

Prevention of Cardiovascular Disease from an Early Age

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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 atheromatous 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 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

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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/m². Obese people have a BMI greater than the 95th 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 its 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 of 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

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.

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