri ili četiri godine imati veći indeks tjelesne mase, veću vrijednost sistoličkog i dijastoličkog krvnog tlaka i veću debljinu kompleksa intima - media karotidne arterije vs. poželjnim vrijednostima indeksa tjelesne mase, krvnog tlaka i debljine kompleksa intima-media karotidne arterije kod djece rođene u terminu i poželjne porođajne mase.

Preliminarni rezultati Prve faze Projekta (period: 2017.-18.) su: prosječna dob 43 trudnice je 30,7 ± 5,7 godina; 90,7% trudnoća protječe uredno; komplikacije su uočene u 9,3%. Tijekom trudnoće kod 86,05% trudnica nije dijagnosticirana nova bolest. Rijetku/laku bolest imalo je

9,3% trudnica, 4,65% je imalo teže komplikacije. Edukacijski status: završena Visoka Škola 8 (18,60%), Srednja Škola: 4 (9,30%), Sveučilišno obrazovanje: 31 (72,10%) trudnica. Navike u prehrani: 49% majki konzumira mliječne proizvode dnevno; voće 65%: dva ili više puta dnevno; povrće 23%: dva ili više puta dnevno; meso 51%: dnevno; 14% konzumira meso nekoliko puta sedmično; riba 46%: jedan put sedmično; 26% rijetko ili nikada. KEP (Cavities/Tooth extraction/seal) index: 12,32 ± 5,7; plak index 0,312; popravljeni zubi 65,62%; kariozni zubi 12,5%. Ovi rezultati indiciraju svjesnost trudnica o značaju oralnog zdravlja i njegovog utjecaja na razvoj djeteta. Međutim, neophodno je pričekati kraj studije i definitivne rezultate. Prezentirana kardiovaskularna-oralna zdravstvena baza podataka za Balkansku regiju može se primijeniti kao i geografski, demografski i epidemiološki izvor informacija za detekciju i identifikaciju mogućih novih faktora rizika za prematuritet i razvoj ateroskleroze.

Zaključak

Mnogobrojna istraživanja ukazuju da virulentne parodontopatogene bakterije prisutne u zubnom plaku uslijed perzistiranja kroničnog upalnog procesa mogu biti faktor rizika za aterosklerotsku kardiovaskularnu bolest i negativno utjecati na sistemsko zdravlje pojedinca. Trudnička parodontna bolest, nepravovremeno dijagnosticirana i neliječena, kao mogući novi faktor rizika za kardiovaskularnu bolest, može nepovoljno utjecati na tijek trudnoće, tj. trudnoća može rezultirati rađanjem djece prije termina i niske porođajne mase, koja u kasnijoj dobi mogu imati preuranjene prediktore kardiovaskularne bolesti. Primarna prevencija aterosklerotske kardiovaskularne bolesti treba početi još tijekom trudnoće. Adekvatna prenatalna njega treba uključiti i zaštitu trudničkog oralnog zdravlja koja treba biti temeljena na pravilnoj higijeni usne šupljine i redovitim stomatološkim pregledima, što će spriječiti ili smanjiti učestalost pojave trudničke parodontne bolesti i njenog utjecaja na komplikacije trudnoće i mogući preuranjeni kardiovaskularni rizik.

NOVČANA POTPORA/*FUNDING*
Nema/*None*

ETIČKO ODOBRENJE/*ETHICAL APPROVAL*
Nije potrebno/*None*

SUKOB INTERESA/*CONFLICT OF INTEREST*
Autori su popunili *the Unified Competing Interest form na www.icmje.org/coi_disclosure.pdf (dostupno na zahtjev)* obrazac i izjavljuju: nemaju potporu niti jedne organizacije za objavljeni rad; nemaju financijsku potporu niti jedne organizacije koja bi mogla imati interes za objavu ovog rada u posljednje 3 godine; nemaju drugih veza ili aktivnosti koje bi mogle utjecati na objavljeni rad./ *All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare: no support from any organization for the submitted work; no financial relationships with any organizations that might have an interest in the submitted work in the previous 3 years; no other relationships or activities that could appear to have influenced the submitted work.*

LITERATURA

1. Mesihović-Dinarević S. Prevention of Cardiovascular Disease from an Early Age. J Cardiovasc Dis Diagn. 2017; 5: 268. doi: 10.4172/2329- 9517.1000268
2. McGill HC Jr, McMahan CA. Pathology of atherosclerosis in youth and the cardiovascular risk factors. In: Lauer RM, Burns TL, Daniels SR, editors. Pediatric prevention of atherosclerotic cardiovascular disease. Oxford: University Press; 2006; 3-23.
3. Kavey RE, Daniels SR, Lauer RM, Atkins DL, Hayman LL, Taubert K. American Heart Association guidelines for primary prevention of atherosclerotic cardiovascular disease beginning in childhood. Circulation. 2003; 107 (11): 1562-6.
4. Dinarević SM, Topić B, Jurišić S et al. The Challenges of Detecting Risk Factors for the Development of Atherosclerosis. Journal of Cardiovascular Diseases & Diagnosis, 2018; 6: 6. doi:10.4172/2329-9517.1000342
5. Berenson GS, Blonde CV, Farris RP et al. Cardiovascular Disease Risk Factor Variables During the First Year of Life. Am J Dis Child. 1979; 133 (10): 1049-57. doi:10.1001/archpedi.1979.02130100073015
6. Dinarević S. The pathogenesis of atherosclerosis: A review. Br J Cardiol. 1994; 67: 241-6.
7. Friedewald VE, Kornman KS, Beck JD et al. The American Journal of Cardiology and Journal of Periodontology editors' consensus: Periodontitis and atherosclerotic cardiovascular disease. J Peridontol. 2009; 80: 1021-32.
8. Teles R, Wang CY. Mechanisms involved in the association between peridontal diseases and cardiovascular disease. Oral Dis. 2011; 17: 450-61.
9. World Health Organization. Oral health. Key facts. 2018. (pristupljeno 15.1.2019. Dostupno na : https://www.who.int/news-room/fact-sheets/detail/oral-health
10. NSW Ministry of Health. Oral Health 2020: A Strategic Framework for Dental Health in NSW. 2014. (pristupljeno 15.1.2019.) Dostupno na: https://www.health.nsw.gov.au/oralhealth/Publications/progress-on-oral-health-2020.pdf
11. Bale BF, Doneen AL, Vigerust DJ. High-risk periodontal pathogens contribute to the pathogenesis of atherosclerosis. Postgrad Med J. 2017; 93 (1098): 215-20. doi: 10.1136/postgradmedj-2016-134279.
12. Karami S, Ghobadi N, Pakravan A, Dabirian M, Sobouti F. Periodontal Diseases and Possible Future Cardiovascular Events, Are they Related? An Overview. J. Pediatr. Rev. 2018; 6 (1): 44-8. doi: 10.5812/jpr.11144
13. Dörfer C, Benz C, Aida J, Campard G. The relationship of oral health with general health and NCDs: a brief review. Int Dent J. 2017; 67 (2): 14-8. doi: 10.1111/idj.12360.
14. Munz M, Willenborg C, Richter GM et al. A genome-wide association study identifies nucleotide variants at SIGLEC5 and DEFA1A3 as risk loci for periodontitis. Hum Mol Genet. 2017; 26 (3): 2577-88. doi:10.1093/hmg/ddx151.
15. Friedewald VE, Kornman KS, Beck JD et al. American Journal of Cardiology; Journal of Periodontology. The American Journal of Cardiology and Journal of Periodontology editors' consensus: periodontitis and atherosclerotic cardiovascular disease. J Periodontol. 2009; 80 (7): 1021-32. doi:10.1902/jop.2009.097001
16. Boggess KA, Edelstein BL. Oral health in women during preconception and pregnancy: implications for birth outcomes and infant oral health. Matern Child Health J. 2006; 10 (5): 169-74.
17. Horton AL, Boggess KA. Periodontal disease and preterm birth. Obstet Gynecol Clin North Am. 2012; 39 (1): 17-23. doi:10.1016/j.ogc.2011.12.008.
18. Mitchell RN, Schoen FJ. Atherosclerosis. In: Kumar V, Abbas AK, Fausto N, Aster JC, editors. Robbins & Cotran Pathologic Basis of Disease, 8 izd. Philadelphia: WB Saunders; 2010; 1020-35.
19. Morré SA, Stooker W, Lagrand WK, van den Brule AJ, Niessen HW. Microorganisms in the aetiology of atherosclerosis. J Clin Pathol. 2000; 53 (9): 647-54.
20. Ross R. Atherosclerosis-an inflammatory disease. N Engl J Med. 1999; 340: 115-26.
21. Hansson GK. Atherosclerosis-an immune disease: The Anitschkov Lecture 2007. Atherosclerosis. 2009; 202 (1): 2-10.

22. Beukers NG, van der Heijden GJ, van Wijk AJ, Loos BG. Periodontitis is an independent risk indicator for atherosclerotic cardiovascular diseases among 60 174 participants in a large dental school in the Netherlands. J Epidemiol Community Health. 2017; 71 (1): 37-42. doi:10.1136/jech-2015-206745.

23. Bartova J, Sommerova P, Lyuya-Mi et al. Periodontitis as a risk factor of atherosclerosis. J Immunol Res. 2014; 636893. doi:10.1155/2014/636893

24. Rufail ML, Schenkein HA, Barbour SE, Tew JG, van Antwerpen R. Altered lipoprotein subclass distribution and PAF-AH activity in subjects with generalized aggressive periodontitis. J Lipid Res. 2005; 46 (12): 2752-60. doi:10.1194/jlr.M500389-JLR200

25. Dietmann A, Millonig A, Combes V, Couraud PO, Kachlany SC, Grau GE. Effects of Aggregatibacter actinomycetemcomitans leukotoxin on endothelial cells. Microb Pathog. 2013; 61-62: 43-50. doi:10.1016/j.micpath.2013.05.001.

26. Valtonen VV. Role of infections in atherosclerosis. Am Heart J. 1999; 138 (5 Pt 2): 431-3.

27. Vt H, TM, TS, Nisha VA, AA. Dental considerations in pregnancy - a critical review on the oral care. J Clin Diagn Res. 2013; 7 (5): 948-53.

28. Offenbacher S, Katz V, Fertik G et al. Periodontal infection as a possible risk factor for preterm low birth weight. J Periodontol. 1996; 67 (10): 1103-13.

29. Soroye M, Ayanbadejo P, Savage K, Oluwole A. Association between periodontal disease and pregnancy outcomes. Odontostomatol Trop. 2015; 38 (152): 5-16.

30. Turton M, Africa CWJ. Further evidence for periodontal disease as a risk indicator for adverse pregnancy outcomes. Int Dent J. 2017; 67 (3): 148-56. doi:10.1111/idj.12274.

31. Govindaraju P, Venugopal S, Shivakumar MA, Sethuraman S, Ramaiah SK, Mukundan S. Maternal periodontal disease and preterm birth: A case-control study. J Indian Soc Periodontol. 2015; 19 (5): 512-5. doi:10.4103/0972-124X.164751.

32. American College of Obstretricians and Gynecologists. Oral health care during pregancy and through the lifespan. Committee Opinion No.569. Obstet Gynecol. 2013; 122: 417-22.

33. Reza Karimi M, Hamissi JH, Naeini SR, Karimi M. The Relation Between Maternal Periodontal Status and Preterm and Low Birth Weight Infants in Iran: A Case Control Study. Glob J Health Sci. 2015; 8 (5): 184-8. doi:10.5539/gjhs.v8n5p184.

34. Moore S, Ide M, Coward PY, Randhawa M, Borkowska E, Baylis R, Wilson RF. A prospective study to investigate the relationship between periodontal disease and adverse pregnancy outcome. Br Dent J. 2004; 197 (5): 251-8.

35. Jeffcoat MK, Geurs NC, Reddy MS, Cliver SP, Goldenberg RL, Hauth JC. Periodontal infection and preterm birth: results of a prospective study. J Am Dent Assoc. 2001; 132 (7): 875-80.

36. Offenbacher S, Jared HL, O'Reilly PG et al. Potential pathogenic mechanisms of periodontitis associated pregnancy complications. Ann Periodontol. 199; 3 (1): 233-50. doi:10.1902/annals.1998.3.1.233.

37. Silk H, DouglassAB; Douglass JM, Silk L. Oral health during pregnancy. Am Physician. 2008; 77: 1139-44.

38. Mardešić D, Benjak V. Nedonošče. In: Mardešić D i sur, editors. Pedijatrija. osmo prerađeno i dopunjeno izdanje. Zagreb: Školska knjiga. 2016; 389-90.

39. Crispi F, Bijnens B, Figueras F et al. Fetal growth restriction results in remodeled and less efficient hearts in children. Circulation. 2010; 121 (22): 2427-36. doi:10.1161CIRCULATIONAHA.110.937995.

40. Barker DJ. Human growth and cardiovascular disease. Nestle Nutr Work-shop Ser Pediatr program. 2008; 61: 21-38.

Summary

A NEW POTENTIAL RISK FACTOR FOR PREMATURITY AND CARDIOVASCULAR DISEASES IN CHILDREN

Senka Mesihović-Dinarević, Lutvo Sporišević, Berislav Topić, Vjekoslav Krželj, Sanja Jurišić, Grit Kirsten-Sarić, Senad Sarić, Anes Jogunčić, Samir Prohić, Aida Ramić

Periodontal disease is a chronic inflammatory, immune mediated, high-frequency disease associated with atherosclerotic cardiovascular disease and many systemic diseases. If the periodontal disease is not detected promptly, or inadequately treated, can lead to the formation of atherosclerotic lesions and the clinical expression of atherosclerotic cardiovascular disease. Insufficient insight into the possible pathologic implications of the oral health status in pregnant women for the development of atherosclerosis and premature birth, initiated an international scientific research Project, which is being implemented in Bosnia and Herzegovina, Croatia and Germany in the period 2017-2019/2020, entitled "The impact of oral health of pregnant women on the cardiovascular health of children". The purpose of the Project is to evaluate the relationship of oral health and cardiovascular health and general health, with reference to the possible occurrence of premature birth and the birth of children of low birth weight. The research will determine whether the maternity periodontal disease is a possible new risk factor for premature cardiovascular disease in children. It also wants to highlight the importance of proper oral hygiene and regular dental examinations of pregnant women in preventing or reducing the incidence of maternity periodontal disease and the impact on pregnancy complications and possible premature cardiovascular risk.

Descriptors: RISK, ATHEROSCLEROSIS, PREMATURITY

Primljeno/Received: 22. 2. 2019.
Prihvaćeno/Accepted: 20. 3. 2019.

SCIENTIFIC FEDERATION
ABODE FOR RESEARCHERS

3rd International Conference on
Women Health and Breast Cancer
May 30-31, 2019 at Nice, France

The Oral Health of Pregnant Women as a New Potential Risk Factor for Prematurity and Cardiovascular Diseases in Children

Senka Mesihovic-Dinarevic*, Lutvo Sporisevic, Berislav Topic, Sanja Jurisic, Senad Saric, Grit Kristen Saric, Vjekoslav Krzelj, Anes Joguncic, Samir Prohic and Aida Ramic
Policlinic Eurofarm, Bosnia and Herzegovina

Pregnancy is a state in which complex physical and physiological changes are present, these have important effects on multiple organ systems. Some authors pointed out the possible connection between periodontal disease in pregnant women with the risk of preterm delivery, newborns of a low gestational age with low birth masses and possible cardiovascular disease. Cardiordiovascular disease atherosclerosis is now one of the leading causes of death in developed countries, it begins in childhood, and goes a long time without manifesting symptoms, increasing with age, it begins to seriously threaten health. Insufficient insight into the possible pathological implications of the oral health status of pregnant women with the premature expression of cardiovascular risk factors in children, initiated this research. The aim of the study is to investigate more prominent predictors of early cardiovascular risk factors: increased body mass index, high values of blood pressure and the thickening of the intima-media carotids complex in comparison to children whose mothers had good oral health during pregnancy. Regular dental therapy/care can decrease the frequency of the occurrence of caries and periodontal disease in pregnant women, the frequency of prematurity and low birth weight with all it's potential complications, decreasing the financial costs of neonatal intensive care management and the cardiovascular repercussions on newborn's health. Primary prevention of atherosclerosis should begin as early as possible, during pregnancy, in childhood, creating a healthy way of life, which will be able to prevent or at least slow the development of atherosclerosis.

Biography

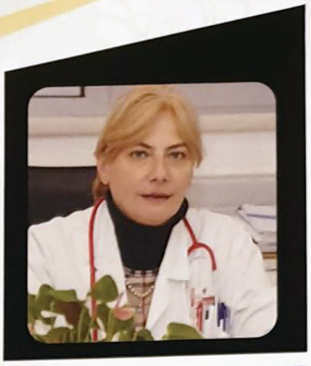
Senka Mesihović-Dinarević paediatric cardiologist: Faculty of Medicine, University of Sarajevo 1982. 1982-2016. Paediatric Clinic. PhD 1991, 1992-1996: Royal Brompton Hospital London. Professor of Paediatrics 2006.1994. AEPC, 1995. BPCA.1995-2011: Lecturer London MRCP; 2014. Director of Discipline for health protection of women and children. Consultant: RCPCH 1997. 2003-2016. Director of Paediatric Clinic Sarajevo.2000 FESC, 2008. Full Member of Academy of Sciences and Arts of Bosnia and Herzegovina, Honorary Doctorate of Letters in Cambridge: 2014. 2016.Member of the European Academy of Science and Arts; 2017. Full Professor University for Peace-United Nations, over 498 papers, cited 218 times in the ICI Web of Science.

EuroSciCon

Senka Mesihovic Dinarevic et al., Arch Med 2019, Volume: 11
DOI: 10.36648/1989-5216-C3-013

Senka Mesihovic Dinarevic, Anes Joguncic Grit Kristen Saric, Liana Cambj Sapunar, Davor Petrovic, Berislav Topic, Vjekoslav Krzelj, Sanja Jurisic Senad Saric, Lutvo Sporisevic, Samir Prohic and Aida Ramic

University of Mostar, Bosnia and Herzegovina



Joint Event on
Nursing Diagnosis, Parasitology & Pediatric Cardiology
December 05-06, 2019, Florence, Italy

THE INFLUENCE OF MOTHER'S NUTRITION AND ORAL HEALTH ON THE CHILD'S BLOOD VESSEL DEVELOPMENT

Introduction: The correlation of oral health and cardiovascular diseases has been evaluated in the past, but not the influence of mother's nutrition, its oral health on cardiovascular foetal system development, which can lead to a slower foetus development, lower birth weight, as well as differences in blood vessels development.

Aim: The aim of our study was to evaluate the relationship between oral health of mothers, dietary habits during pregnancy with the development of the coronary and carotid arteries.

Patients & Methods: The study included 40 pregnant women and their newborns. During pregnancy the dental mother's status and eating habits were analysed. After delivery a detailed colour Doppler echocardiography including carotid vessels has been performed.

Results: There was a significant correlation of LVEDs and mothers eating habits (rho = -0.415, p = 0.044), whereby a better value LVEDs determined in infants whose mothers had worse eating habits. Carotid Intima Media had moderate connection with nutrition intake on both of the carotids, whereby the thicker intima had a pregnant woman with poor eating habits (rho = -0.492, p = 0.03). Fortified is a significant correlation between the diameter of the right coronary artery and the KEP index, where the pregnant woman had better diameters with the smaller blood KEP Index (rho = -0.693, p = 0.047). Diameter of descending aorta had a significant association with the dietary habits, and larger diameters defined in the infants, whose mothers had worse eating habits (rho = -0.508, p = 0.011). Ejection fraction (FC) has a significant correlation with the KEP index values (rho = 0.507, p = 0.014). In mothers with KEP index <10, FS had significant lower values (p = 0,002).

Conclusion: There was a significant connection between diet and oral health status of mothers with some segments of the development of cardiovascular system in infants. It is necessary to extend the study and test inference on a larger sample.

Biography

Senka Mesihovic Dinarevic, Bosnia and Herzegovina: Faculty of Medicine, University of Sarajevo 1982. 1982-2016: Paediatric Clinic-University Clinical Centre /UCC/ Sarajevo. MSc 1985, paediatrician age 30, subspecialty in paediatric cardiology: Sarajevo, Belgrade, London: has completed his PhD from Royal Brompton Hospital London/Imperial College in 1991, 1992-1996.She is a Research fellow and Professor of Paediatrics since 2006 at Faculty of Medicine, University of Sarajevo. 1994: She is a Member of AEPC, 1995: BPCA 1995-2011, Lecturer: London MRCP, 2014: She is the Director of Discipline for health protection of women and children including Ginecology-Obstretics Clinic of UCC Sarajevo. She is a Consultant Paediatric Cardiologist at Royal College of Paediatrics and Child Health (RCPCH) 1997 2003-2016: Director of Paediatric Clinic, UCC Sarajevo.2000 FESC, 2008: She is a Full Member of Academy of Sciences and Arts of Bosnia and Herzegovina, since 2009: She is also the Chairman of the Committee of Cardiovascular pathology Academy of Sciences and Arts of Bosnia and Herzegovina; Honorary Doctorate of Letters in Cambridge, England 2014- 2016. He is also a Member of the European Academy of Science and Arts since 2017. He is a Full Professor at the European Center for Peace and Development of the University for Peace established by the United Nations. He has published over 498 papers, cited 218 times in the ICI Web of Science.

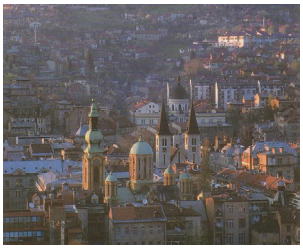
dsenka@bih.net.ba

26th International International Conference on Pediatric Cardiology and Congenital Heart Disease

The influence of mother's nutrition and oral health on the child's blood vessel development

Acc.Prof.dr.med.sci. Senka Mesihović-Dinarević

Florence, Italy, 2nd December 2019.



The influence of mother's nutrition and oral health on the child's blood vessel development

Senka Mesihović-Dinarević*, *Anes Jogunčić Grit Kristen Sarić, Liana Cambj-Sapunar, Davor Petrovic, Berislav Topić, Vjekoslav Krželj, Sanja Jurišić, Senad Saric, Lutvo Sporišević, Samir Prohic, Aida Ramić*

Committee for Cardiovascular Pathology, Academy of Sciences and Arts Sarajevo, Policlinic Eurofarm Sarajevo, Bosnia and Herzegovina

Introduction

The correlation of **oral health and cardiovascular diseases** has been evaluated in the past, but not the influence of mother's nutrition, its oral health on cardiovascular **foetal system development**, which can lead to

- a slower foetus development,
- lower birth weight,
- as well as differences in blood vessels development.

Pregnancy is a state in which complex physical and physiological changes are present, these have important effects on multiple organ systems.

Some authors pointed out the **possible connection** between **periodontal disease in pregnant women** with

- the risk of preterm delivery,
- newborns of a low gestational age with low birth masses and
- possible cardiovascular disease.

The aim of our study

- is to evaluate **the relationship** between
- oral health of mothers,
- dietary habits during pregnancy with
- the development of the coronary and carotid arteries, the cardiovascular system.

Topics:

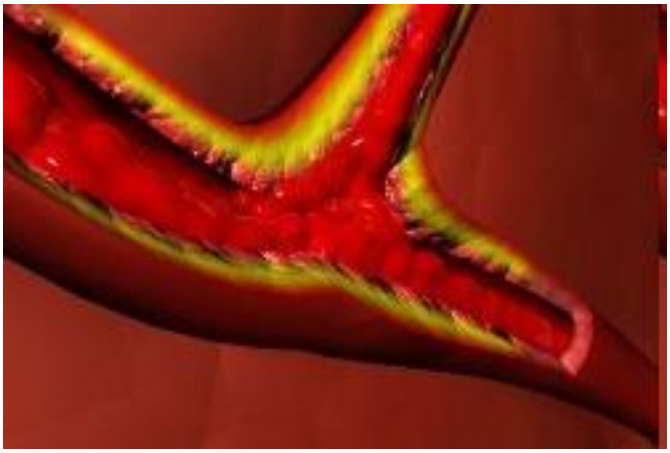
- Atherosclerosis
- Risk factors
- Oral health
- Pregnancy
- Prematurity
- Research data
- Conclusiones

Topic:

Atherosclerosis

Cardiordiovascular disease Atherosclerosis is now one of **the leading causes of death in developed countries,** it begins in childhood, and goes a long time without manifesting symptoms, increasing with age, it begins to seriously threaten health.

Atherosclerosis /the most frequent disease of the arteries/ is characterized by lumen reduction of blood vessels due to local thickening of internal blood vessels caused by **plaque /atheroma.**



As a cardiovascular disease, atherosclerosis is **an interdisciplinary problem, multifactorial in its etiopathogenesis, course and repercussions,**
demands **the action of:**

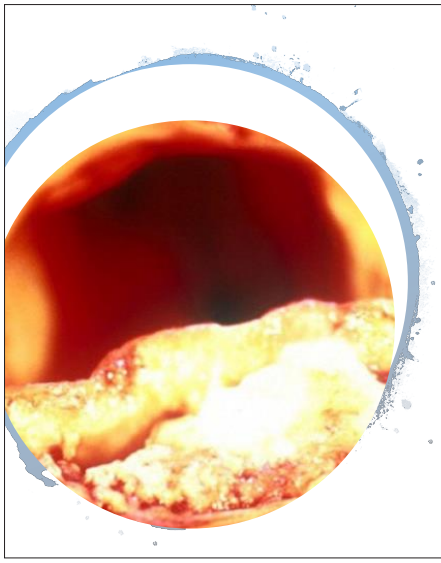
- family doctors,
- physicians,
- paediatricians,
- cardiologist,
- paediatric cardiologist,
- neurologist,

- diabetologist,
- endocrinologist,
- cardiac and vascular surgeons,
- neurosurgeon,
- radiologist,
- specialist of nuclear medicine,
- epidemiologist,
- nutricionist,
- pathologist,
- biochemist.

with the aim of **early detection and treatment of atheroscelrosis** as well as the reduction of development of risk factors for coronary artery diseases**.**

- **Pathophysiology** of the disease is to damage cells that line the inner surface of the arteries that endothelium due to chemical or mechanical damage.
- Elevated blood cholesterol, smoking, or elevated homocysteine (now one of the more investigated the causes of atherosclerosis) are examples of **chemical damage** and
- **mechanical damage** to the cells are: **high blood pressure, damage of the catheter during diagnostic procedures or even infections.**

- As **the first stage of development of atherosclerosis** occurs **"fatty streak."**
- It is totally reversible, which means that the cessation of the activities of harmful pathogens, endothelial cells recover completely.
- However, **if exposure to adverse event continues**, atherosclerotic plaque grows and more narrow lumen.
- Consequently, **reducing blood flow and tissue oxygen supply becomes insufficient.**



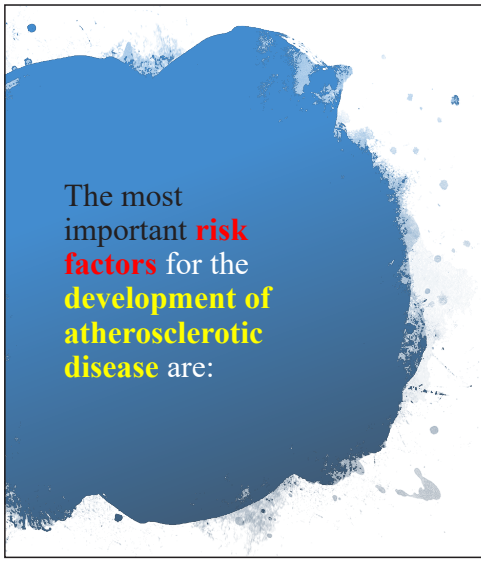
- **In the blood vessel** itself due to reduced elasticity, an increase of blood pressure occurs.
- **Elevated blood pressure** can lead to: cracking in blood of the court or its stratification with the formation of aneurysm or plaque, which can calcify and slim down the wall of the vessel with the ability of forming a clot.
- For atherosclerotic disease itself **plaque composition** rather than its size is much more important.

- Early precursors of vascular changes – **subclinical atherosclerosis** – warrant special attention as this process can be stabilized or even reversed if treated in time.

- Sonographic Intima Media Thickness measurement of the carotid artery (**cIMT: carotid Intima-Media-Thickness**) is considered **a valid surrogate marker** for **cardiovascular risk** allowing assessment of atherosclerotic changes at a very early stage.

Topic:

Risk factors



- hyperlipidemia,
- hypertension,
- smoking,
- diabetes, high fibrinogen, a male sex at younger and middle age,
- menopause in women taking oral contraceptives or hormone replacement therapy only with presence of other risk factors,
- excessive weight, increased level of homocysteine,
- physical inactivity, heredity and immune response in some diseases.

- **The primary intention of prevention** is to **preclude the occurrence of risk factors** for atherosclerosis.
- **The secondary** is **to prevent the development or aggravation of the illness** along with **the reduction or control of existing risks.**
- **Primary prevention should begin as early as possible**, during pregnancy, in childhood, creating a healthy diet, eliminating smoking, regular physical activity, which will prevent or at least slow the development of atherosclerosis.

The consequences of atherosclerosis are:

- **coronary or ischemic heart disease,**
- **myocardial infarction,**
- **cerebrovascular disease and cerebrovascular accident (80% of all heart attacks and brain due to atherosclerosis),**
- **narrowing or blockage of peripheral arteries, carotid arteries,**
- **particularly the legs, which can lead even to the development of gangrene**

Since
there is no specific cure for atherosclerosis,
the best way to prevent this disease,
is prevention!

Therefore,
it is necessary to establish
a dialogue in cardiovascular medicine!

Topic:

Oral health

The association of oral health with atherosclerotic cardiovascular diseases

- **Oral diseases** are among **the most common chronic non-communicable diseases during the entire life.**
- **Oral health** is **a key indicator of well-being and quality of life,** and is closely connected with **the general health.**

- The non-diagnosed and treated periodontal disease **becomes a chronic inflammatory, immune-mediated disease** characterized by deterioration of the periodontal ligament and associated alveolar bone.
- **Correlation between oral diseases and general health is complex** and **multifaceted.**

The largest number of oral diseases share **common risk factors**, **including unhealthy diet high in sugar, tobacco smoking and excessive alcohol consumption, with cardiovascular disease, malignant tumors, chronic diseases of the respiratory system and diabetes mellitus**.

The oral cavity is an integral part of the human organism and therefore there exists a great connection between oral health and systemic health. Not only do some systemic diseases such as

- diabetes,
- osteoporosis,
- HIV infection,
- trisomy 21

have a predisposition for periodontitis but an opposite applies.

Susceptibility to certain systemic disease is **higher in patients with periodontitis than in healthy people:**

- chronic periodontitis is a risk factor **for future cardiovascular disease**,
- pregnant women with chronic periodontitis have **more frequent preterm birth** and
- **newborns have a low birth weight**.

- The explanation for the **pathophysiological mechanisms** of paradont focus and systemic disease is associated with **elevated levels of circulating pro-inflammatory cytokines** and **prostaglandins** derived from:

- deseased parodont,
- gram negative bacteria and their endotoxin-like substances,
- that appear from subgingival biofilms immediately entering the bloodstream.

The dominant problems of everyday dental practice are: **caries, periodontal disease, occlusal abnormalities**, the relationship of oral and general health and a holistic approach to the patient.

Caries and periodontal disease are of an **infectious etiology** therefore the prevention of dental caries and periodontal disease means **preventing odontogenic focuses.**

A Periodontal pocket is a risk factor for **the development or worsening of systemic - focal disease,** because **the infection is always present in it;** a pocket flora is various, massive, virulent and penetrates the soft wall of the **pocket**, the pocket is under **constant mechanical stimulation** during **chewing, swallowing and speech**, all of which **favor the penetration of bacteria** into circulation and **the formation of transient bacteremia**.

Interdisciplinary cooperation in the elimination of potential negative effects of periodontal infections **will result in better systemic health.**

Dental caries and periodontal disease are **the most common and significant oral disease,** they can cause and aggravate numerous other disease:

- of the cardiovascular system (infective endocarditis, atherosclerosis, myocarditis and myocardial infarction),
- of the respiratory system (pneumonia, chronic obstructive pulmonary disease, bronchial asthma and pulmonary abscess),
- neurological disorders (cerebral infarction and cerebral abscess),
- diabetes mellitus, rheumatoid arthritis,
- Alzheimer's disease,
- complications of pregnancy (preeclampsia, stillbirth, miscarriage),
- preterm births and low birth weight, osteoporosis.

Topic:

Pregnancy

- **Pregnancy** is a state in which there are complex physical and physiological changes, which have important effects on multiple systems of organs. High levels of circulating **estrogen** during pregnancy are associated with high incidence of gingivitis and gingival hyperplasia or certain forms of periodontal disease. It is believed that approximately **40% of pregnant women** have a certain form of **periodontal disease**.

- Offenbacher et al. (1996) first suggested a possible **link** between **periodontal disease and risks for child delivery of a low gestational age or small birth weight.** Many researchers suggest a possible link between periodontal disease in pregnant women with a risk for preterm delivery, respectivelly, the birth of babies with low birth weight.
- Researches show that in **pregnant women** with periodontal disease there is a **2-7 times higher risk for prematurity**.

- That is why dentists need **to motivate, educate and instruct** pregnant women towards **a higher level of oral hygiene** and to repair all dento-oral lesions in dental therapeutic procedures, especially **periodontal pockets,** thereby reducing the number of premature births.

It is considered that **in the development of periodontal disease a hereditary risk factors** could have the importance.

Scientists believe that **DNA sequence variations** have an effect on the individual risk for the development of periodontal disease because they have found that **due to the variation of gene sequences,** the activity of alpha defensins /antimicrobial peptides present in neutrophil granulocytes/ which is responsible for the destructionof periodontopathogenic bacteria, could be disabled.

Munz et al. have **discovered the genetic loci** associated with **susceptibility for chronic and aggressive parodont disease** where due **to disorders in congenital and acquired immunity** leads to development of periodontal disease.

Topic:

Prematurity

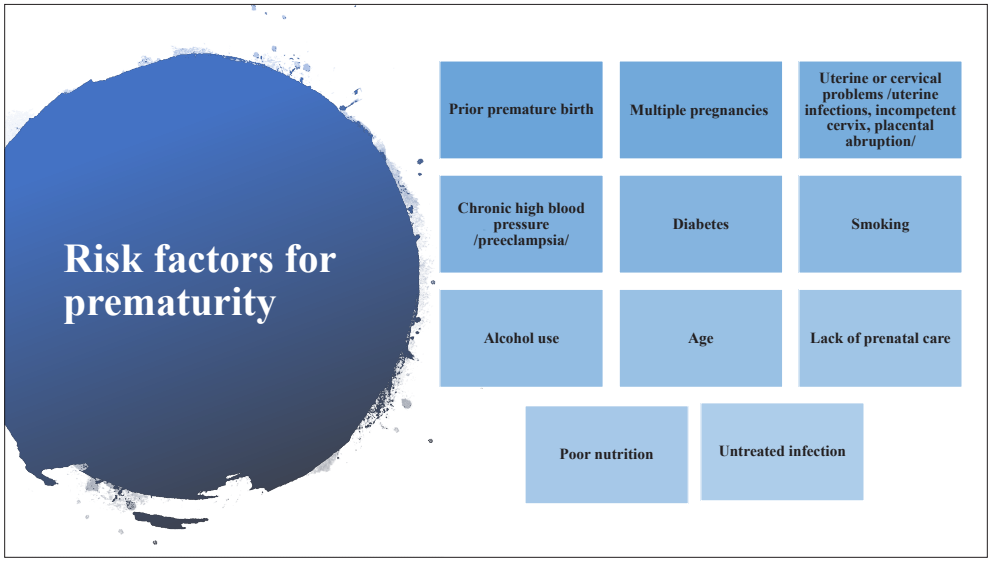
The incidence of births of premature infants and newborns of a small birth weight is between **5-18%**, depending on the geographical area and population characteristics.

The causes of preterm birth in more than **50%** of cases are not known, and as **possible causes**, among other things, are cited:

- a socioeconomic factors,
- acute and chronic diseases of mothers,
- multiple pregnancy,
- obstetrical causes,
- hereditary diseases and
- placental causes.

- It is important **to identify possible risk factors for preterm birth and birth of children of low birth weight** because in that way **is possible to significantly reduce the incidence of premature birth and the birth of children of low birth weight**, which **decrease the rate of perinatal mortality and possible perinatal complications.**

- Preterm children and infants of low birth weight have **a higher incidence of risk factors for cardiovascular disease** vs. term infants and children of desirable birth weight.



It was established that the mothers who had given birth to premature infants or children of a small birth weight had **significantly elevated levels of PGE2 in the gingival fluid** opposed to the mothers who had given birth to children in the dedicated time or children with an appropriate birth weight.

During pregnancy, there is **an increased susceptibility to caries** due to:

- **the increased acidity of the oral cavity,**
- **the increased consumption of refined sugars and**
- **poor oral hygiene**.

- **Caries bacteria in children** are usually transmitted by direct transmission through the mother's saliva.
- **Mothers** with **high titers of Streptococcus mutans** in their saliva are going to substantially transmit the bacteria to their baby – by **vertical transmission,** creating conditions for early childhood caries.

- Of course, **the time and frequency of the transmission of bacteria, the childs preference for the accumulation of bacteria on it's teeth, the composition and flow of the childs saliva, the amount of refined sugar in the babies food**, are all **significant predictors of early children's caries.**

Due to **the immaturity of their organ systems**, premature babies and infants of a small birth weight are **among in vulnerable group of infants - complications due to prematurity are the leading cause of death in children under 5 years of age**.

- **Preterm children** or **infants of a small birth weight** exhibit a **higher incidence of cardiovascular risk factors (obesity, hypertension, dyslipidemia), and type 2 diabetes mellitus**.

- ***Animal and epidemiological studies*** indicate that conditions of **elevated levels of glucocorticoids intrauterine** during life, **programme the** hypothalamus-pituitary-adrenal gland axis that plays a **key role** in **the higher incidence** of cardiovascular risk in premature infants and children of a small birth weight.

- Apart from **the role of microbiome mouth** (microbiome - all microbes, their genome and mutual interaction in a particular environment) as a **risk factor** for premature delivery or the birth of newborn of small birth weight, it is possible that the **microorganisms of the oral cavity** condition chronic inflammation that can represent an **atherosclerotic cardiovascular risk factor**.

- **Adequate prenatal care** should include **oral health care of pregnant women,** ie. for pregnant women, there is a need to point out the **importance of practicing regular oral hygiene and the need for periodic or as many as or as frequently as needed dental checkups. Any dental intervention or dental radiography** is most appropriate to be undergone in a dental practice **upon the completion of organogenesis,** ie. in **II or III trimester of pregnancy.**

A significant number of pregnant women maintain inappropriate oral health.

- Insufficient visits to the dentist,
- inappropriate oral hygiene and
- the consumption of unhealthy food,

all affect the appearance of **caries as well as parodontal disease** in pregnant women.

- **The sufficient screening/screening of oral health status of pregnant women is not carried out in daily work**, so with screening status of oral health in a greater number of pregnant women, including the assessment of oral hygiene, we would be able to timely identify pregnant women who have **dental caries** respectively **periodontal disease.**
- With **timely dental treatment** we could **reduce** the incidence of dental caries and periodontal disease in pregnant women, and **may reduce** the incidence of preterm delivery and the birth of newborns of a small birth weight, an early childhood caries and predictors of early atherosclerotic cardiovascular risk (**increased body mass index, blood pressure and thickening of the carotid intima-media complex**).

In a cohort of children, who are **preterm or have a low birth weight**,

- a certain number of children age 3 have a greater body mass index,
- a higher value of systolic and diastolic blood pressure, as well as
- a thickening of the intima-media complex of the carotid artery with
- incipient signs of cardiovascular system disease.

Insufficient insight into the possible pathological implications of the oral health status of pregnant women, their eating habits with the premature expression of cardiovascular risk factors in children, initiated this research.

Topic:

Research data

PROJECT

- "Cardiovascular Disease and Oral Health - The impact of oral health of pregnant women on the cardiovascular health of children" a **Project** that is run by the Committee of the Cardiovascular Disease Department of Medical Sciences ASA of Bosnia and Herzegovina, during 2017, the first phase of research was completed according to plan /12 months / as well as second phase /2017-2019/.

- In this study **43 pregnant women from Bosnia and Herzegovina and Croatia** were included, with a plan to also include pregnant women from Slovenia.

An assessment of

THE GENERAL HEALTH OF THE PREGNANT WOMAN

THEIR LIFE HABITS AND

THEIR ORAL HEALTH /FILLING OUT A QUESTION FORM FOR THE FUTURE MOTHERS AND THE DENTAL QUESTIONNAIRES FOR DENTISTS/

AS WELL AS FORMING A DATA BASE IN MS ACCESS/MS OFFICE

The Project's common goals are to give answers to:

- Does and in what capacity **the oral health of pregnant women influence pregnancy ?**
- **Does insufficient oral health of pregnant women** (periodontal disease and certain forms of caries) **influence gestational age, birth mass of children or oral and cardiovascular health** of newborn's, infants and small children?
- **Is chronic inflammation of the oral cavity** (periodontal disease and caries) in pregnant women **a atherosclerotic and cardiovascular risk factor**, that is; do preschool children whose mothers during pregnancy had periodontal disease and/or caries, have a more prominent predictor of early cardiovascular risk (increased body mass index, high value of blood pressure and thickening of intima–media carotids complex) in comparison to children whose mothers during pregnancy had good oral health ?

To achieve these goals, we are conducting **the research that can** last up to 48 months, using a multidisciplinary approach which includes:

- a gynaecologist,
- a dentist,
- a paediatrician,
- a radiologist,
- a cardiologist,
- nutritionists,
- epidemiologists and
- statistics

These examinations integrated research from 3 respected centres in B&H and Croatia using combined experience and skills.

The aim of this research is to investigate **more prominent predictors of early cardiovascular risk**

- increased body mass index,
- high values of blood pressure and
- the thickening of the intima-media carotids complex

in **comparison** to children whose mothers had good oral health during pregnancy.

These are the results of **the First and Second phase of the Project** within the Southeastern European region: „Cardiovascular disease and Oral health - the influence of pregnant women's oral health on children's cardiovascular health" conducted in: **Sarajevo, Mostar, Split.**

The plan is to the finish project:

- 2020 III phase.

Respondents

- The survey is designed **as a kohorn study**: include **mothers /pregnant women** selected by random selection (randomized sampling).

- **During regular gynecological and obstetric-examination** (being I trimester, if necessary, II and III trimester of gestation) a **suggestion was given** to pregnant women **to do their dental examination in order** to assess their **oral health status.**

- The **general health status** of the **pregnant women** was detemined on the basis of an assesment of their **medical records**.

The research **did not include:**

- pregnant women with cardiovascular diseases,
- diabetes mellitus,
- kidney disease or any chronic illnesses.

The survey testing assesses the **habits of pregnant women:**

- eating habits,
- physical activity,
- alcohol consumption,
- drugs and smoking.

II phase:

The children were evaluated

- as newborns,
- preterm infants,
- newborns of a desirable body weight and
- newborn of a small birth weight,

they would be followed up to **their third or fourth year of life.**

During the systematic review (the first month of life, the first year, the third and fourth year of life) **pediatricians** evaluate:

- the basic characteristics related to pregnancy and childbirth,
- analysis of the eating habits of children,
- anthropometric parameters,
- determine blood pressure values and
- while radiologists determine the value of complex intima-media carotid artery
- a cardiologist by echocardography evaluate the hemodynamic status of the respondents.

- **The study included children of proper health conditions**, ie. children with congenital anomalies or certain chronic illnesses were excluded from the study.
- **Dentists** judged **the status of dental health of pregnant women and children,** and **evaluate the appropriateness of the oral health of pregnant women and children.**
- The research is based on the principles of the Helsinki Declaration from 1975 and its amendments in 2008.

In order to implement the principles of ethical and bioethical research a consent / approval of **the appropriate ethics committees / commissions** was obtained.

Voluntary inclusion of pregnant women and children is confirmed by **signing an informed consent form.**

Research Methods

After **signing the informed consent form** ie. informing mothers /pregnant women, by research methodology the following tetsts are conducted **/I phase/** :

- survey testing

- dental examination.

In II phase the following examination of **Children** was performed:

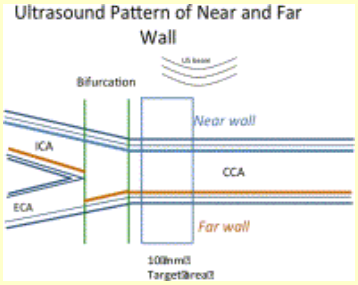
- survey testing,

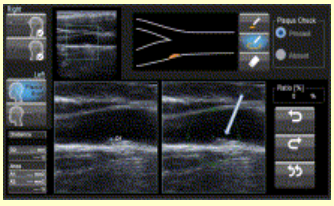
- anthropometric measurements,

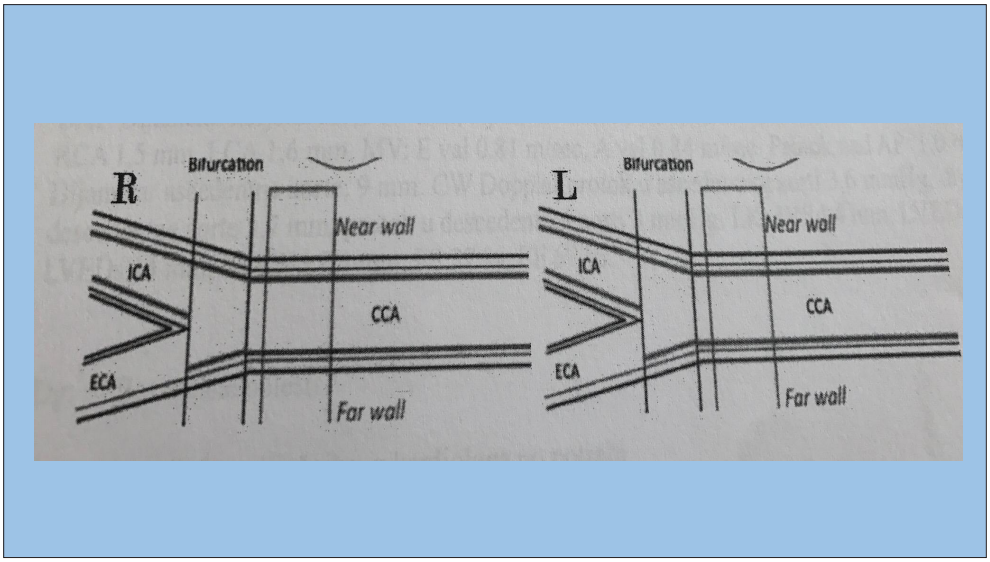
- determination of blood pressure,

- dental examination,

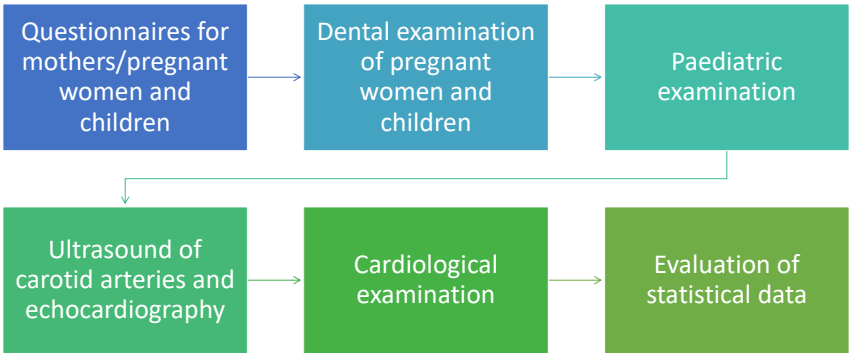
- determination of thickness of intima-media complex of the carotid blood vessels by two-dimensional Color Doppler ultrasonography,
- two-dimensional Color Doppler echocardiographic evaluation of the cardiovascular system.





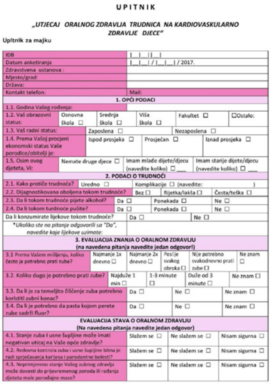

R
Bifurcation
Near wall
ICA
CCA
ECA
Far wall
L
Bifurcation
Near wall
ICA
CCA
ECA
Far wall

Methods


Questionnaires for mothers/pregnant women and children
Dental examination of pregnant women and children
Paediatric examination
Ultrasound of carotid arteries and echocardiography
Cardiological examination
Evaluation of statistical data

Survey sheets were originally designed, they include questions about their habits in food intake (frequency, quantity and types) and fluids, and the frequency and intensity of physical activity.

Questionary for mothers:


UPITNIK

„UTJECAJ ORALNOG ZDRAVLJA TRUDNICA NA KARDIOVASKULARNO ZDRAVLJE DJECE"

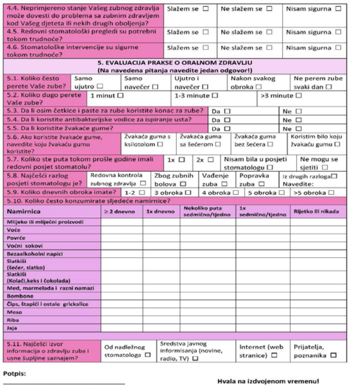
Upitnik za majku

1. OPĆI PODACI

2. PODACI O TRUDNOĆI

3. EVALUACIJA ZNANJA O ORALNOM ZDRAVLJU

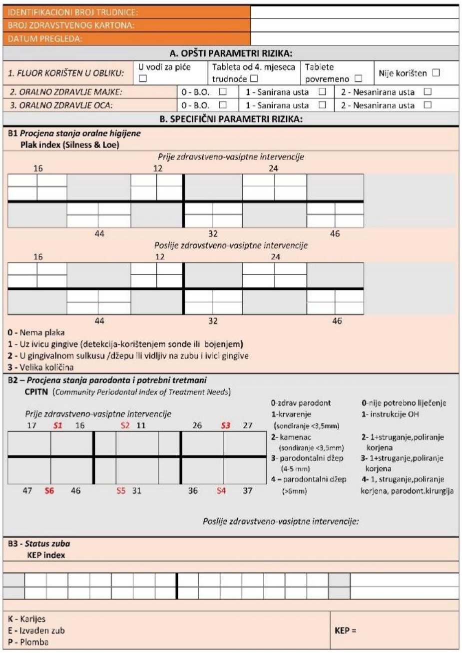
EVALUACIJA STAVA O ORALNOM ZDRAVLJU


5. EVALUACIJA PRAKSE O ORALNOM ZDRAVLJU

Potpis:

Hvala na izdvojenom vremenu!

Questionary of dental status in mothers:


IDENTIFIKACIONI BROJ TRUDNICE:

BROJ ZDRAVSTVENOG KARTONA:

DATUM PREGLEDA:

A. OPŠTI PARAMETRI RIZIKA:

1. FLUOR KORIŠTEN U OBLIKU:	U vodi za piće ☐	Tableta od 4. mjeseca trudnoće ☐	Tablete povremeno ☐	Nije korišten ☐
2. ORALNO ZDRAVLJE MAJKE:	0 - B.O. ☐	1 - Sanirana usta ☐	2 - Nesanirana usta ☐	
3. ORALNO ZDRAVLJE OCA:	0 - B.O. ☐	1 - Sanirana usta ☐	2 - Nesanirana usta ☐	

B. SPECIFIČNI PARAMETRI RIZIKA:

B1 Procjena stanja oralne higijene
Plak index (Silness & Loe)

Prije zdravstveno-vasiptne intervencije

16 12 24

44 32 46

Poslije zdravstveno-vasiptne intervencije

16 12 24

44 32 46

0 - Nema plaka
1 - Uz ivicu gingive (detekcija-korištenjem sonde ili bojenjem)
2 - U gingivalnom sulkusu /džepu ili vidljiv na zubu i ivici gingive
3 - Velika količina

B2 – Procjena stanja parodonta i potrebni tretmani
CPITN (Community Periodontal Index of Treatment Needs)

Prije zdravstveno-vasiptne intervencije

17 S1 16 S2 11 26 S3 27

47 S6 46 S5 31 36 S4 37

0-zdrav parodont
1-krvarenje
(sondiranje <3,5mm)
2- kamenac
(sondiranje <3,5mm)
3- parodontalni džep
(4-5 mm)
4 – parodontalni džep
(>6mm)

0-nije potrebno liječenje
1- instrukcije OH
2- 1+struganje,poliranje korjena
3- 1+struganje,poliranje korjena
4- 1, struganje,poliranje korjena, parodont.kirurgija

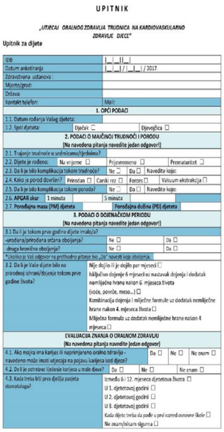
Poslije zdravstveno-vasiptne intervencije:

B3 - Status zuba
KEP index

K - Karijes
E - Izvađen zub
P - Plomba

KEP =

Childs Questionary:


UPITNIK

„UTJECAJ ORALNOG ZDRAVLJA TRUDNICA NA KARDIOVASKULARNO ZDRAVLJE DJECE"

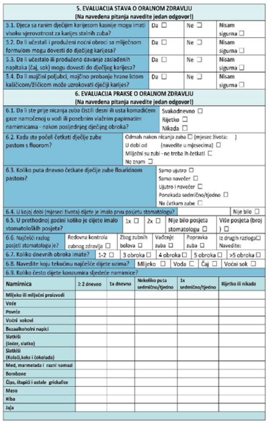
Upitnik za dijete

1. OPĆI PODACI

2. PODACI O MAJČINOJ TRUDNOĆI I PORODU

3. PODACI O DOJENAČKOM PERIODU

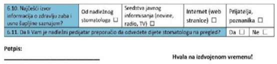
EVALUACIJA ZNANJA O ORALNOM ZDRAVLJU


5. EVALUACIJA STAVA O ORALNOM ZDRAVLJU

(Na navedena pitanja navedite jedan odgovor!)

6. EVALUACIJA PRAKSE O ORALNOM ZDRAVLJU

(Na navedena pitanja navedite jedan odgovor!)


Potpis:

Hvala na izdvojenom vremenu!

Anonymous Questionnaire for gynaecologists and dentists:

- As a dentist I avoid the application of local anaesthesia with adrenalin to pregnant women during all months of pregnancy?
- I avoid any kind of X raying pregnant women?
- In pregnancy the extraction of a tooth under pain is not recommended?
- I avoid therapy of gravidity gingivitis in pregnant women in all phases of pregnancy?
- Trepanation of teeth, the cause of acute dentogen infection, and incisions are not recommended in pregnant women?

The Study Workflow:

Pregnant women-gynecologist-dentist-radiologist- cardiologist-epidemiologist

Patients and methods:

The study included 43 pregnant women and their newborns /I phase/

During pregnancy the **dental mother's status and eating habits** were analysed

After delivery a detailed **colour Doppler echocardiography** including **carotid vessels** has been performed

Preliminary study data **I phase** /2017-2018/:

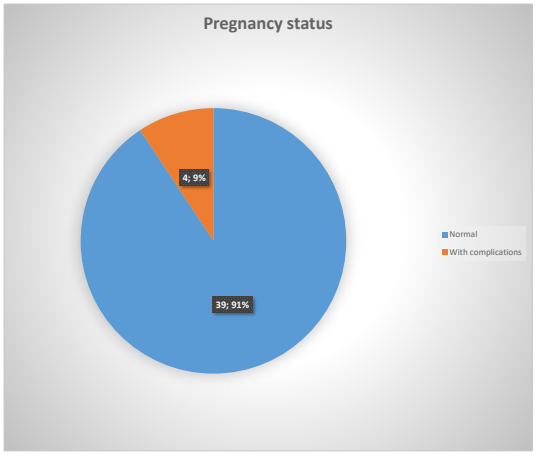
- mean age of 43 pregnant women is 30.7+/-5.7 years,
- 90.3% pregnancy ran properly,
- complication detected in 9,7%

Preliminary study data **II phase** /2018-2019/:
Included: **40 children** due to sufficinet obtained research data

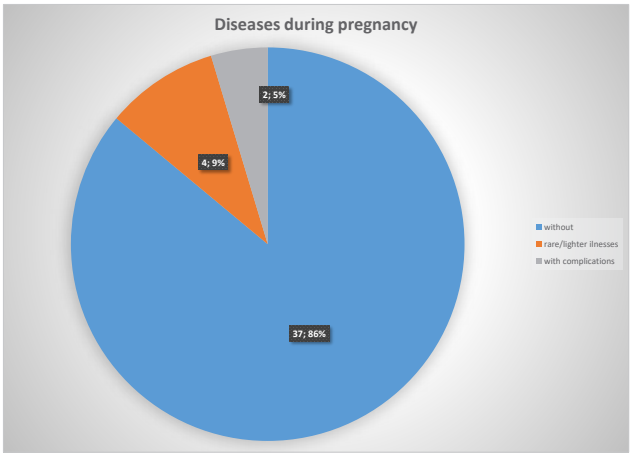
- Echocardiography
- Color Doppler of carotid arteries

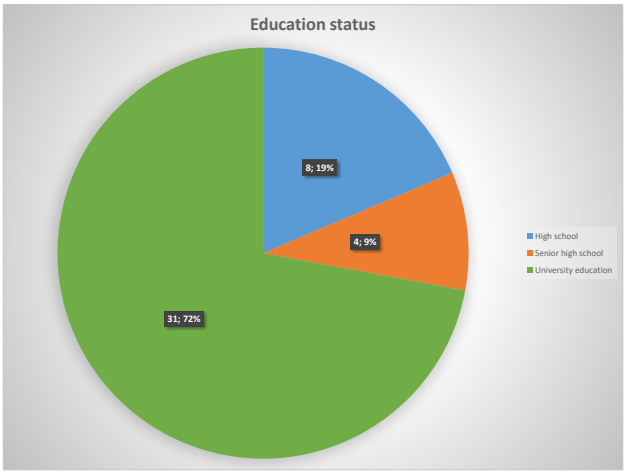
Table 1. Demographic characteristics

N	43
AGE	30,7 ±5,7
PREGNANCY STATUS	
NORMAL	39 (90,70%)
WITH COMPLICATIONS	4 (9,30%)
EDUCATION STATUS	
HIGH SCHOOL	8 (19,30%)
SENIOR HIGH SCHOOL	4 (9,70%)
UNIVERSITY EDUCATION	31(71,00%)
DISEASES DURING PREGNANCY	
WITHOUT	37 (87,1%)
RARE/LIGHTER ILNESSES	4 (9,7%)
WITH COMPLICATIONS	2 (3,2%)



• During pregnancy, **87.1%** mothers had no new disease diagnosed.



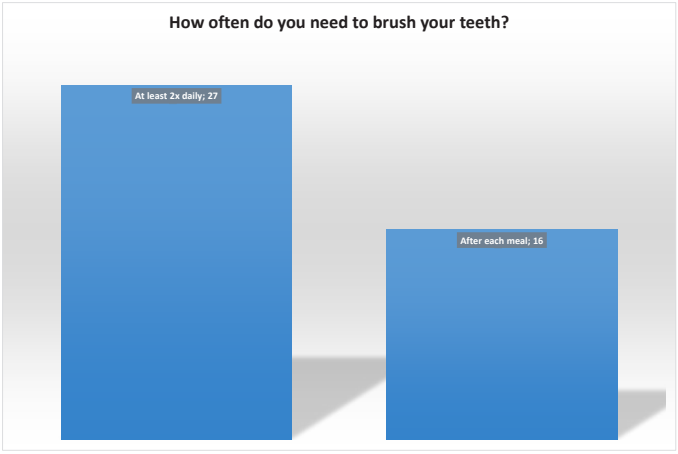


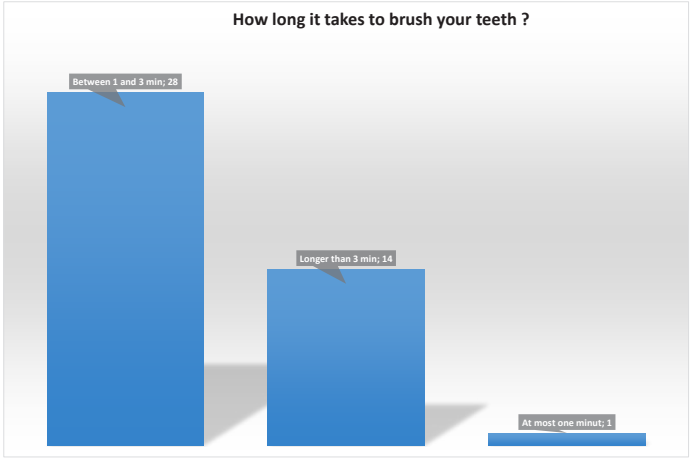
Eating habits

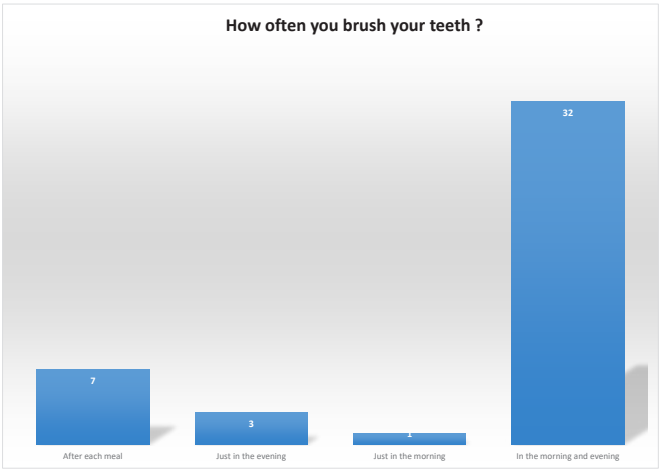
- dairy products 48.4% : daily,
- fruit 64.5% : two or more times per day,
- vegetables 22.6% : two or more times per day,
- meat 41.9% : daily; meat: in 45.2% few times during week
- fish in 35.2%: once a week; in 35.8% rarely or never

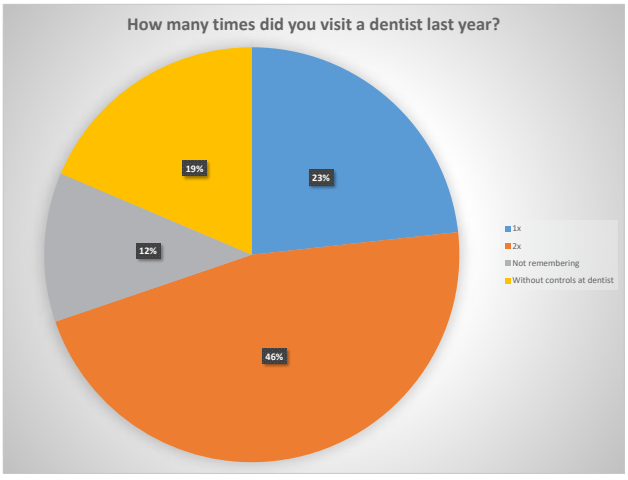
- Only 3.2% of women in pregnancy consumed **Alcohol** and 3.7% of respondents consumed **cigarettes**.

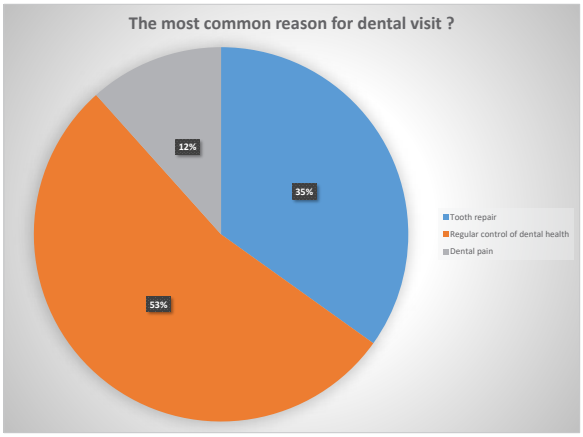
Assessment of oral hygiene


How often do you need to brush your teeth?
At least 2x daily; 27
After each meal; 16


How long it takes to brush your teeth ?
Between 1 and 3 min; 28
Longer than 3 min; 14
At most one minut; 1


How often you brush your teeth ?
7
3
1
32
After each meal
Just in the evening
Just in the morning
In the morning and evening


How many times did you visit a dentist last year?
23%
46%
12%
19%
1x
2x
Not remembering
Without controls at dentist



Dental status

KEP (Cavities/Tooth extraction/seal) index:12.32+/-5.7

plaque index 0.312

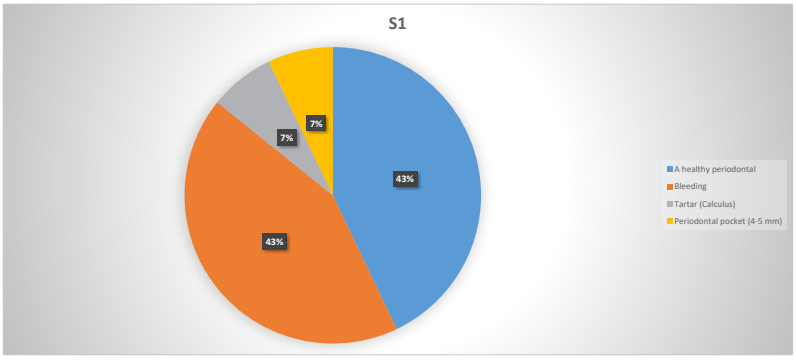
repaired teeth 65.62%;

non repaired teeth 12.5%

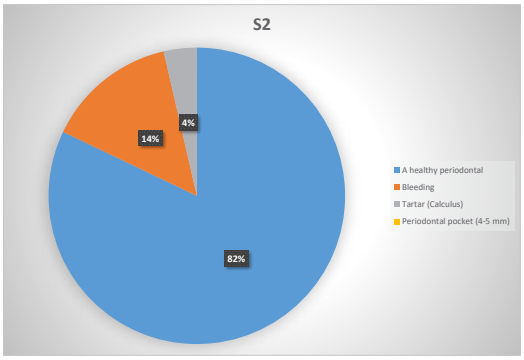
Table 2. Dental status

KEP Index	12,32±5,729		PLAQUE Index	0,3125±0,405		
	S1	S2	S3	S4	S5	S6
A healthy periodontal	42,9%	82,1%	39,3%	53,6%	71,4%	35,7%
Bleeding	42,9%	14,3%	46,4%	35,7%	25,0%	53,6%
Tartar (Calculus)	7,1%	3,6%	7,1%	7,1%	3,6%	10,7%
Periodontal pocket (4-5 mm)	7,1%		7,1%	3,6%		

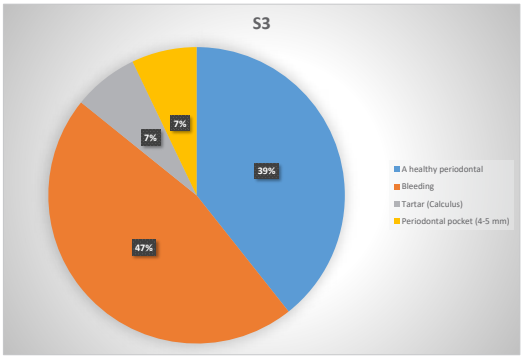
Dental status



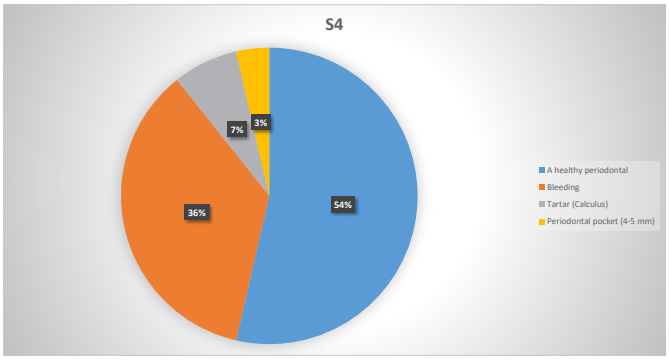
Dental status



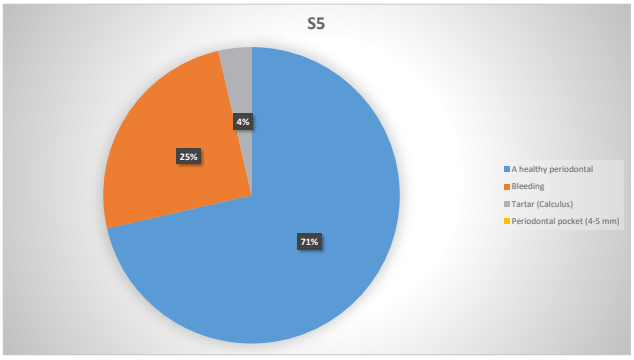
Dental status



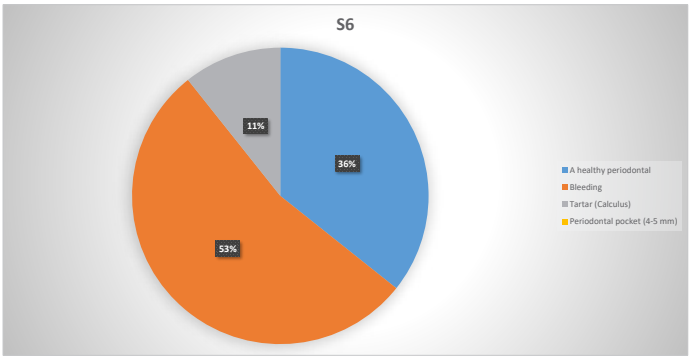
Dental status



Dental status



Dental status



Results of the Second phase

Table 3. Demographic characteristics of the newborns

Values are representing frequency with percentage for gender distribution. Months, Body weight on birth, body weight on the examination are represented with median and interquartile range.
From total number of 40 newborn babies 18 of them were males, and 22 of them were females. When we compare their age in months there isn't any significant difference. Body weigh on birth also didn't differ. Body weight on examination was pretty much similar.

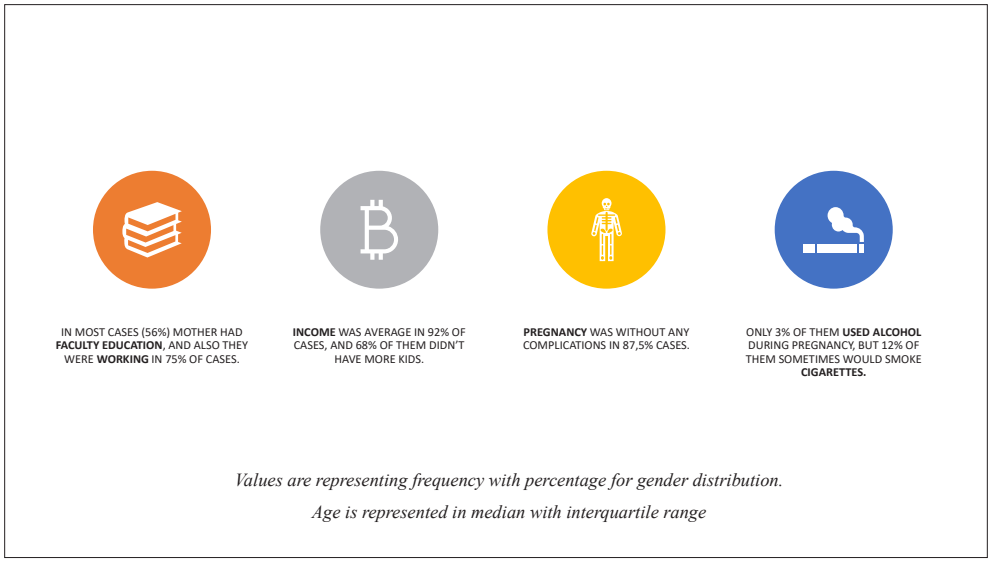
Sex	Male N=18 (45%)	Females N=22 (56%)
Months	4,25 (3,50 - 6,0)	4,0 (2,50 - 5,50)
Body weight on birth	3515 (3200 - 3850)	3425 (3170 - 3700)
Body weight on examination	7425 (6580 - 8700)	6730 (6100 - 8170)

There was a significant correlation of **LVEDs** and m**others eating habits** (rho = -0.415, p = 0.044), whereby a better value LVEDs determined in infants whose mothers had worse eating habits.

Carotid Intima Media had moderate connection with nutrition intake on both of the carotids, whereby **the thicker intima** had a pregnant woman with poor eating habits (rho = -0.492, p = 0.03).

Table 4. Demographic characteristics of mothers

Mother characteristics					
Age	25 (22-30)				
Education			Pregnancy status		
Faculty	22	56%	Normal	35	87,50%
High school	16	40%	With complications	3	7,50%
Collage	2	4,00%	No data	2	5,00%
Employment status			Alcohol during pregnancy		
Working	30	75%	Yes	1	3,00%
Unemployed	10	25%	No	39	97,00%
Economic status			Cigarette smoking		
Above average	3	8%	Yes	0	0%
Average	37	92%	Sometimes	5	12%
Other children			No	35	88%
Older and younger child	3	8%			
Younger child	2	4%			
Older child	8	20%			
No other kids	27	68%			


IN MOST CASES (56%) MOTHER HAD **FACULTY EDUCATION**, AND ALSO THEY WERE **WORKING** IN 75% OF CASES.
INCOME WAS AVERAGE IN 92% OF CASES, AND 68% OF THEM DIDN'T HAVE MORE KIDS.
PREGNANCY WAS WITHOUT ANY COMPLICATIONS IN 87,5% CASES.
ONLY 3% OF THEM **USED ALCOHOL** DURING PREGNANCY, BUT 12% OF THEM SOMETIMES WOULD SMOKE **CIGARETTES.**
Values are representing frequency with percentage for gender distribution.
Age is represented in median with interquartile range

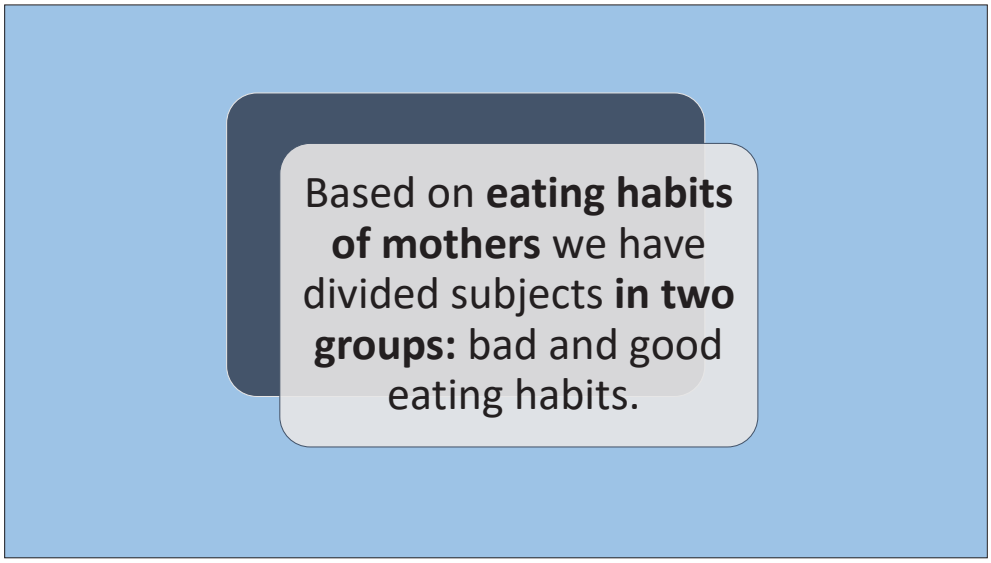

Based on **eating habits of mothers** we have divided subjects **in two groups:** bad and good eating habits.

Table 5. Eating habits during pregnancy

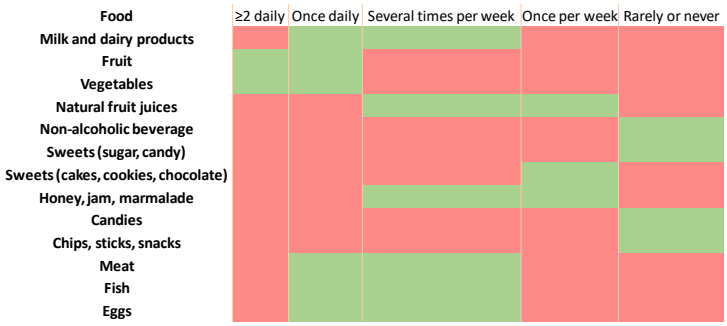
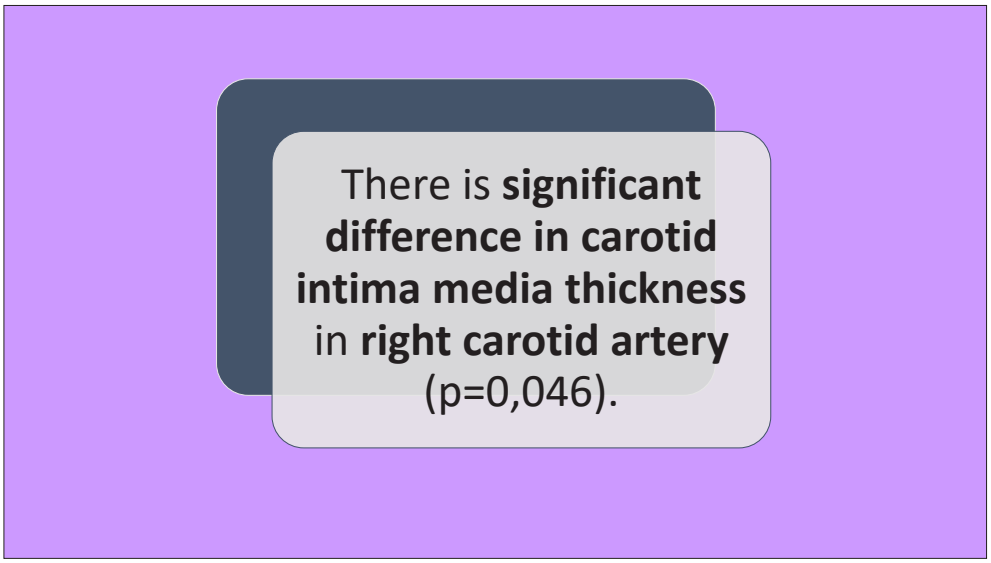
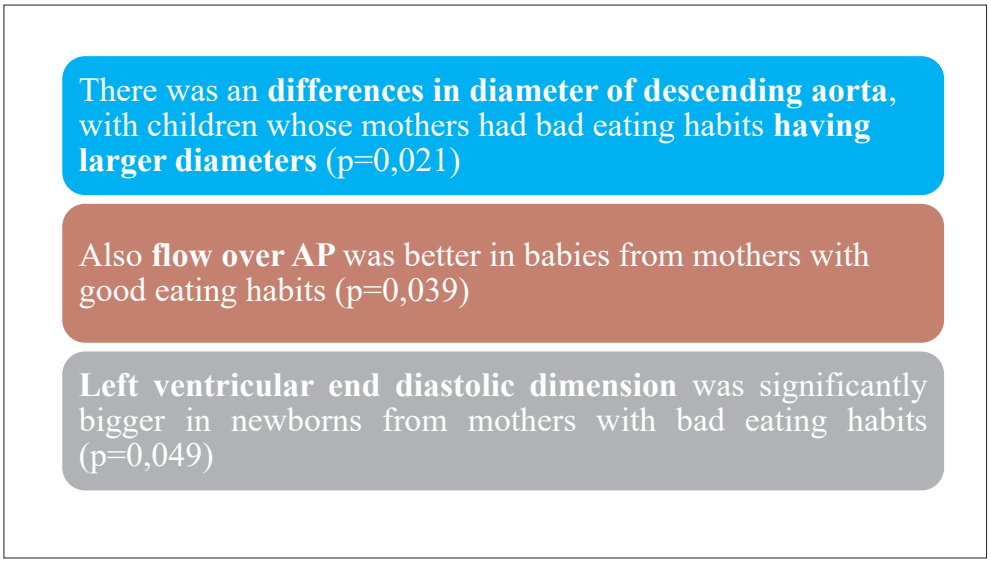


Table 6. Eating habits and Echo imaging

Values are shown as median value with interquartile range, p – probability with level of significance set on p<0,05

Variable	Eating habits		
	Bad eating habits Median (IQ range)	Good eating habits Median (IQ range)	p
DACC	4(3,8-4,7)	4(3,5-4,35)	0,323
LACC	4,1(0,03-4,2)	4,1(3,7-4,2)	0,811
CIMT R	0,04(0,03-0,05)	0,03(0,02-0,04)	0,046*
CIMT L	0,04(0,03-0,04)	0,03(0,03-0,03)	0,053
Aortic root	10(9,5-11)	10(8,8-10,7)	0,810
MPA	10(8,2-11,8)	8,5(8-10,5)	0,296
RPA	3,2(2,2-5,8)	2,6(2,3-3,2)	0,411
LPA	2,8(2,3-5,1)	2,8(2,3-2,9)	0,402
RCA	1,4(1,2-1,9)	1,4(1,1-2)	0,509
LCA	1,5(1,3-1,7)	1,4(1,2-1,6)	0,417
Ascending aorta	9,7(9-12)	9(8,8-9)	0,029*
CW Doppler flow over AA	2,475(1,68-4)	1,62(1,38-1,88)	0,300
Descending aorta	7,5(5,8-8,5)	5,8(5-7)	0,021*
CW Doppler Descending aorta	2,335(1,55-7)	1,575(1,37-1,67)	0,171
E wave m/s	1,07(0,9-1,29)	1,2(1,13-1,3)	0,233
A wave m/s	0,82(0,75-0,95)	0,84(0,81-0,93)	0,550
Flow over AP	1,3(1-1,4)	1,48(1,4-1,48)	0,039*
IVSd	4(4-4,4)	4(4-4,3)	0,371
LVEDd	22(19-25)	19(18-20)	0,091
LVEDs	14(12-15,3)	12(11-13)	0,049*
LVPWd	4,1(3,4-4,6)	4,6(4,1-4,6)	0,149
FS%	37(35-39)	38(36-42)	0,489
EF%	69(66-70,9)	69(69-69)	0,983


There is **significant difference in carotid intima media thickness** in **right carotid artery** (p=0,046).


There was an **differences in diameter of descending aorta**, with children whose mothers had bad eating habits **having larger diameters** (p=0,021)
Also **flow over AP** was better in babies from mothers with good eating habits (p=0,039)
Left ventricular end diastolic dimension was significantly bigger in newborns from mothers with bad eating habits (p=0,049)

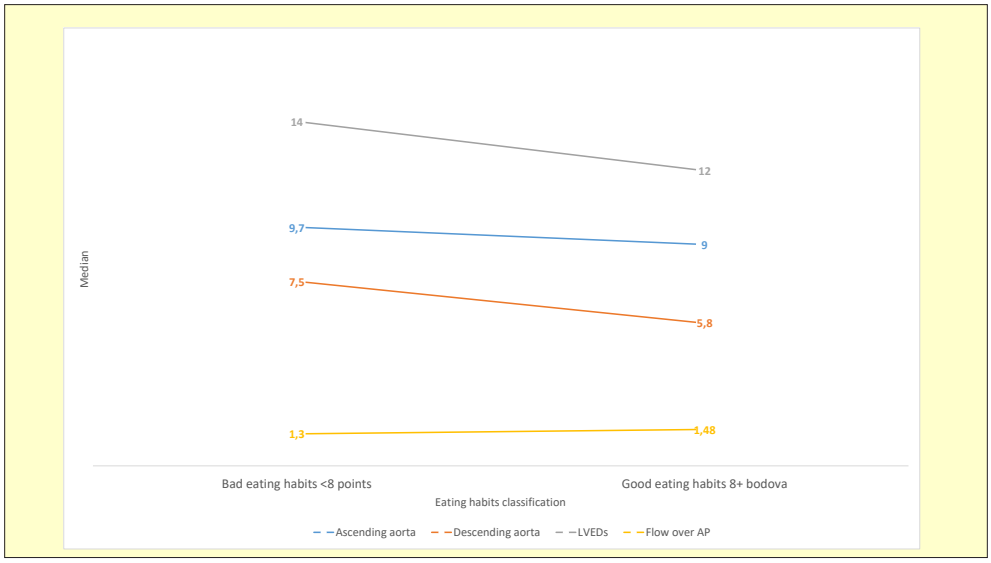


Table 6. EHO characteristics based on KEP index

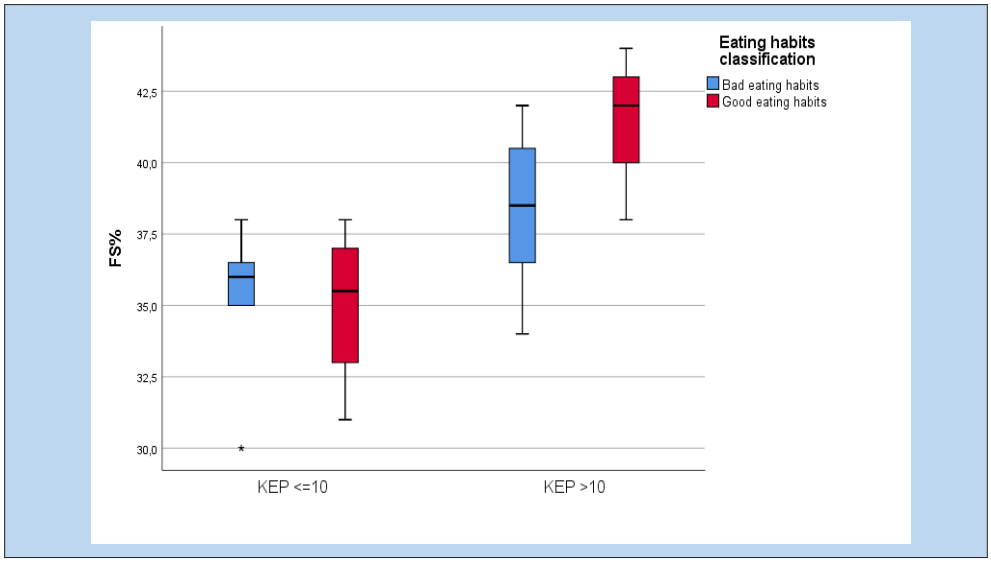
Variable	KEP <=10	KEP>10	p
	Median (IQ range)	Median (IQ range)	
DACC	4,3 (3,6-4,6)	3,8 (3,6-4,4)	0,441
LACC	4,2 (3,4-4,2)	4,1 (3,3-4,2)	0,641
CIMT R	0,04 (0,03-0,05)	0,035 (0,03-0,045)	0,495
CIMT L	0,035 (0,03-0,04)	0,035 (0,03-0,04)	0,704
The root of aorta	10,5 (10-11)	9,95 (8,9-10,35)	0,181
MPA	10,5 (8,3-11,8)	8,75 (7,65-11,65)	0,295
RPA	3,2 (2-6,2)	2,6 (2,2-4,6)	0,489
LPA	2,9 (2,3-5,5)	2,45 (2,2-3)	0,274
RCA	1,4 (1,2-2)	1,3 (1,1-1,75)	0,402
LCA	1,5 (1,3-1,8)	1,4 (1,2-1,7)	0,710
Ascending aorta	10,5 (9-11,8)	9,05 (9-10,95)	0,706
CW Doppler flow AA	1,85 (1,68-4)	1,78 (1,5-4)	0,388

Descending aorta	7 (5,7-8,5)	7,5 (5,6-8,2)	1,000
CW Doppler descending aorta	1,67 (1,58-5)	1,57 (1,37-7)	0,412
E wave m/s	1,15 (1,05-1,3)	1,16 (0,9-1,28)	0,558
A wave m/s	0,76 (0,73-0,84)	0,885 (0,815-0,94)	0,130
Flow over AP	1,38 (1,15-1,4)	1,39 (1,17-1,49)	0,422
IVSd	4 (4-4,7)	4,05 (4-4,35)	0,395
LVEDd	20 (19-22)	22,65 (18,5-24,5)	0,620
LVEDs	13 (12-14)	14 (11-14,8)	0,951
LVPWd	4,1 (3,5-4,6)	4,4 (3,95-5)	0,252
FS%	36 (35-37)	39,5 (37,5-42)	0,003
EF%	68,5 (67-69,5)	69,95 (67-71,45)	0,468

During pregnancy a **dental check** up has been performed for mothers, **KEP index** was used as one of the parameters.

Smaller value is better one. Based on that, a value of 10 was used as border one.

Ejection fraction FS% is significantly higher in group of newborns from mothers who had KEP index larger than 10 (p=0,003).


Eating habits classification
Bad eating habits
Good eating habits
FS%
42,5
40,0
37,5
35,0
32,5
30,0
KEP <=10
KEP >10

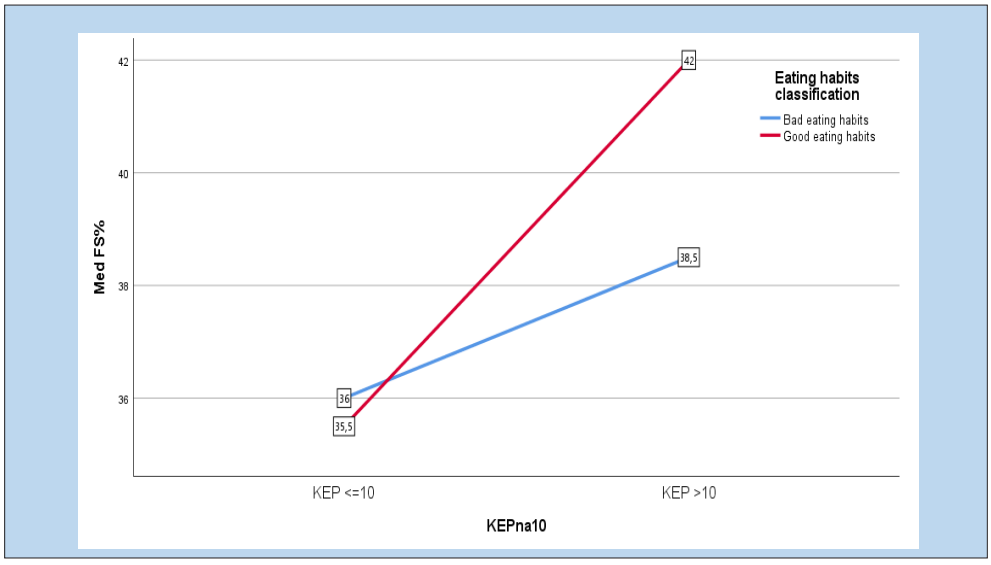

Eating habits classification
Bad eating habits
Good eating habits
Med FS%
42
40
38
36
42
38,5
36
35,5
KEP <=10
KEP >10
KEPna10

Table 7. The correlation between KEP and Cardiovascular Variables

Correlations		
Variable	Coefficient	KEP index
RCA	rho	-0,693*
	p	0,0047
A wave m/s	rho	,424*
	p	0,044
FS%	rho	,524*
	p	0,01

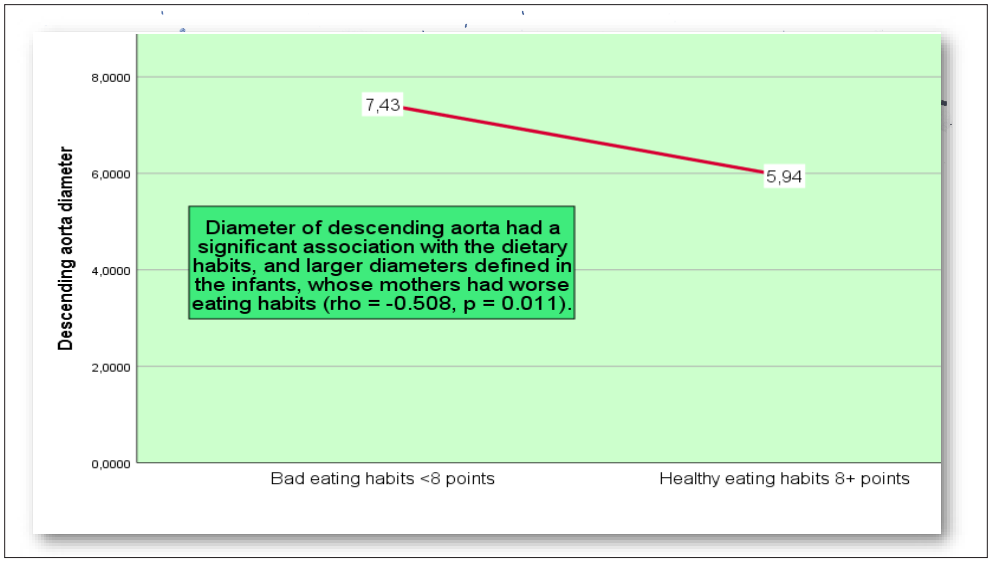
Only significant correlation are shown

Fortified is a **significant correlation** between the

- **diameter of the right coronary artery and the KEP index,**

- where the pregnant **woman had better diameters with the smaller blood KEP Index** (rho = -0.693, p = 0.047).

As the KEP rise, the values of RCA were worse.


Descending aorta diameter
8,0000
6,0000
4,0000
2,0000
0,0000
7,43
5,94
Diameter of descending aorta had a significant association with the dietary habits, and larger diameters defined in the infants, whose mothers had worse eating habits (rho = -0.508, p = 0.011).
Bad eating habits <8 points
Healthy eating habits 8+ points

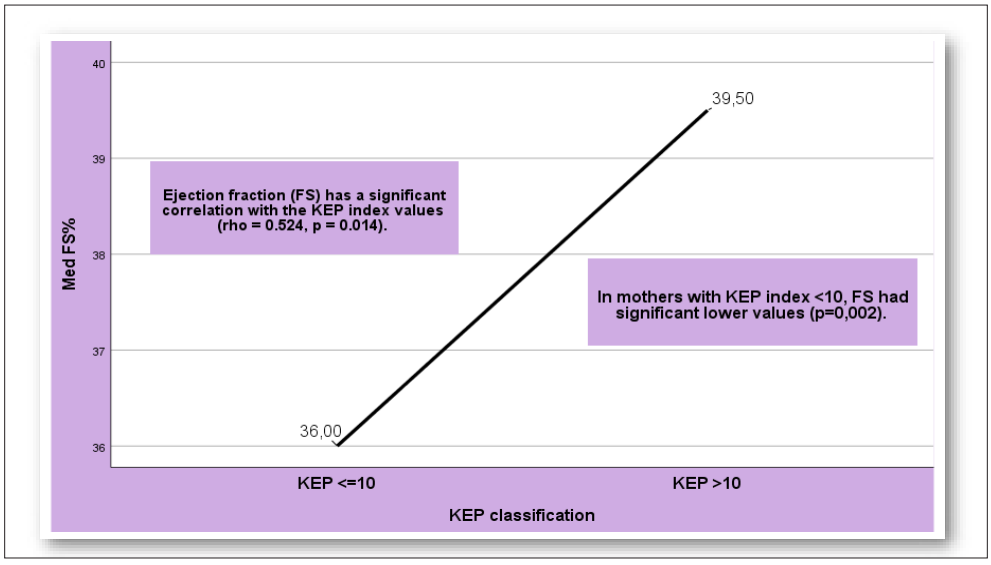

Med FS%
40
39
38
37
36
39,50
36,00
Ejection fraction (FS) has a significant correlation with the KEP index values (rho = 0.524, p = 0.014).
In mothers with KEP index <10, FS had significant lower values (p=0,002).
KEP <=10
KEP >10
KEP classification

Table 8. The correlation between Paradontosis and Cardiovascular Echo Variables

Correlations							
Variable	Coefficient	S1	S2	S3	S4	S5	S6
CIMT L	rho	0,331	0,038	0,478	,629**	0,382	,540*
	p	0,195	0,885	0,052	0,007	0,131	0,025
RPA	rho	,496*	0,389	,728**	,749**	,537*	,774**
	p	0,022	0,081	0	0	0,012	0
LPA	rho	,490*	0,323	,747**	,772**	,475*	,761**
	p	0,028	0,165	0	0	0,034	0
RCA	rho	,560**	0,151	,543**	,572**	0,065	,484*
	p	0,007	0,502	0,009	0,005	0,774	0,022
LCA	rho	,552**	0,159	,605**	,629**	0,065	,551**
	p	0,008	0,479	0,003	0,002	0,775	0,008
Ascending aorta	rho	,458*	0,062	,492*	,548**	0,265	,504*
	p	0,032	0,783	0,02	0,008	0,233	0,017
CW Doppler flow on AA	rho	0,355	0,314	,646**	,593**	0,258	,711**
	p	0,148	0,204	0,004	0,009	0,301	0,001
Descending aorta	rho	-0,201	-0,321	-0,068	0,136	-0,036	0,019
	p	0,369	0,146	0,764	0,546	0,873	0,932
CW Doppler descending aorta	rho	0,276	0,164	,587*	,583*	0,242	,620**
	p	0,268	0,517	0,01	0,011	0,334	0,006
Flow over AP	rho	-0,278	-0,264	-,565**	-,556**	-0,219	-,558**
	p	0,21	0,235	0,006	0,007	0,328	0,007
LVEDd	rho	,542**	0,267	,712**	,723**	,456*	,709**
	p	0,009	0,23	0	0	0,033	0
LVEDs	rho	,511*	0,208	,676**	,718**	0,338	,693**
	p	0,015	0,354	0,001	0	0,124	0
LVPWd	rho	-,531*	-0,347	-,698**	-,664**	-0,311	-,698**
	p	0,011	0,114	0	0,001	0,159	0

Conclusions

The presented cardiovascular-oral health data base for the Balkan region can be used as a geographic, demographic and epidemiologic source of information for the detection and identification of new potential risk factors of individuals for preterm delivery and possible atherosclerosis devlopment.

Primary prevention of atherosclerosis should begin as early as possible, during pregnancy, in childhood, by creating a healthy way of life, which will be able to prevent or at least slow the development of atherosclerosis.

The results so far indicate to the awareness of pregnant women of the importance of oral health and its influence on child development.

However, it is necessary to wait until the end of the study to see definitive results, the impact of mothers oral health on the developing fetus.

There was a significant connection between **diet and oral health status of mothers** with **some segments of the development of cardiovascular system** in infants.

It is necessary to extend the study and test inference on a larger sample.

Final results of the research

Regular dental therapy can decrease the frequency of the appearance of caries, peridontal disease in pregnant women, the frequency of prematurity, low birth weight (with all it's potential complications, decrease the financial costs of neonatal intensive care management and cardiovascular repercussions on a newborn's health.

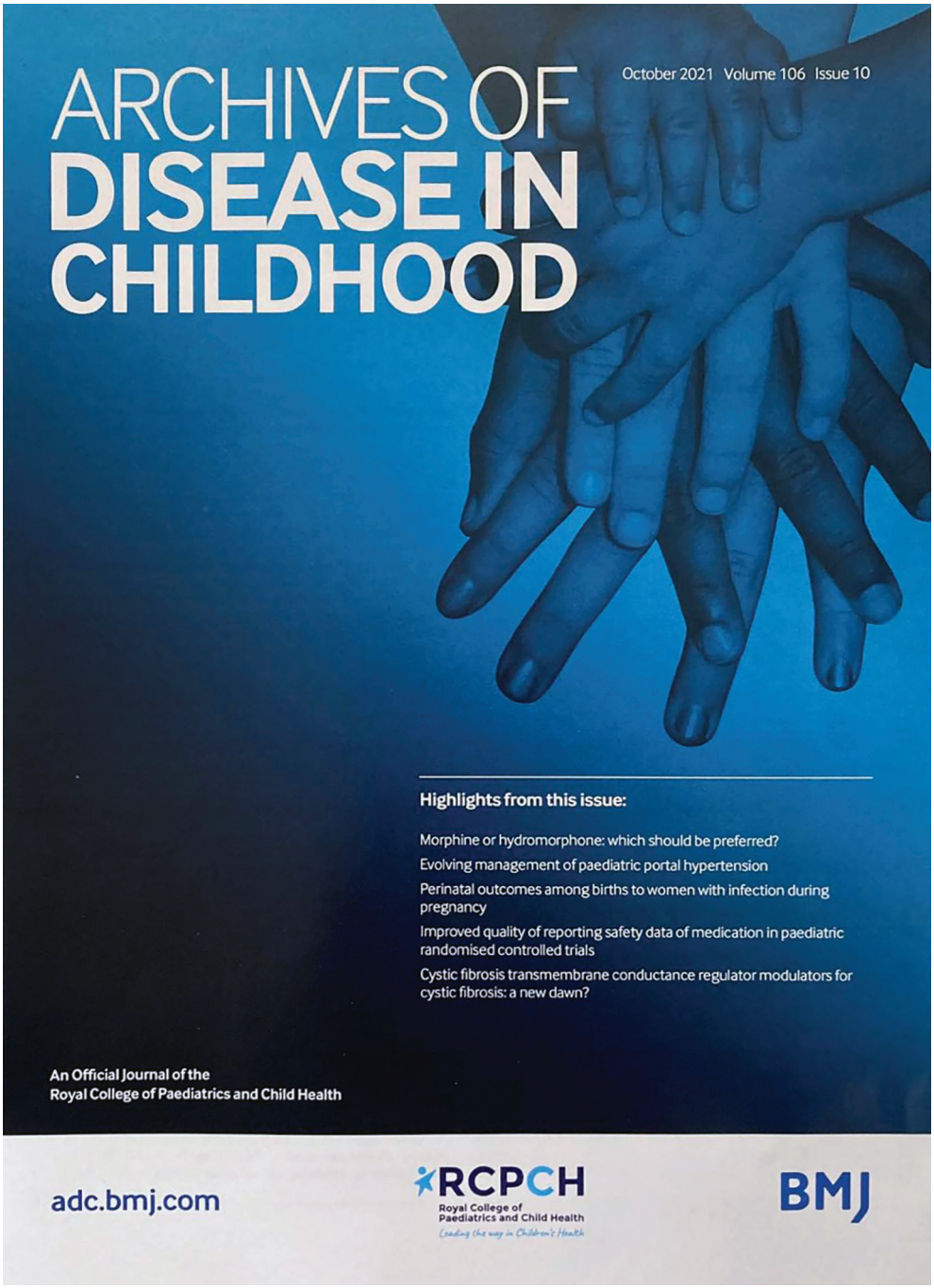
References

1. Pezelj-Ribarić i sur. Oralno zdravlje – uvjet za opće zdravlje. Rijeka; medicinski fakultet Sveučilišta u Rijeci; 2013
2. Teles R, Wang CY. Mechanisms involved in the association between periodontal diseases and cardiovascular disease. Oral Dis 2011;17:450–461.
3. Zoellner H. Dental infection and vascular disease. Semin Thromb Hemost 2011;37:181–192.
4. Kamer AR, Craig RG, Dasanayake AP, Brys M, Glodzik-Sobanska L, de Leon MJ. Inflammation and Alzheimer's disease: possible role of periodontal diseases. Alzheimers Dement 2008;4:242–250.
5. Boggess KA, Edelstein BL. Oral health in women during preconception and pregnancy: implications for birth outcomes and infant oral health. Matern Child Health J 2006; 10 (5 Suppl):S169-174.
6. Hemaltha V, Manigandan T, Sarumathi T, Aaarthi Nisha V, Amudhan A. Dental considerations in pregnancy – a critical review on the oral care . J Clin Diagn Res 2013; 7:938.
7. American College of Obstetricians and Gynecologists. Oral health care during pregnancy and through the lifespan. Committee Opinion No. 569. Obstet Gynecol 2013;122:417–422.
8. Offenbacher S, Katz V, Fertik G, Collins J, Boyd D, Myynor G i sur. Periodontal infection as a possible risk factor of preterm low birth weight . J Periodontal 1996;67:1103-1113.
9. Soroey M, Avanbadejo P, Savage K, Oluwole A. Association between periodontal disease and pregnancy outcomes. Odontostomatol. Trop. 2015; 38 (152):5-16.
10. Turton M, Africa CW. Further evidence for periodontal disease as a risk indicator for adverse pregnancy outcomes. Int Dent J. 2016 Dec 17. doi: 10.1111/idj.12274.
11. Trivedi S, Lal N, Singhal R. Periodontal disaease during pregnancy. J Orofacial Sci 2015; 7:67.
12. Govindaraju P, Venugopal S, Shivakumar MA, Sethuraman S, Ramaiah SK, Mukundan S. Maternal periodontal disease and preterm birth: A case-control study. J Indian Soc Periodontol. 2015;19(5):512-515. doi: 10.4103/0972-124X.164751
13. Reza Karimi M, Hamissi JH, Naeini SR, Karimi M. The Relationship Between Maternal Periodontal Status of and Preterm and Low Birth Weight Infants in Iran: A Case Control Study. Glob J Health Sci. 2015 ;8(5):184-188. doi: 10.5539/gjhs.v8n5p184.
14. Moore S, Ide M, Coward PY, Randhawa M, Borkowska E, Baylis R, Wilson RF. A prospective study to investigate the relationship between periodontal disease and adverse pregnancy outcome. Br Dent J. 2004 Sep 11;197(5):251-258.
15. Ali TB, Abidin KZ. Relationship of periodontal disease to pre-term low birth weight infants in a selected population--a prospective study. Community Dent Health. 2012; 29(1):100-105.
16. Davenport ES, Williams CE, Sterne JA, Murad S, Sivapathasundram V, Curtis MA. Maternal periodontal disease and preterm low birthweight: case-control study. J Dent Res. 2002;81(5):313-318.
17. Offenbacher S, JaredHL, O'Reilly PG, Wells SR, Salvi GE, Lawrence HP et al. Potential pathogenic mechanism of periodontitis pregnancy complications. Ann Perriodontol 1998; 3:233-250.
18. Jeffcoat MK, Guers NC, Reddy MS, Cliver SP, Goldenberg RL, Hauth JC. Periodontal infection and preterm birth: results of a prospective study. J Am Dent Assoc 2001; 132:875-880.

19. Silk H, Douglass AB, Douglass JM, Silk L. Oral health during pregnancy . Am Physician 2008; 77:1139-1144.
20. Haake SK, Newman MG, Nisengard RJ, Sanz M: Periodontal microbiology. Clinical Periodontology. Edited by: Newman MG, Takei HH, Carranza FA. 2002, Philadelphia: Saunders, 96-112.
21. Nair PNR: Pathogenesis of apical periodontitis and the causes of endodontic failures. Crit Rev Oral Biol Med. 2004, 15: 348-381.
22. Škrinjarić I. Prevencija oralnih bolesti u djece: U: Bralić I. i sur. Prevencija bolesti u dječjoj dobi. Medicinska naklada. Zagreb, 2014. str. 412-431.
23. World Health Organization. Preterm birth. Fact sheet. Reviewed November 2016. http://www.who.int/mediacentre/factsheets/fs363/en/ (pristup 10.1.2017.),.
24. Mardešić D., Benjak V. Nedonošče. U: Mardešić D. i sur. Pedijatrija. Školska knjiga; Zagreb, 2016. str. 389-397.
25. Crispi F, Bijnens B, Figueras F, Bartrons J, Eixarch E, Le Noble F et al. Fetal growth restriction results in remodeled and less efficient hearts in children. Circulation 2010; 121 (22): 2427-2436.
26. Barker DJ. Human growth and cardiovascular disease. Nestle Nutr Work-shop Ser Pediatr program 2008; 61:21-38.
27. Mitchell RN, Schoen FJ. Atherosclerosis. U: Kumar V, Abbas AK,Fausto N, Aster JC, (ur.). Robbins & Cotran Pathologic Basis of Disease, 8 izd. Philadephia: WB Saunders; 2010. str. 1020-35.
28. Al-Ghamdi A, Jiman-Fatani AA, El-Banna H. Role of Chlamidia pneumoniae, helicobacter pylori and cytomegalovirus in coronary artery disease. Pak J Pharm Sci 2011; 24(2):95-101.
29. Bearfield C, Davenport ES, Sivapathasandarem V, Allaker RP. Possible association between amniotic fluid micro-organism infection and microflora in the mouth. BJOG. 2002;109:527-533.
30. Dunlop AL, Mulle JG, Ferranti EP, Edwards S, Dunn AB, Corwin EJ. The Maternal Microbiome and Pregnancy Outcomes that Impact Infant Health: A Review. Advances in neonatal care : official journal of the National Association of Neonatal Nurses. 2015;15(6):377-385. doi:10.1097/ANC.0000000000000218.
31. Boggess KA, Urlaub DM, Moos MK, Polinkovsky M, El-Khorazaty J, Lorenz C. Knowledge and beliefs regarding oral health among pregnant women. J Am Dent Assoc 2011; 142(11):1275-1282.
32. Glaziou Philippe. Samsize. Computer sample size and power. Version 06.2003. Dostupno s URL: http://sampsize.sourceforge.net/ (pristup 10.1.2017.).
33. WHO. Child growth standards. WHO Anthro (version 3.2.2., January 2011) http://www.who.int/childgrowth/software/en/
34. World Health Organization. BMI-for - age BOYS . Birth to 5 years (percentiles) Dostupno s URL: http://www.who.int/childgrowth/standards/cht_bfa_boys_p_0_5.pdf?ua=1 (pristup 10.1.2017.).
35. World Health Organization. BMI-for - age GIRLS . Birth to 5 years (percentiles) Dostupno s URL: http://www.who.int/childgrowth/standards/cht_bfa_girls_p_0_5.pdf?ua=1 (pristup 10.1.2017.)
36. Baylor College of medicine. USDA/ARS Children's Nutrition Research Center, Houston, Texas. Age-based Pediatric Blood Pressure Reference Charts . Dostupno s URL: https://www.bcm.edu/bodycomplab/Flashapps/BPVAgeChartpage.html (dostupno 10.1.2017.).

37. National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. The Fourth report on the diagnosis, evaluation and treatment of high blood pressure in children and adolescents. Pediatrics 2004; 114 (2 Suppl 4 th Report) 555-576. (dostupno 10.1.2017.).
38. Rosamond W, Flegal K, Friday G, Furie K, Go A, Greenlund K et al: Heart disease and stroke, statistics-2007 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation 2007; 115-e 69-e171.
39. Friedewald VE, Kornman KS, Beck JD, Genco R, Goldfine A, Libby P et al: The American Journal Cardiology and Journal of Peridontology editor's consensus: peridontitis and atherosclerotic cardiovascular disease. J. Peridontol 2009; 80:1021-32.
40. Paraskevas S, Huizinga JD, Loos BG. A systemic review and meta-analyses on C reactive proten in relation to periodontitis. J Clin Periodontol 2008; 35: 277-90.
41. Humphrey Li, Fu R, Buckley DI, Freeman M, helfand M. Peridontal disease and coronary heart disease incidence: a systemic review and meta-analyses. J Gen Inter Med 2008; 23:2079-86.
42. Tonetti MS, D'Aiuto F, Nihali L, Donald A, Storry C, Parkae M et al: Treatment of peridontitis and endothelial function. N Engl J Med 2007: 356:911-20.
43. Pizzo G, La Cara M, Conti Nibali M, Guiglia R. Peridontitis and preterm delivery. A review od the literature. Minerva. Stomatol 2005; 54:1-14.
44. Srinivas SK, Sammel MD, Stamilio DM, Cothier B, Jeffcoat MK; Perry S et al: Peridontal disease and adverse pregnancy outcome: Is there an association? Am J Obstet Gynecol 2009;200:497-e491-98.
45. Meqa et al: Periodontal disease, preterm delivery and preterm low gestational mass. Acta stomatol Croat. 2017;51(1):33-40. DOI: 10.15644/asc51/1/4.
46. Mesihović-Dinarević S:"Prevention of Cardiovascular Disease from an Early Age", Journal of Cardiovascular Disease/Diagnosis, 2017; S:3, vol 5, issue 3, DOI : 10.4172/2329-9517.1000268, p 2-5.
47. Berenson GS, Blonde CV, Faris RP: Cardiovascular disease risk factor variable during the first year of life. American Journal of Disease in Children, 1979; 133:1049-1057.
48. Berenson GS, Srinivasan SR, Mac D et al: Risk factors in early life as predictors of adult heart disease: The Bogalusa heart study, Am.J.Med.Sci.1989; 298:141-151.
49. Geer JC, McGill, He Strong JP: The fine structure of human atherosclerotic lesions, An. J. Pathol. 1961; 38:263-9.
50. Dhuper S, Buddhe S, Patel S. Managing Cardiovascular Risk in Overweight Children and Adolescents. Paediatric Drugs, 2013, 15(3):181-90. doi: 10.1007/s40272-013-0011-y.
51. Berenson GS, Srinivasan SR, Bao, Newman WP, III, Tracy RE, Wattigney WA. Association between multiple cardiovascular risk factors and atherosclerosis in children and young adults. The Bogalusa Heart Study. N Engl J Med 1998; 338:1650–6.
52. Vt H, T M, T S, Nisha V A, A A. Dental considerations in pregnancy-a critical review on the oral care. J Clin Diagn Res. 2013;7(5):948-53.
53. Offenbacher S, Katz V, Fertik G et al. Periodontal infection as a possible risk factor for preterm low birth weight. J Periodontol. 1996 ;67(10 Suppl):1103-13.
54. Soroye M, Ayanbadejo P, Savage K, Oluwole A. Association between periodontal disease and pregnancy outcomes. Odontostomatol Trop. 2015 ;38(152):5-16.
55. Turton M, Africa CWJ. Further evidence for periodontal disease as a risk indicator for adverse pregnancy outcomes. Int Dent J. 2017; 67(3):148-56. doi: 10.1111/idj.12274.

56. Govindaraju P, Venugopal S, Shivakumar MA, Sethuraman S, Ramaiah SK, Mukundan S. Maternal periodontal disease and preterm birth: A case-control study. J Indian Soc Periodontol. 2015;19(5):512-5. doi: 10.4103/0972-124X.164751.
57. American College of Obstretricians and Gynecologists. Oral health care during pregancy and through the lifespan. Committee Opinion No.569. Obstet Gynecol. 2013; 122:417-22.
58. Reza Karimi M1, Hamissi JH, Naeini SR, Karimi M. The Relation Between Maternal Periodontal Status and Preterm and Low Birth Weight Infants in Iran: A Case Control Study. Glob J Health Sci. 2015;8(5):184-8. doi: 10.5539/gjhs.v8n5p184.
59. Boggess KA, Edelstein BL. Oral health in women during preconception and pregnancy: implications for birth outcomes and infant oral health. Matern Child Health J. 2006;10 (5 Suppl):S169-74.
60. World Health Organization. Oral health. Key facts. 2018. (pristupljeno 15.1.2019. Dostupno na : https://www.who.int/news-room/fact-sheets/detail/oral-health
61. NSW Ministry of Health. Oral Health 2020: A Strategic Framework for Dental Health in NSW. 2014. (pristupljeno 15.1.2019.) Dostupno na: https://www.health.nsw.gov.au/oralhealth/Publications/progress-on-oral-health-2020.pdf
62. Bale BF, Doneen AL, Vigerust DJ. High-risk periodontal pathogens contribute to the pathogenesis of atherosclerosis. Postgrad Med J. 2017;93(1098):215-20. doi: 10.1136/postgradmedj-2016-134279.
63. Karami S, Ghobadi N, Pakravan A, Dabirian M, Sobouti F. Periodontal Diseases and Possible Future Cardiovascular Events, Are they Related? An Overview. J. Pediatr. Rev. 2018; 6 (1): 44-8. doi: 10.5812/jpr.11144
64. Dörfer C, Benz C, Aida J, Campard G. The relationship of oral health with general health and NCDs: a brief review. Int Dent J. 2017; 67(Suppl 2):14-8. doi: 10.1111/idj.12360.
65. Munz M, Willenborg C, Richter GM et al. A genome-wide association study identifies nucleotide variants at SIGLEC5 and DEFA1A3 as risk loci for periodontitis. Hum Mol Genet. 2017. 26(3): 2577-88. doi: 10.1093/hmg/ddx151.
66. Friedewald VE, Kornman KS, Beck JD et al. American Journal of Cardiology; Journal of Periodontology. The American Journal of Cardiology and Journal of Periodontology editors' consensus: periodontitis and atherosclerotic cardiovascular disease. J Periodontol. 2009 ; 80(7):1021-32. doi: 10.1902/jop.2009.097001
67. Boggess KA, Edelstein BL. Oral health in women during preconception and pregnancy: implications for birth outcomes and infant oral health. Matern Child Health J. 2006;10 (5 Suppl):S169-74.
68. Horton AL, Boggess KA. Periodontal disease and preterm birth. Obstet Gynecol Clin North Am. 2012;39(1):17-23, vii. doi: 10.1016/j.ogc.2011.12.008.
69. Mardešić D. i Benjak V. Nedonošče. In: Mardešić D. i sur., editors. Pedijatrija. osmo prerađeno i dopunjeno izdanje. Zagreb: Školska knjiga.; 2016. str. 389-90.
70. Crispi F, Bijnens B, Figueras F et al. Fetal growth restriction results in remodeled and less efficient hearts in children. Circulation. 2010; 121 (22): 2427-36. doi: 10.1161 CIRCULATION AHA. 110.937995.
71. Atherosclerosis. 2015 Feb;238(2):380-7. doi: 10.1016/j.atherosclerosis.2014.12.029. Epub 2014 Dec 24.Intima media thickness measurement in children: A statement from the Association for European Paediatric Cardiology (AEPC) Working Group on Cardiovascular Prevention endorsed by the Association for European Paediatric Cardiology.


ARCHIVES OF
DISEASE IN
CHILDHOOD
October 2021 Volume 106 Issue 10
Highlights from this issue:
Morphine or hydromorphone: which should be preferred?
Evolving management of paediatric portal hypertension
Perinatal outcomes among births to women with infection during pregnancy
Improved quality of reporting safety data of medication in paediatric randomised controlled trials
Cystic fibrosis transmembrane conductance regulator modulators for cystic fibrosis: a new dawn?
An Official Journal of the
Royal College of Paediatrics and Child Health
adc.bmj.com
RCPCH
Royal College of
Paediatrics and Child Health
Leading the way in Children's Health
BMJ

Abstracts

physical health of children all while describing the various ways that one can work with children along with some of the challenges that the experts face each day along with some of the children's experiences.

23 PEDIATRICIAN AND EDUCATIONAL REHABILITATOR – ASSOCIATES IN THE PROCESS OF OBSERVATION, DIAGNOSIS AND REHABILITATION OF CHILDREN WITH DEVELOPMENTAL DISABILITIES

[1]Marija Presečki Zmajlović*, [1]Presečki Zmajlović, [2]Mara Modrić, [3]Ivan Razum. [1]*Kindergarten Radost, Jastrebarsko, Croatia*; [2]*Elementary School Sesvetska Sopnica, Sesvete, Croatia*; [3]*Health Center Jastrebarsko, Croatia*

10.1136/archdischild-2021-europaediatrics.23

The number of children with disabilities and persons with disabilities is continuously increasing, which is evident from the data of the Croatian Institute of Public Health. The report on persons with disabilities in the Republic of Croatia, May 2019, lists 45,314 children with disabilities. The pediatrician, as a doctor who deals with the health care of children from birth to the end of adolescence and cares about improving the child's health and eliminating risk factors that threaten his normal growth and development, certainly has children with disabilities and developmental difficulties among his patients. An important part of any systematic examination of a child should be an assessment of psychomotor development and monitoring developmental milestones. When it comes to children with disabilities it can also include information obtained from co-specialists. The competencies of pediatricians include the promptly detection of developmental dilays, knowledge of various developmental disabilities, and also perspective of related co-experts within different systems.

In providing support to children with disabilities, educational rehabilitators are important part of the interdisciplinary diagnostic team, the team of early intervention experts and professional teams in kindergartens and schools. They are a profession whose diagnostic, educational and rehabilitation procedures and programs apply to children with disabilities and persons with disabilities, the population with visual impairment, learning difficulties, attention deficit hyperactivity disorder, motor disorders, chronic diseases and multiple disabilities. The actions of both, the pediatrician and the educational rehabilitator, are aimed at the well-being of the child with risk factors, developmental delays or identified developmental difficulties. Mutual cooperation should include the exchange of key information and trust in the assessment, competencies and recommendations.

It is particularly important in case of children with autism spectrum disorder, which is primarily characterized by difficulties in social communication and interaction and limited, repetitive patterns of behavior, interests, and activities. During the periodic systematic examination in the pediatric clinic, the mere presence of the parents and the learned strategies can mask the characteristic difficulties. In some children, symptoms are present at an early stage of development, but often become more apparent when social demands exceed the child's current abilities. They are more pronounced during the child's time in kindergarten or school, which is then noticed by other professional associates – educational rehabilitator.

If the parent is not concerned about the child's development, finds it difficult to accept the possibility of the difficulty or denies it, sometimes is missing the transfer of key informations in sequence ,,educational rehabilitator – parent – pediatrician', which unfortunately slows down the process of diagnosis and intervention. As an example of good practice and cooperation between a pediatrician and an educational rehabilitator for the purpose of objective informing, we provide and recommend a written opinion about the developmental status of the child.

24 PRESENCE OF LANGUAGE DISORDERS IN SCHOOL AGE

Martina Galeković*. *Centar za odgoj i obrazovanje Velika Gorica*

10.1136/archdischild-2021-europaediatrics.24

Language difficulties refer to impaired language acquisition and impaired language processing and can be an integral part or one of multiple difficulties. The most common among them is developmental language disorder, which refers to the present difficulties in the domain of language. Developmental language disorder is diagnosed when a child, despite orderly general cognitive abilities and a stimulating environment, has difficulty learning his mother tongue, and then any other language.

The paper presents the results of the analysis of the presence of developmental speech disorder in users of psychosocial support services in the Zagreb County. Linguistic comprehension was examined and the obtained results were analyzed by a qualitative methodology.

We emphasize the awareness of parents, professionals and all those involved in the upbringing and education of the child as a prerequisite for partnership with students and providing the necessary support to students in working with difficulties in the field of language comprehension.

General Pediatrics

25 CHILD'S BLOOD VESSEL DEVELOPMENT IN RELATION TO MOTHER'S DIETARY EATING HABITS AND ORAL HEALTH

Senka Mesihovic Dinarevic*, Anes Jogunčić, Kristen Sarić, Lutvo Sporišević, Berislav Topić, Vjekoslav Krželj, Liana Cambj-Sapunar, Davor Petrović, Sanja Jurišić, Senad Sarić, Samir Prohić. *Polyclinic Eurofarm*

10.1136/archdischild-2021-europaediatrics.25

Dietary eating habits and oral health of pregnant women have the potential to affect pregnancy outcomes. Some observational studies have indicated a significant association of the periodontal disease with adverse pregnancy outcomes, such as the risk of preterm delivery and differences in blood vessels development.

The aim of the study was to evaluate the relationship between the dietary eating habits of mothers and their oral health during pregnancy with the development of the coronary and carotid arteries including intima media thickness.

By random selection, 40 pregnant women and their newborns formed a cohort – pilot study. The approval of the ethics committee was obtained. During pregnancy eating habits and dental mother's status were analyzed. After delivery, a

detailed color Doppler echocardiography including carotid vessels has been performed Newborns from mothers with bad eating habits had significantly higher values of the right carotid artery intima-media thickness/CAIMT/(p=0.046). Oral health was examined with DMF index/Decayed, Missing, Filled/. A significant correlation between the diameter of the right coronary artery and the DMF index was proven, where the pregnant woman had better diameters with the smaller DMF Index (rho = -0.693, p = 0.047). CAIMT had a moderate connection with nutrition intake on both of the carotids, whereby the thicker intima had a pregnant woman with poor eating habits (rho = -0.492, p = 0.03). There was a statistically significant difference in the diameter of descending aorta, with larger diameters in children whose mothers had bad eating habits (p=0.021). Flow over AP was better in newborns from mothers with good eating habits (p=0.039). Fraction shortening/FS%/was significantly higher in newborns whose mothers had a larger DMF index (p=0.03). There was a significant correlation of LVEDs/left ventricle end-diastolic diameter/and mothers eating habits (rho = -0.415, p = 0.044), whereby a higher value LVEDs determined in infants whose mothers had worse eating habits Dietary eating habits and oral health of pregnant women have a significant connection with some segments of cardiovascular system development. Eating habits have an impact on the diameter of blood vessels and on flow.

Unhealthy dietary plans will most probably lead to bad oral health and the presence of periodontitis, which could contribute to the CAIMT and the development of atherosclerosis. It is necessary to extend the study and test inference on a larger sample.

26 FAMILIAL HYPERCHOLESTEROLEMIA: A RARE CASE OF EARLY DIAGNOSIS

Ekaterina Dubonosova*, Anastasia Lamasova, Elizaveta Leonova, Alina Pankova, Kamilla Efendieva. *Research Institute of Pediatrics and Child Health CCH RAS, Ministry of Science and Higher Education*

10.1136/archdischild-2021-europaediatrics.26

Familial hypercholesterolemia (FH) is a common life-threatening genetic condition that causes high cholesterol and leads to a much higher-than-normal risk of coronary heart disease (CHD). The heterozygous type is found in about 1 out of 300-500 people, the homozygous type is quite rare in 1 out of 1 million people.

Objective To analyze the clinical case of family hypercholesterolemia in sibs.

Patients and Methods In 3 siblings (from triplets) at the age of 7 years randomly detected new-onset hypercholesterolemia 5.97 mmol/L, 5.65 mmol/L, 6.43 mmol/L. In a second study after 14 days, hypercholesterolemia persists (6.11 mmol/L, 5.67 mmol/L and 6.49 mmol/L, respectively). Two siblings (identical) had high cholesterol levels (4.060 mmol/L and 4.413 mmol/L) due to low density lipoprotein (LDL). The third child with the lowest level of hypercholesterolemia had normal LDL and a high level of high density lipoprotein (HDL). No evidence of secondary hypercholesterolemia (diabetes mellitus, chronic renal insufficiency, hypothyroidism, cholestatic hepatitis, iatrogenic illness) was found.

A mother (42 years old), sticks to a strict diet with a reduced fat content, but hypercholesterolemia persists, statins therapy is not conducted, recommendations for examining children have not been received.

Results Plasma LDL cholesterol level of 4.0 mmol/L or higher in follow-up blood test, provided parents with hypercholesterolemia, confirms the FH in two children from triplets.

At the same time, there are no external physical signs of the disease in children (xanthomas, corneal arch, xanthelasma). This, along with relatively low hypercholesterolemia, suggests a prognostically favorable Heterozygous Familial Hypercholesterolemia. Genetic screening for the presence of FH is not required to confirm the diagnosis, but may be useful if the diagnosis is ambiguous.

A strict diet with a reduced fat content was recommended to patients, as well as supervision of a cardiologist and lipid screening. It was decided that at the age of 8-10 years, while maintaining LDL cholesterol>4.0 mmol/l in follow-up blood test would be observed even on the recommended diet, the treatment with low doses of statins wiould be discussed.

Conclusion Despite the prevalence of FH and the availability of effective treatment, FH is rarely diagnosed in children. This emphasizes the importance of lipid screening in childhood and cascading screening of all members of the patient's family for the prevention of CHD.

27 ANTHROPOMETRIC DIMENSIONS OF THE ARAL SEE REGION (KARAKALPAKSTAN, REPUBLIC OF UZBEKISTAN) NATIVES MAY REFLECT NEGATIVE INFLUENCE OF PESTICIDE ENDOCRINE DISRUPTOR CHEMICALS ON THE POSTNATAL ONTOGENESIS

Andrey P Pugovkin*, Valeriy O Yerkudov, Azat T Matchanov, Kenjabek U Rozumbetov, Ruslan K Dauletov, Sanovar P Esemuratova, Sergey A Lytaev. *St.Petersburg State Pediatric Medical University, Department of human physiology*

10.1136/archdischild-2021-europaediatrics.27

The aim of the study was revelation of the specific tendencies of the physique development in subjects born and grown up at various distances from the former Aral Lake disaster (ALD) as a possible factor determining exposure window of organochlorine pesticides (OCPs) during the body growth. ALD was a combined result of essential climate aridization and anthropogenic pollution with the excessive application of OCPs in a droughty agricultural region.

A complex anthropometric study including measurement of body mass and length, the size of extremities, pelvis and of skinfold thickness was carried out on 310 volunteers of both sexes. All of them had been born in 1990 – 1995 before the start of effective measures for liquidation of the ALD consequences. The volunteers were divided into three groups, attached to geographical zones: first – zone of ALD, northern part of the region around the town of Muynak; second zone, relatively safe – central part, around the city of Nukus; third zone, safe – the southern part of the region.

The comparison of anthropometric parameters was statistically measured using Kruskal-Wallis test and Mann-Whitney criterion including Bonferoni correction for multiple comparison.

Males from the first group possessed statistically valuable lower body mass, arm length, size of the chest and major joints, waist perimeter, skinfold thickness in comparison to subjects from other groups. In contrast, females from the

Child's blood vessel development in relation to mother's dietary eating habits and oral health

Senka Mesihović-Dinarević [1], Anes Jogunčić [2], Kristen Sarić [3], Lutvo Sporišević [4], Berislav Topić [5], Vjekoslav Krželj [6], Liana Cambj-Sapunar [7], Davor Petrović [8], Sanja Jurišić [9], Senad Sarić [10], Samir Prohić [11]

[1, 5] Academy of Sciences and Arts of BiH, [2, 4] Public Health of Canton Sarajevo, [3, 9, 10] Polyclinic Arbor Vitae Mostar, [6, 7, 8] KCU Split Croatia, [11] Dental Clinic Sarajevo

Europaediatrics Zagreb, Croatia 7 - 9 October 2021

Introduction

- Dietary eating habits and oral health of pregnant women have the potential to affect pregnancy outcomes. Some observational studies have indicated a significant association of periodontal disease with adverse pregnancy outcomes, such as risk of preterm delivery and differences in blood vessels development.

Methods & Objectives

The aim of the study was evaluate the relationship between the dietary eating habits of mothers and their oral health during pregnancy with the development of the coronary and carotid arteries including intima media thickness.

Patients and methods:
By random selection, 40 pregnant women and their newborns formed a cohort - pilot study. The approval of the ethics committee was obtained. During pregnancy eating habits and dental mother's status were analysed. After delivery a detailed colour Doppler echocardiography including carotid vessels has been performed.

Results

Newborns from mothers with bad eating habits had significantly higher values of the right carotid artery intima-media thickness /CAIMT/ (p=0.046).

Eating habits and Echo imaging

Values are shown as median value with interquartile range, p – probability with level of significance set on p<0,05

Variable	Eating habits		
	Bad eating habits Median (IQ range)	Good eating habits Median (IQ range)	p
DACC	4(3,8-4,7)	4(3,5-4,35)	0,323
LACC	4,1(0,03-4,2)	4,3(3,7-4,2)	0,811
CIMT R	0,040(0,03-0,05)	0,030(0,02-0,04)	0,046*
CIMT L	0,040(0,03-0,04)	0,030(0,03-0,03)	0,053
Aortic root	10(9,5-11)	10(8,8-10,7)	0,810
MPA	10(8,2-11,8)	8,5(8-10,5)	0,396
RPA	3,2(2,2-3,8)	2,6(2,3-3,2)	0,411
LPA	2,8(2,3-3,1)	2,8(2,3-2,9)	0,402
RCA	1,4(1,2-1,9)	1,4(1,1-2)	0,509
LCA	1,5(1,3-1,7)	1,4(1,2-1,6)	0,417
Ascending aorta	9,7(9-12)	9(8,8-9)	0,029*
CW Doppler flow over AA	2,47(1,68-4)	1,62(1,38-1,88)	0,300
Descending aorta	7,5(5,8-8,5)	5,8(5-7)	0,011*
CW Doppler Descending aorta	2,33(1,55-3,7)	1,57(1,37-1,67)	0,171
E wave m/s	1,07(0,9-1,29)	1,2(1,13-1,3)	0,233
A wave m/s	0,82(0,75-0,95)	0,84(0,81-0,93)	0,550
Flow over AP	1,3(1-1,4)	1,48(1,4-1,48)	0,039*
IVSd	4(4-4,4)	4(4-4,5)	0,371
LVIDd	22(19-25)	19(18-20)	0,093
LVIDs	14(12-15,3)	12(11-13)	0,049*
LVPWd	4,3(3,4-4,6)	4,6(4,1-4,6)	0,149
FS%	37(35-39)	38(36-42)	0,489

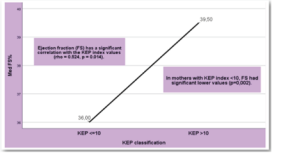
The correlation between KEP and Cardiovaskular Variables

Correlations		
Variable	Coefficient	KEP index
RCA	rho	-0,693*
	p	0,0047
A wave m/s	rho	,424*
	p	0,044
FS%	rho	,524*
	p	0,01

Only significant correlation are shown

There was a significant correlation of **LVEDs** and **mothers eating habits** (rho = -0.415, p = 0.044), whereby a better value LVEDs determined in infants whose mothers had worse eating habits.

Carotid Intima Media had moderate connection with nutrition intake on both of the carotids, whereby **the thicker intima** had a pregnant woman with **poor eating habits** (rho = -0.402, p = 0.03).



Conclusions

Dietary eating habits and oral health of pregnant woman have significant connection with some segments of cardiovascular system development. Eating habits have an impact on diameter of blood vessels and on flow. Unhealthy dietary plans will most probably led to bad oral health and presence of periodontitis, which could contribute to the CAIMT and the development of atherosclerosis.

References & Acknowledgements

- Atherosclerosis. 2015 Feb;238(2):380-7. doi: 10.1016/j.atherosclerosis.2014.12.029. Epub 2014 Dec 24. Intima media thickness measurement in children: A statement from the Association for European Paediatric Cardiology (AEPC) Working Group on Cardiovascular Prevention endorsed by the Association for European Paediatric Cardiology.
- Trivedi S, Lal N, Singhal R. Periodontal disaease during pregnancy. J Orofacial Sci 2015; 7:67.
- Mesihović-Dinarević S:"Prevention of Cardiovascular Disease from an Early Age", Journal of Cardiovascular Disease/Diagnosis, 2017; S:3, vol 5, issue 3, DOI : 10.4172/2329-9517.1000268, p 2-5.

FINANCIAL SUPPORT

AbelaPharm

AMICUS
a Swixx BioPharma company

amsal

POLIKLINIKA

ARBOR VITAE
DR. SARIĆ