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Food and nutrition in the prevention of atherosclerosis

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Streszczenie

W związku, iż choroby układu sercowo – naczyniowego są najczęstszą przyczyną hospitalizacji (15%) i zgonów (46%) w Polsce, a także na świecie (31%) należy podjąć intensywne działania w zakresie profilaktyki schorzeń kardiologicznych we wszystkich grupach wiekowych. Profilaktyka żywieniowa miażdżycy przewiduje przede wszystkim ograniczenie spożycia produktów spożywczych zawierających: kwasy tłuszczowe, cholesterol, sól, cukry proste i białko pochodzenia zwierzęcego, a zwiększenie witamin, składników mineralnych, błonnika i substancji antyoksydacyjnych. Nawyki żywieniowe i stan odżywienia kobiet planujących ciążę mają istotny wpływ na jej przebieg, rozwój płodu i zdrowie dzieci w kolejnych latach życia. Wszystkim pacjentom kardiologicznym zaleca się prawidłowo zbilansowaną dietę, ustaloną przez dietetyka i dostosowaną do indywidualnych potrzeb pacjenta. Należy pamiętać, że oprócz diety, ważnym elementem terapeutycznego stylu życia pacjentów z miażdżycą jest aktywność fizyczna. Choroby układu krążenia stanowią bardzo duży problem zdrowotny w Polsce i na świecie. Sposób odżywiania odgrywa znaczącą rolę w patogenezie oraz profilaktyce miażdżycy.

Słowa kluczowe: żywność, żywienie, profilaktyka, miażdżyca

Abstract

Cardiovascular disease is the most frequent cause of hospitalization (15%) and death (46%) in Poland, as well as worldwide (31%), by reason of strenuous activity in the field of preventative healthcare in all age groups has to be taken. Preventative nutrition of atherosclerosis predicts mostly intake restriction of food containing: fatty acids, cholesterol, salt, monosaccharides and animal protein, while increasing intake of vitamins, minerals, fiber and antioxidant substances. Eating habits and nutritional status of women who are planning pregnancy have a crucial impact on its course, development of the fetus and children's health in later years of their life. For all of cardiac patients well balanced diet is advised. In preventative care of Cardiovascular Disease it is advised to apply the diet given by a certified dietician and adjusted to fit patient's needs. It is to remember, that besides a good diet, an important therapeutic factor of the patients with atherosclerosis is physical activity. Cardiovascular disease is a serious concern in Poland, as well as worldwide. Eating habits are playing a big role in pathogenesis and prevention of atherosclerosis.

Keywords: food, nutrition, prevention, atherosclerosis

Introduction

Every year cardiovascular disease (CVD) is cause of death of 17,7 million people, which accounts for 31% of deaths worldwide [1]. Cardiovascular disease is a heart and blood vessels disfunction, involving ischemic heart disease, arterial hypertension and atherosclerosis. Atherosclerosis is a chronic inflammatory process affecting aorta and medium sized arteries. It works by accumulating cholesterol calculi in the space between endothelium and muscle layer, which with time are being surrounded by fibrous elements of connective tissue, creating inflammatory focus. Besides inflammatory condition and oxidative stress a major factor being favorable to development of atherosclerosis is occurrence of large amounts of oxygenated lipoproteins of low density of LDL, which are being deposited on the walls of blood vessels. As a result of fibrosis and calcification, inflammation transforms into hard plaque, which is called "atherosclerotic plaque". Atherosclerotic plaque has a tendency to grow, causing narrowing, or even fully closing the vessels. Sudden block of blood flow in artery causes clinical syndromes such as heart attack or stroke.

European Society of Cardiology in guidelines updated in 2016, sensified two categories of risk factors of cardiovascular diseases – modifiable and non-modifiable. Non-modifiable risk factors involve: sex, age, negative family history, presence of cardiovascular diseases on atherosclerosis background and race. Modifiable risk factor are: arterial hypertension, diabetes and glucose intolerance, dyslipidemia, smoking, overuse of alcohol, chronic stress and psychosocial factors, low physical activity, incorrect nutrition and obesity [2].

Prevention

In connection with the fact that CVD is the most common cause of death (46%) [3] and hospitalization (15%) in Poland [4], intensive action in prevention of cardiovascular diseases in all age groups needs to be taken. Prevention of cardiovascular diseases needs to be implemented on level of general population through promoting healthy lifestyle, and on individual level – which means people with risk of CVD, or people with diagnosed CVD – by lifestyle change for health-enhancing and optimizing health risks [5]. Nutritional prevention of atherosclerosis projects mostly limiting intake of food of animal origin containing: fatty acids, cholesterol, salt, monosaccharides and animal based protein, while increasing intake of vitamins, minerals, fiber and antioxidant substances. In preventative care of CVD it is advised to apply the diet given by a certified dietician and adjusted to fit patient needs.

Diet

Information found in literature says, that the beginning of atherosclerosis process starts in childhood, or even in fetal life [6,7,8]. Eating habits and nutritional status of women planning pregnancy have crucial impact on its course, fetal development and health of the child in next years of life [9]. Since early ages diet has to be takes into consideration – one of the modifiable risk factors of atherosclerosis occurrence. Forming appropriate children's eating habits should be started by parents. Developing habits in early stages of childhood should let maintain health and good condition in adult's life. From early ages, diet is some sort of indicator of adults health.

Risk factors of atherosclerosis resulting from bad eating habits:

- diet with too high caloric value
- fat intake higher than 30% of daily intake
- animal based fat (saturated fat) intake higher than 15%
- intake of cholesterol higher than 300mg/day
- content of monosaccharides higher than 10%
- deficit of copper, iron, zinc, chrome, selenium, magnesium, fiber
- deficit of antioxidant vitamins (A, C, E, beta-carotene)

FATTY ACIDS AND CHOLESTEROL

Crucial part of CVD prevention is a type of fatty acid we ingest. Supply of fat should not be surpassing 30% of caloric value. Trans fatty acids (present in margarine and bakery items) are harmful because of adverse influence of total cholesterol concentration and high density lipoprotein fraction (HDL-C). In American Heart Association (AHA) and American College of Cardiology's (ACC) directives regarding hypercholesterolemia treatment for decreasing risk of atherosclerosis cardiovascular incidents in adults, great attention has been brought to lowering concentration of low density lipoprotein fraction (LDL-C) with the aim of preventing CVD [10]. In prevention and treatment of CVD it is advised to: intake the lowest possible amount of trans acids [11]. Intake of saturated fats should be cut down to 10% maximum of received calories and should be substituted with polyunsaturated fatty acids (WNKT), which amount should be within 250 to 500 mg/d. Fatty acids n-6, derived from plants and fatty acids n-3, present mostly in fish oil, have preventative impact on cardiovascular system, as well as working antithrombotic, antiarrhythmic, anti-inflammatory, while also lowering concentration of triglycerides. Chowdhury and associates have shown 6% decrease of risk of brain stroke within group of people, which were consuming 2 to 4 portions of fish weekly, in reference to people consuming less than 1 portion per week [12].

SODIUM

In instances of higher risk of atherosclerosis, cutting down on sodium chloride is crucial. Excess of salt in diet conduce arterial hypertension – one of modifiable risk factors CVD [13]. World Health Organization (WHO) states that minimizing salt intake in worldwide population is a priority in public health. Reducing sodium intake to 75-100 mmol/day (4,35-5,8 g NaCl) cause lowering blood pressure by 2-8 mm Hg. To lower the blood pressure, while at the same time lowering risk of cardiovascular diseases, brain stroke and heart attack, patient's diet should not contain more than 5 g of salt/day (≤ 85 mmol of sodium) [14,15]. Some scholars are of the opinion, that lowering supply of salt to 3g/d might have other health benefits [16].

PROTEIN

Source of protein in cardiological patient's diet can be lean meat and fermented dairy products, yet the most beneficial is increasing plant based protein. According to Polish Society of Dietetics protein content in diet should be fitted accordingly to patient's health state.

FIBER

Fiber is recommended in dietary prophylaxis of circulatory system. It is advised for adult's diet to contain 25g/day and 38g/day for women and men accordingly. Some researchers in their studies have proved, that every additional 7g of fiber consumed daily is lowering, by 9%, risk of developing cardiovascular diseases [17]. Researches are showing that consuming additional 10g/day of fiber is lowering, by 16%, risk of brain stroke [18].

MINERALS

Supply of minerals in diet, such as potassium, magnesium or calcium should be fitted to patient's individual need and medicinal treatment.

VITAMINS

Supply of vitamins cardiological patients should be consistent with nutritional norms for healthy people. Vitamins should be coming from food.

ANTI-ATHEROSCLEROSIS FLAVANOIDS

Flavonoids show antioxidant, anti-inflammatory, anticancer, detoxing, anti-arythmics, antihypertensive and anti-atherosclerosis activity. Flavonoids can reduce inflammatory reaction emerging in atherosclerosis processes of blood vessels by inactivating reactive oxygen species (ROS) and nitric oxide (NO) as well as suppressing leukocytes from reaching inflammation area. They also show protective activity for blood plasma lipoproteins. Due to chelation, amount of ROS in blood plasma is going down, which prevents oxygenation of LDL fraction, and at the same time it is protecting endothelium cells against atherosclerosis plaque forming.

CARBOHYDRATES

Monosaccharides are an energy source for human body. Although, limiting intake of easily digestible carbohydrates, especially fructose and sucrose, is beneficial. In WHO guidelines, it is advised to limit sugar intake to less than 10% of calories supplied from carbohydrates [19]. It is worth consuming products rich in complex carbohydrates, which are digested slowly. That allows glucose levels in blood to stay stable. Wholegrain products, vegetables and fruits are recommended, due to their high content of vitamins, minerals and other antioxidant ingredients, which are desired in daily diet.

Consuming carbohydrate products causes increase of glucose levels in blood. Hence why researchers formulated glycemic index indicator. Glycemic index was defined as "surface area under curve of glucose concentration in blood, developed in two hours after ingesting product containing 50g of assimilable carbohydrates and it is expressed in reference to surface area of glycemic curve formed after ingesting 50g of pure glucose" [20].

Food classified according to glycemic index:

- Low IG (55% or less)
- Medium IG (between 55% and 70%)
- High IG (70% or higher)

Frequent ingestion of food with high IG, such as: baked potatoes (95%), parabolic rice (85%), pumpkin (75%), watermelon (72%), may cause developing carbohydrate metabolism disorders, which many times are cause of cardiovascular diseases.

All cardiological patients should be given balanced diet. The most commonly advised diet is Mediterranean diet, which is based on fresh vegetables and fruits, wholegrain products, legumes, vegetable oils and fish. Diet recommended in treatment and prevention of circulatory system diseases, mainly in arterial hypertension, is DASH diet (Dietary Approaches to Stop Hypertension) This diet has low sodium intake, as well as proper dosage of calcium, potassium and magnesium. It is rich in fiber and antioxidants, while lacking in fatty acids and cholesterol. DASH diet is composed mostly of low fat dairy, fruits and vegetables, wholegrain products, seeds and nuts, lean meat and fish. Lowering blood pressure, concentration of total cholesterol, LDL cholesterol and triglycerides.

Physical activity

It is to remember, that besides diet, crucial element of therapeutic lifestyle for patients with atherosclerosis is physical activity. Done regularly is base of effective prophylaxis of CVD. It is advised to do 2,5 - 5 hours of medium intensity training per week, or at least 30-60 minutes

of physical activity throughout the week. Frequency, intensity and duration of physical activity should be based on patient's health. Patients, who cannot perform longer and higher intensity workouts, are advised to do low intensity physical exercises, such as going for a walk, or gardenwork [22].

Summary

- Cardiovascular diseases are high health concerns in Poland and worldwide
- Nutrition plays major role in pathogenesis on prophylaxis of atherosclerosis.

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