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The Challenges of Detecting Risk Factors for the Development of Atherosclerosis

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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

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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.

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.

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 ☐

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.

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				

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 ☐		

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.

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.

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