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DASH DIJETA U PREVENCIJI I LEČENJU ARTERIJSKE HIPERTENZIJE

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SAŽETAK

Procenjuje se da od arterijske hipertenzijeu Republici Srbiji boluje skoro polovina odraslog stanovništva. Adekvatnom dijetoterapijom može se uspešno kontrolisati i sprečiti razvoj arterijske hipertenzije i njenih komplikacija. Dijetetskipristupi za zaustavljanje hipertenzije (engl. *Dietary Approaches to Stop Hypertension* – DASH) predstavljaju jedan od najefikasnijih načina ishrane u kontroli hipertenzije, dovode do prosečnog smanjenja arterijskog krvnog pritiska za 4 do 15 mmHg, postizanja optimalne telesne mase i lipida u serumu. DASH dijeta promoviše pre svega racionalnu i uravnoteženu ishranu. Kako bi se principi DASH dijete približili pacijentima, neophodno je adekvatno angažovanje nutricioniste - dijetetičara u radu sa visokorizičnim pacijentima. U radu su predstavljene praktične preporuke za implementaciju DASH dijete i priložene su ilustracije koje mogu da se koriste za unapređenje savetodavnog rada sa pacijentima na nivou primarne zdravstvene zaštite.

Ključne reči: hipertenzija, nutricionista, dijetetičar, edukacija, DASH dijeta

Uvod

Kardiovaskularne bolesti (KVB) predstavljaju značajan javnozdravstveni problem širom sveta i u Srbiji. Bolesti srca i krvnih sudova sa učešćem od 47,3% u svim uzrocima smrti, vodeći su uzrok umiranja odraslog stanovništva u Republici Srbiji. Tokom 2020. godine u Srbiji je zbog kardiovaskularnih bolesti život izgubilo preko 55 hiljada osoba (1,2).

Arterijska hipertenzija predstavlja najčešći oblik KVB koja se manifestuje sistolnim krvnim pritiskom ≥ 140 mmHg i/ili dijastolnim pritiskom ≥ 90 mmHg (3). Prema istraživanju zdravlja stanovništva u Srbiji (2019), hipertenzija je evidentirana kod skoro polovine (46%) odraslog stanovništva (4). Za postavljanje dijagnoze arterijske hipertenzije, neophodno je registrovati povišene vrednosti krvnog pritiska u dva odvojena merenja (3,4).

Poznato je da nepravilna ishrana ugrožava vitalni kapacitet srca i krvnih sudova. Deficitarna ishrana dovodi do slabljenja srčanog mišića i usporenog protoka krvi (5). Sa druge strane, prekomeran unos zasićenih masti, prostih šećera i soli, kao i energetski suficit, dovodi do ubrzane ateroskleroze i povećanja rizika za nastanak hipertenzije, oštećenja vida, bubrega, tromboze, infarkta miokarda, cerebrovaskularnog insulta i dekompenzacije srca (6). Prevencija kardiovaskularnih faktora rizika, od kojih je većina povezana sa načinom ishrane, smanjuju rizik za nastanak hipertenzije i drugih KVB (7).

Cilj ovog rada je sagledavanje aktuelnih preporuka za prevenciju arterijske hipertenzije dijetoterapijom i značaja nutricioniste-dijetetičara u medicinskoj nutritivnoj prevenciji na nivou primarne zdravstvene zaštite.

Lečenje arterijske hipertenzije

Terapijski ciljevi u lečenju hipertenzije, zavise od uzrasta pacijenta, prisutnih komorbiditeta i uspešnosti tretmana. Ciljne vrednosti krvnog pritis-

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DASH DIET IN THE PREVENTION AND TREATMENT OF ARTERIAL HYPERTENSION

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SUMMARY

It is estimated that almost half of the adult population suffers from arterial hypertension in the Republic of Serbia. The development of arterial hypertension and its complications can be successfully controlled and prevented. The Dietary Approaches to Stop Hypertension, that is, the DASH diet is one of the most efficient dietary eating patterns in the control of hypertension. It leads to an average reduction in blood pressure by 4 to 15 mmHg, supports the optimization of body mass and lipids in the blood serum. The DASH diet promotes rational and balanced diet. In order to bring principles of the DASH diet closer to patients, it is necessary to adequately engage a nutritionist - dietician in working with high-risk patients. The paper presents practical recommendations for the implementation of the DASH diet and includes illustrations that serve to improve counseling work with patients in primary health care.

Key words: hypertension, nutritionist, dietitian, education, DASH diet

Introduction

Cardiovascular diseases (CVD) represent a significant public health problem worldwide, and in Serbia, as well. Disorders of the heart and blood vessels are the leading cause of death of adults in the Republic of Serbia, representing 47.3% of all deaths. In 2020, more than 55 thousand people died from cardiovascular diseases in Serbia (1,2).

Arterial hypertension is the most frequent form of CVDs, which is manifested by systolic blood pressure > 140 mmHg and/or diastolic pressure > 90 mmHg (3). According to the population health research in Serbia (2019), hypertension was registered in almost half (46%) of adult population (4). In order to establish the diagnosis of arterial hypertension, it is necessary to register increased values of blood pressure in two separate measurements (3,4).

It is known that the irregular diet jeopardizes the vital capacity of heart and blood vessels. Nutritional deficiency leads to the weakening of heart muscle and slowing down of blood flow (5). On the other hand, the excessive intake of saturated fats, simple sugars and salts, as well as excess energy lead to the accelerated atherosclerosis and the increased risk of hypertension, vision damage, kidney damage, thrombosis, myocardial infarction, cerebrovascular insult and cardiac decompensation (6). The prevention of cardiovascular risk factors, the majority of which is associated with diet, reduces the risk of hypertension and cardiovascular diseases (7).

The aim of this paper is to perceive current recommendations for the prevention of arterial hypertension with the help of diet therapy, as well as the significance of a nutritionist – dietician in medical nutritional prevention at the level of primary healthcare.

The treatment of arterial hypertension

The goals of therapy in the treatment of hypertension depend on patients' age, present comorbidities and the successfulness of the

ka za hipertenzivne bolesnike prvenstveno se odnose na snižavanje krvnog pritiska ispod 140/90 mmHg. Za osobe mlađe od 65 godina preporučeno je sniženje sistolnog krvnog pritiska na 120-129 mmHg, dok kod starijih osoba ciljna vrednost sistolnog krvnog pritiska treba da bude u opsegu 130-139 mmHg. Vrednost dijastolnog krvnog pritiska za sve pacijente treba da iznosi ispod 80 mmHg (8).

Pored adekvatne farmakološke terapije, u lečenju arterijske hipertenzije koriste se nefarmakološke mere (3). U nefarmakološke mere lečenja hipertenzije spadaju adekvatna ishrana, smanjenje nivoa stresa, adekvatna fizička aktivnost, postizanje optimalne telesne mase, kao i eliminisanje drugih faktora rizika poput konzumiranja alkohola i duvana.

Promena stila života jeste prva karika u lečenju prema algoritmu lečenja hipertenzije evropskog Društva za kardiologiju (engl. *Europen Society of Cardiology*). Sprovodi se počev od utvrđenih prehipertenzivnih vrednosti krvnog pritiska sa ciljem da se spreči dalje povećanje vrednosti krvnog pririska i da se smanji kardiovaskularni rizik (8).

Prevencija arterijske hipertenzije adekvatnom ishranom

Adekvatna, uravnotežena i raznovrsna ishrana može doprineti prevenciji arterijske hipertenzije ili stabilizaciji, kao i sprečavanju komplikacija. Takođe, uravnotežena ishrana doprinosi postizanju optimalne telesne mase i prevenciji drugih masovnih nezaraznih oboljenja.

Medicinska nutrititvna prevencija KVB podrazumeva uravnoteženu i racionalnu ishranu baziranu pretežno na namirnicama biljnog porekla. Osnov ishrane treba da čine integralne žitarice, voće i povrće, posebno leguminoze odnosno visok unos dijetnih vlakana, flavonoida, fenola i drugih fitohemikalija. Potrebno je ograničiti unos soli, rafinisanih žitarica, crvenog mesa, mesnih prerađevina, slatkiša i grickalica, jer je prekomeran unos ovih namirnica povezan sa češćom pojavom KVB i cerebrovaskularnih oboljenja (6,9,10). U cilju nutritivne prevencije KVB preporučuje se unos mesa, peradi i ribe uz izbegavanje pripremanja ovih namirnica prženjem. Unos mono- i poli-nezasićenih masnih kiselina putem ribe, maslinovog ulja i orašastog voća je važan princip nutritivne prevencije KVB.

Najpoznatiji način ishrane koji se preporučuje u okviru prevencije i kontrole hipertenzije jeste dijetetski pristup za zaustavljanje hipertenzije (engl. *Dietary Approaches to Stop Hypertension* - DASH), odnosno DASH dijeta (9,11).

DASH piramida ishrane

Značajna komponenta DASH dijete jeste ograničen unos kuhinjske soli tj. natrijum-hlorida i to najviše 2g dnevno za osobe sa potvrđenom hipertenzijom, odnosno do 5 g za ostalu populaciju. Procenjuje se da se svakodnevnom ishranom unosi prosečno oko 15-20 g soli dnevno. Važan izvor kuhinjske soli su namirnice koje sadrže velike količine skrivene soli, kao što su suhomesnati i konzervisani proizvodi (11-13).

Samo polovina osoba sa visokim krvnom pritiskom je osetljiva na smanjen unos soli (6,9,10,13). U polovini slučajeva redukcija unosa soli nije efikasna u snižavanju povišenog krvnog pritiska. Pridržavanjem navedenih preporuka mogu se eliminisati faktori rizika drugih srčanih i metaboličkih oboljenja. Smanjenje unosa soli za 1 g dnevno smanjuje rizik za razvoj KVB za četvrtinu (6,9,10,13).

Obilje dijetnih vlakana, kalijuma i magnezijuma, koji se unose putem DASH ishrane pomaže vezivanju dela holesterola u cirkulaciji i podstiče peristaltiku creva, dok redukcija unosa soli sprečava zadržavanje prekomerne količine tečnosti u telu. Sve navedeno rezultira smajenjem krvnog pritiska i prekomerne telesne mase dugoročno (6,9,11-13). Prevalencija hipertenzije je dva puta češća kod prekomerno uhranjenih nego kod normalno uhranjenih osoba. Smanjivanjem telesne mase dolazi do rasterećivanja srca i krvnih sudova. Arterijski krvni pritisak može se sniziti za 2-4 mmHg po izgubljenom kilogramu telesne mase (6).

Pored adekvatanog izbora namirnica, važno je da obroci budu redovni, količinski manji, a češći kako bi se tokom dana obezbedio dovoljan energetski unos i iskoristljivost hranljivih materija bez naglog opterećivanja organizma (14).

Ilustrovani principi DASH dijete koji su pogodni za savetodavni rad i pripremu edukativnog materijala za pacijente prikazani su na slici 1 (6,9,11-13). Preporuke su bazirane za energetski unos od 2000 kalorija dnevno.

Uticaj DASH dijete na krvni pritisak, glikemiju i lipidni status

Studije su pokazale da DASH dijeta ima uočljive pozitivne efekte već nakon 14 dana od početka

treatment. Targeted values of blood pressure for hypertensive patients primarily refer to lowering blood pressure below 140/90 mmHg. It is recommended that systolic blood pressure should be lowered to 120-129 mmHg in people younger than 65 years, while in older people the targeted value of systolic blood pressure should be within the range 130-139 mmHg. The value of diastolic blood pressure for all patients should be below 80 mmHg (8).

An addition to adequate pharmacotherapy, non-pharmacological measures are used in the treatment of arterial hypertension (3). Non-pharmacological measures related to the treatment of hypertension include adequate diet, reducing stress levels, adequate physical activity, achieving optimal body mass, as well as the elimination of other risk factors such as alcohol consumption and tobacco use.

Lifestyle changes are the first step in the treatment according to the treatment algorithm for hypertension of the European Society of Cardiology. It is conducted starting from the established pre-hypertensive values of blood pressure aimed at preventing further increase in the values of blood pressure and decreasing cardiovascular risk (8).

The prevention of arterial hypertension with the help of adequate diet

An adequate, balanced and varied diet may contribute to the prevention of arterial hypertension or stabilization, as well as to the prevention of complications. Also, a balanced diet contributes to achieving the optimal body mass and prevention of other major non-communicable diseases.

The medical nutritional prevention of CVDs means the balanced and rational diet, which is mainly a plant-based diet. This diet should be made up of whole grains, fruit and vegetables, especially legumes, that is, the high intake of dietary fibers, flavonoids, phenols and other phytochemicals. The intake of salt, refined grains, red meat, meat products, sweets and snacks should be limited, because the excessive intake of these products is associated with the more frequent occurrence of CVDs and cerebrovascular diseases (6,9,10). The intake of meat, poultry and fish, which should not be fried, is recommended with the aim of nutritional preventing of CVD. The intake of mono- and poly-unsaturated fatty acids via fish, olive oil, and nuts is the principle of nutritional prevention of CVD.

The most famous dietary eating pattern which is recommended within the prevention and control of hypertension is a dietary approach to stop hypertension, that is, DASH diet (9,11).

DASH food pyramid

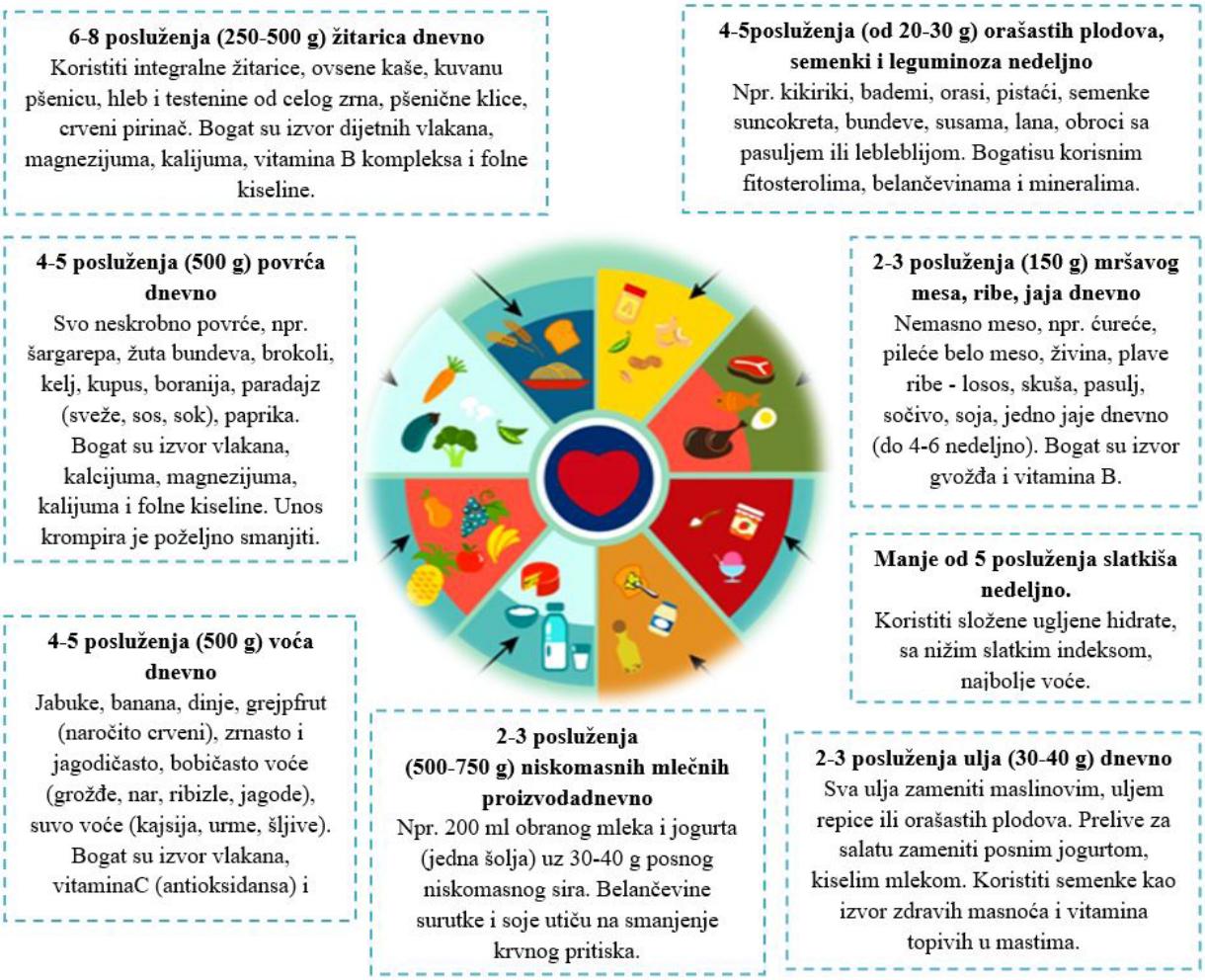
A significant component of DASH diet is the limited intake of table salt, that is, sodium-chloride up to 2 g a day for persons with the confirmed hypertension, that is, 5 g for the rest of the population. It is estimated that about 15-20 g of salt are taken every day. An important source of table salt is food rich in high amounts of hidden salt, such as cured meat products and preserved products (11-13).

Only one half of persons with hypertension is sensitive to the reduced intake of salt (6,9,10,13). In 50% of cases, the reduction of salt intake is not efficient in lowering high blood pressure. By respecting the above mentioned recommendations, risk factors for other cardiac and metabolic diseases may be eliminated. By reducing the salt intake for 1 g a day, the risk of CVD is reduced by 25% (6,9,10,13).

The abundance of dietary fibers, potassium and magnesium, which are taken via DASH diet, help by binding to cholesterol particles in the circulation and enhance the intestinal peristalsis, while the reduction of salt intake prevents excess water retention. All the above mentioned results in lowering of blood pressure and excessive body weight on a long-term basis (6,9,11-13). The prevalence of hypertension is two times more frequent in overweight than in persons with normal weight. The reduction of body weight leads to relaxing of heart and blood vessels. Arterial blood pressure may be lowered for 2-4 mmHg for each lost kilogram of body mass (6).

In addition to the adequate selection of food, meals should be regular, smaller in quantity, and more frequent in order to secure a sufficient energy intake during the day and usability of nutrients without sudden burdening the body (14).

The illustrated examples of DASH diet which are suitable for counseling work and preparation of educational materials for patients are presented in figure 1 (6,9,11-13). The recommendations are based on the energy intake of 2000 calories a day.



Slika 1. Principi DASH dijete
(Preuzeto i adaptirano: https://bariel-med.com/bmc-medical-quicktips/)

primene (9). Primena DASH dijete može dovesti do snižavanja krvnog pritiska za 8-14 mmHg, smanjenja telesne mase, snižavanja nivoa ukupnog holesterola u krvi (7).

Ispitivanja o uticaju DASH dijete i smanjenog unosa natrijuma (od 50-150 mmol/dan pri energetskom unosu od 2100 kcal), ukazuju da DASH dijeta rezultira smanjenjem sistolnog krvnog pritiska za 5,10 ili čak 20 mmHg. Kod većeg stepena hipertenzije (≥ 150 mmHg) veće je i smanjenje sistolnog krvnog pritiska po uvođenju DASH dijete u poređenju sa konvencionalnom ishranom (15).

Meta-analiza o efektima DASH dijete pokazuje da pomenuti način ishrane dovodi do prosečnog smanjenja nivoa krvnog pritiska od 3,5 mmHg kod normotenzivnih i kod osoba sa hipertenzijom. Zaključak pomenute studije je da DASH dijeta ima veći uticaj na smanjenje sistolnog i dijastolnog krvnog pritiska kod osoba mlađih od 50 godina u odnosu na stariju populaciju. Značajnije smanjenje sistolnog i dijastolnog krvnog pritiska evidentirano je u studijama u kojima je dnevni unos natrijuma bio iznad 2400 mg/dan u odnosu na studije sa niskim unosom natrijuma (ispod 2400 mg) (16).

U studiji koja je upoređivala efekte tronedeljne konvencionalne ishrane, standardne DASH dijete i modifikovane HF-DASH dijete (dijeta sa niskim sadržajem ugljenih hidrata i visokim sadržajem masti), utvrđeno je da se kod ispitanika na DASH i HF-DASH dijeti sistolni krvni pritisak smanjio za prosečnih 4 mmHg, a dijastolni za 0,9 mmHg. Kod ispitanika na DASH dijeti značajno se smanjio LDL-holesterol i HDL-holesterol u poređenju sa ispitanicima koji su se hranili konvencionalno. Kod ispitanika na HF-DASH dijeti značajno se smanjio nivo triglicerida, koncentracija VLDL čestica i povećao nivo HDL-holesterola u poređenju sa ispitanicima na DASH dijeti, što ukazuje da ishrana bogata mastima i siromašna ugljenim hidratima može imati pozitivan uticaj na nivo arterijskog krvnog pritiska bez značajnog povećanja LDL-holesterola (Tabela 1) (17).

Figure 1. The principles of the DASH diet
(Retrived and adapted from: https://bariel-med.com/bmc-medical-quicktips/)

The influence of the DASH diet on blood pressure, glycemia and lipid status

Studies have shown that the DASH diet has visible positive effects within 14 days of starting the plan (9). The application of the DASH diet may lead to lowering of blood pressure for 8-14 mmHg, reduction of body mass, lowering of the level of total cholesterol in blood (7).

The investigation of the influence of DASH diet and reduced intake of sodium (from 50-150 mmol/day during the energy intake of 2100 kcal) has shown that the DASH diet results in the lowering of systolic blood pressure for 5, 10 or even 20 mmHg. In case of higher hypertension (>150 mmHg), lowering of systolic blood pressure is greater after the introduction of DASH diet in comparison to conventional diet (15).

A meta-analysis of the effects of the DASH diet has shown that it leads to the average lowering of blood pressure level of 3.5 mmHg in normotensive persons and in persons with hypertension. The conclusion of the above mentioned study is that the DASH diet has a greater influence on the lowering of systolic and diastolic blood pressure in persons younger than 50 years in comparison to the elderly. A more significant lowering of systolic and diastolic blood pressure was recorded in studies, in which a daily intake of sodium was above 2400 mg/day in comparison to studies with the low intake of sodium (below 2400 mg) (16).

In a study that compared the effects of a three-week conventional diet, the standard DASH diet and modified HF-DASH diet (diet with the low amount of carbohydrates and high contents of fat), it has been found that in participants on the DASH and HF-DASH diet, systolic blood pressure was lowered for 4 mmHg on average, while diastolic for 0.9 mmHg. In participants who were on the DASH diet, LDL-cholesterol and HDL-cholesterol were significantly lower in comparison to participants who used a conventional diet. In participants on

Tabela 1. Nutritivni sastav konvencionalne ishrane, DASH i HF-DASH dijete i njihov uticaj na nivo krvnog pritiska i lipoproteinski status (preuzeto i adaptirano prema referenci broj 17)

	HF-DASH dijeta	DASH dijeta	Konvencionalna ishrana
Ugljeni hidrati (% od dnevnog unosa)	43	55	47
Belančevina (% od dnevnog unosa)	18	17	14
Masti (% od dnevnog unosa)	40	27	38
Sistolni krvni pritisak (mmHg)	125,0	125,4	128,8
Dijastolni krvni pritisak (mmHg)	79,0	78,3	81,2
Ukupan holesterol (mmol/L)	4,53	4,51	4,76
LDL-holesterol (mmol/L)	2,65	2,60	2,81
HDL-holesterol (mmol/L)	1,36	1,32	1,40
Trigliceridi (mmol/L)	1,15	1,32	1,20

Uočen je pozitivan uticaj DASH dijete u kontrolisanju dijabetesa i hiperglikemije, koja je značajan faktor rizika za razvoj i progresiju KVB (18-20).

Nutrijenti u kontrolisanju arterijske hipertenzije

Postoji širok spektar mikronutrijenta i namirnica čiji povećan ili smanjen unos ima uticaj na pojavu KVB. Iako su poznati kardioprotektivni efekti pojednih nutrijenata i namirnica, većina autora ostaje bez konačnog zaključka o njihovim efektima na prevenciju KVB zbog nemogućnosti kontrolisanja iskoristljivosti nutrijenata u organizmu.

Flavonoidi, koji se nalaze u voću i povrću, zelenom i crnom čaju, doprinose snižavanju arterijskog krvnog pritiska verovatno putem antioksidativnog dejtva (21). Resveratrol i flavonoidi prisutni u semenkama grožđa i mesu, i kvercetin prisutan u luku, borovnicama i jabukama, mogu znatno da utiču na stabilizaciju krvnog pritiska, ali i na prevenciju KVB (22). Istraživanja su pokazala da antioksidansi iz grožđa utiču na smanjenje sistolnog i dijastolnog arterijskog pritiska za 5-6%, dok se ukupan nivo holesterola u krvi smanjuje za 14% (23).

Omega-3 masne kiseline imaju antiinflamatorno dejstvo i utiču na funkciju endotela krvnih sudova čime se poboljšava vazodilatacija kod osoba sa metaboličkim sindromom. Pregledni radovi pokazuju da povećanje unosa omega-3 polinezasićenih masnih kiselina doprinosi smanjenju ukupnih triglicerida u krvi i rizika od smrtnosti usled koronarne bolesti srca (24). Rastvorljiva dijetna vlakna, koja se nalaze u ovsenim pahuljicama, jagodama, sočivu, pasulju i mnogim drugim namirnicama, vezuju holesterol smanjujući rizik od hiperlipidemije i KVB. Svakodnevni unos rastvorljivih dijetnih vlakana dovodi do snižavanja ukupnog holesterola u krvi. Dijetna vlakna imaju ulogu u apsorpciji u tankom crevu smanjujući glikemijski indeks namirnica i pospešuju peristaltiku u debelom crevu gde dolazi do njihove fermentacije (25). Visok unos kalijuma može doprineti smanjenju arterijskog krvnog pritiska za 2-4 mmHg. Kalijum se nalazi u svežem voću i povrću poput blitve, spanaća, kelja, peršuna, šampinjona, banana, trešanja, dinje i grožđa (26). Veliki broj biljnih čajeva, poput čaja od peršuna ili maslačka, deluje diuretski što doprinosi i smanjenju arterijskog krvnog pritiska. Salate od rukole i celera imaju slično dejstvo. Konzumacija cvekle u vidu salate ili soka dovodi do smanjenja nivoa holesterola u krvi za 40% (27). Fitoestrogeni su materije biljnog porekla koji u organizmu izazivaju efekte slične estrogenu. Najpoznatiji izvor pomenutih materija su izoflavoni iz soje. Umeren unos utiče na smanjenje rizika od KVB i malignih bolesti (28). Vitamin D iz ribe i jaja ima ulogu u regulaciji povišenog krvnog pritiska. Povišen homocistein u plazmi, koji je povezan sa pojavom periferne arterijske bolesti, može značajno da se smanji putem DASH dijete bogate povrćem i folatima (29).

Uloga nutricioniste-dijetetičara u prevenciji i lečenju arterijske hipertenzije

Nutricionisti-dijetetičari imaju značajnu ulogu u prevenciji i lečenju masovnih nezaraznih oboljenja posebno na nivou primarne zdravstvene zaštite. Zajedno sa medicinskim sestrama, nutri-

Table 1. Nutrient composition of conventional diet, DASH and HF-DASH diet and influence on blood pressure level and lipoprotein status (retrieved and adapted from reference number 17)

	HF-DASH diet	DASH diet	Conventional diet
Carbohydrates (% of daily intake)	43	55	47
Protein (% of daily intake)	18	17	14
Fats (% of daily intake)	40	27	38
Systolic blood pressure (mmHg)	125.0	125.4	128.8
Diastolic blood pressure (mmHg)	79.0	78.3	81.2
Total Cholesterol (mmol/L)	4.53	4.51	4.76
LDL-cholesterol (mmol/L)	2.65	2.60	2.81
HDL-cholesterol (mmol/L)	1.36	1.32	1.40
Triglycerides (mmol/L)	1.15	1.32	1.20

the HF-DASH diet the level of triglycerides was significantly lower, as well as the concentration of VLDL particles, while the level of HDL-cholesterol increased in comparison to the participants on the DASH diet, which indicates that the diet rich in fats and lower in carbohydrates may have a positive effect on the level of arterial blood pressure without a significant increase in LDL cholesterol (Table 1) (17).

A positive influence of the DASH diet was noticed regarding the control of diabetes and hyperglycemia, which is a significant risk factor for the development and progression of CVD (18-20)

Nutrients in the control of arterial hypertension

There is a wide range of micronutrients and foods, whose increased or reduced intake has influence on the occurrence of CVD. Although cardio-protective effects of certain nutrients and foods are known, most authors have not made final conclusions on their effects on the prevention of CVDs due to the impossibility of controlling the usability of nutrients in the body.

Flavonoids that are present in fruits and vegetables, green and black tea contribute to lowering of arterial blood pressure probably via their antioxidative effect (21). Resveratrol and flavonoid present in grape seeds and meat, quercetin present in onions, blueberries and apples, may significantly affect the stabilization of blood pressure, as well as the prevention of CVD (22). The research has shown that antioxidants from grapes influence lowering of systolic and diastolic blood pressure by 5-6%, while the total level of cholesterol is reduced for 14% (23).

Omega-3 fatty acids have anti-inflammatory effect and influence the endothelial function of blood vessels, thus enhancing the vasodilatation in persons with metabolic syndrome. Review articles show that the increase of the intake of omega-3 polyunsaturated fatty acids contributes to the lowering of total triglycerides in blood and the risk of CVD mortality (24). Soluble dietary fibers, which are present in oat meals, strawberries, lentils, beans and other foods, bind to cholesterol thus reducing the risk of hyperlipidemia and CVDs. Daily intake of soluble dietary fibers leads to the lowering of total cholesterol in blood. Dietary fibers have a role in the absorption in small intestines, thus reducing the glycemic index of foods and enhancing peristalsis in the colon, where their fermentation happens 925). The high intake of potassium may contribute to the lowering of arterial blood pressure for 2-4 mmHg. Potassium is present in fresh fruit and vegetables such as chard, spinach, Savoy cabbage, parsley, mushrooms, bananas, sour cherries, melon and grapes (26). A large number of teas, such as tea made of parsley or dandelion, have a diuretic effect, thus contributing to the lowering of arterial blood pressure. Salads, which are made of arugula and celery, have a similar effect. The consumption of beetroot in the form of salad or juice leads to the lowering of cholesterol level in blood by 40% (27). Phytoestrogens are plant compounds

Tabela 2. Preporučene namirnice kod povišenog krvnog pritiska prema DASH dijeti (13,14,32)

Namirnice	Preporučeno	Umereno	Izbegavati
Žitarice i proizvodi	Integralne žitarice, ovas, ječam, raž, pšenica, heljda, integralni pirinač, proso, palenta. Integralne testenine i neslan crni hleb.	Bele/rafinisane žitarice (beli pirinač, testenina, hleb od belog brašna). Dve kriške hleba sadrže preko 1,5 g kuhinjske soli.	Pekarski proizvodi, lisnata testa, peciva, proizvodi od belog brašna sa dodatkom jaja, punomasnog mleka ili maslaca.
Voće	Sveže, sezonsko voće ili smrznuto. Trešnje, višnje, kajsije, jabuke i ostalo voće. Bogato je vitaminom C, vlaknima.	Voće sa puno šećera (ananas, krompir, lubenica). Konzervisano, suvo ili ušećereno voće, marmelade.	Prženo voće, voće pripremljen sa slatkom pavlakom.
Povrće	Sveže sezonsko povrće, ili kuvano, dinstano, smrznuto povrće. Krompir je dobar izvor kalijuma, a siromašan natrijumom.	Konzervisano povrće (isprati pre upotrebe). Npr. 100 g konzervisanog graška sadrži 0,7 g soli, dok sveži grašak ne sadrži so.	Prženo i pohovano povrće, povrće pripremljen sa pavlakom, sirom, maslacem. Npr. konzerviran paradajz u proseku sadrži 2,2 g soli u pola šoljice proizvoda.
Mleko i proizvodi	Obrano mleko (manje od 2% mlečne masti), fermentisani mlečni proizvodi, jogurt, kefir, sveži posni sir, zrnasti sir, surutka. Iako mlečni proizvodi sadrže natrijum, vredan su izvor belančevina.	Četvrt masni sirevi (15–25 % m.m.). Npr. mozzarella, koja u 60 g proizvoda sadrži 0,7 g soli.	Punomasno mleko i fermentisani mlečni proizvodi, punomasni, zreli, slani sirevi, mlečni sladoled. Npr. 60 g feta sira sadrži 2,3 g soli.
Meso, riba, jaja	Pileće i ćureće belo meso - bez kožice. Sve vrste (plave, morske) nemasne ribe - sardele, skuše; kuvana jaja, belance jajeta.	Plodovi mora (školjke, rakovi, lignje), mršava svinjetina, govedina, teletina, jagnjetina. 4-5 jaja nedeljno, uključujući i one koje se koriste za pripremu jela. Pileće, ćureće šunke, npr. u 60g* proizvoda sadrže 0,85 g soli. **60 g predstavlja prosečno posluženje ovih proizvoda*	Masno meso –svinjetina, teletina, jagnjetina, govedina, iznutrice, perad sa kožicom. Prženo, pohovano meso/ riba, i meso pripremljeno u dubokom ulju/masti. Pržena jaja, kajgana. Suhomesnati proizvodi. Npr. 60 g pršute sadrži 3,2 g soli; dok čajna salama u 60 g sadrži 2,4 g soli, dve viršle (130 g proizvoda) sadrže 3,1 g soli.
Mahunarke	Grašak, pasulj, sočiva, leblebije, soja pripremljeni sa malo ulja u obliku variva i salata (ukoliko ne izazivaju nadutost).	Konzervisane mahunarke (isprati pre upotrebe).	Mahunarke pripremljene u varivu sa zaprškom, masnim mesom i sa puno ulja/masti.
Orašasto voće i semenke	Bademi, orasi, lešnik, semenke bundeve, lana, suncokreta.		Ušećereno i usoljeno orašasto voće i semenke.
Ulja i masti	Maslinovo i bundevino ulje.	Suncokretovo, repičino i ostala biljna ulja, meki „*light*" margarin sa nižim procentom masti.	Životinjska i svinjska mast, slanina, salo, čvarci, maslac, pavlaka, tvrdi margarin, majonez, palmino i kokosovo ulje.
Napici	Voda, nezaslađeni biljni i voćni čajevi.	Prirodni sokovi od voća i povrća, kafa, pivo i vino.	Zaslađeni gazirani i negazirani napici, vitaminski napici u prahu, alkohol, naročito žestoka pića.
Slatkiši	Med i voće.	Smrznuti jogurt sa bobičastim voćem, domaći voćni sladoled pripremljen od obranog mleka, integralni kolač sa svežim sirom i/ili voćem, voćni frape ili tamna čokolada.	Industrijski proizvedeni keksi, krekeri, kolači, džemovi, mlečna čokolada, bombone, pekarske pite i krofne (svi proizvodi sa puno šećera, od punomasnog mleka, sa dodatkom jaja, margarina, pavlake ili kokosa).
Začini	Beli i crni luk, paprika, peršun, majoran, mirođija, kim, lan, korijander, kurkuma, muskatni oraščići, cimet, majčina dušica, nana, đumbir itd.		So i industrijske mešavine začina (vegeta i sl.). Promeniti način doziranja soli. Npr. jednom kafenom kašičicom dozira se 5 g soli, prstohvatom oko 0,5 g, a vrhom noža 0,25 g soli.

Table 2. Recommended foods for high blood pressure according to the DASH diet (13,14,32)

Food	Recommended	Moderate	Avoid
Cereals and products	Whole grains, oats, barley, rye, wheat, buckwheat, whole grain rice, millet, polenta. Integral pasta and unsalted brown bread.	White/refined grains (white rice, pasta, white flour bread). cTwo slices of bread contain over 1.5 g of table salt.	Bakery products, puff pastry, pastries, products made from white flour with the addition of eggs, whole milk or butter.
Fruit	Fresh, seasonal fruit or frozen. Cherries, sour cherries, apricots, apples and other fruits. It is rich in vitamin C, fiber.	Fruits with a lot of sugar (pineapple, potato, watermelon). Canned, dried or candied fruit, marmalades.	Fried fruit, fruit prepared with sweet cream.
Vegetables	Fresh seasonal vegetables, or boiled, stewed, frozen vegetables. Potatoes are a good source of potassium, but poor in sodium.	Canned vegetables (wash before use). For example. 100 g of canned peas contain 0.7 g of salt, while fresh peas do not contain salt.	Fried and fried vegetables, vegetables prepared with sour cream, cheese, butter. For example. canned tomatoes contain an average of 2.2 g of salt in half a cup of the product.
Milk and products	Skimmed milk (less than 2% m.m.), fermented milk products, yogurt, kefir, fresh cottage cheese, granulated cheese, whey. Although dairy products contain sodium, they are a valuable source of protein.	A quarter of fat cheeses (15–25 % m.m.). For example. mozzarella, which contains 0.7 g of salt in 60 g of the product.	Whole milk and fermented milk products, full-fat, mature, salty cheeses, milk ice cream. For example. 60 g of feta cheese contains 2.3 g of salt.
Meat, fish, eggs	Chicken and turkey white meat - without skin. All types of (blue, sea) lean fish - sardines, mackerel; boiled eggs, egg whites.	Seafood (shellfish, crabs, squid), lean pork, beef, veal, lamb. 4-5 eggs per week, including those used for cooking. Chicken, turkey hams, e.g. 60 g* of product contain 0.85 g of salt. **60 g represents an average serving of these products*	Fatty meat - pork, veal, lamb, beef, offal, poultry with skin. Fried, fried meat/fish, and meat prepared in deep oil/fat. Fried eggs, scrambled eggs. Cured meat products, e.g. 60 g of prosciutto contains 3.2 g of salt; while tea salami in 60 g contains 2.4 g of salt, two hot dogs (130 g of product) contain 3.1 g of salt
Legumes	Peas, beans, lentils, chickpeas, soybeans prepared with a little oil in the form of stews and salads (as long as they do not cause bloating). Canned legumes (rinse before use).	Canned legumes (rinse before use).	Legumes prepared in a stew with sauce, fatty meat and a lot of oil/fat.
Oils and fats	Bademi, orasi, lešnik, semenke bundeve, lana, suncokreta.		Ušećereno i usoljeno orašasto voće i semenke.
	Olive and pumpkin oil.	Sunflower, rapeseed and other vegetable oils, soft "light" margarine with a lower percentage of fat.	Animal and pork fat, bacon, lard, crackers, butter, sour cream, hard margarine, mayonnaise, palm and coconut oil.
Soups	Vegetable soups and tender meat soups prepared without oil, with a small amount of salt or spices.		Fatty meat soups, vegetable cream soups prepared with whole milk or cream.
Drinks	Water, unsweetened herbal and fruit teas.	Natural fruit and vegetable juices, coffee, beer and wine.	Sweetened carbonated and non-carbonated drinks, powdered vitamin drinks, alcohol, especially spirits.
Spices	Garlic and onion, paprika, parsley, marjoram, dill, cumin, flax, coriander, turmeric, nutmeg, cinnamon, thyme, mint, dill, ginger, etc.		Salt and industrial mixtures of spices (vegetables, etc.). Change the method of dosing salt. For example. 5 g of salt is dosed with one coffee spoon, about 0.5 g with a pinch, and 0.25 g of salt with the tip of a knife.

cionisti-dijetetičari sprovode edukaciju pacijenata o adekvatnoj ishrani i promeni stila života na nivou primarne i sekunadrne zdravstvene zaštite.

Jedan od osnovnih zadataka nutricioniste-dijetetičara je da pomoću nutritivne procene utvrdi navike u ishrani, stanje uhranjenosti i druge faktore rizika za nastanak KVB. Nakon nutritivne procene odnosno identifikovanih faktora rizika, potrebno je utvrditi probleme povezane sa ishranom i planirati nutritivnu intervenciju. U dogovoru sa pacijentom potrebno je odrediti individualne ciljeve lečenja, dati savet i motivaciju za postepenu promenu stila života (30).

Edukacija o pravilnoj ishrani primenjuje se kroz individualno i grupno savetovanje u savetovalištima za ishranu na nivou primarne zdravstvene zaštite. To su mesta gde se pružaju saveti o pravilnoj ishrani, energetskoj vrednosti namirnica, dnevnim energetskim potrebama, energetskom i nutritivnom sastavu namirnica, sastavljanju optimalnog obroka, termičkoj obradi namirnica i uticaju fizičke aktivnosti na energetski bilans (31).

Nutricionista – dijetetičar treba da ponudi različite mogućnosti za promenu životnih navika i motiviše pacijente da prihvate promene u ishrani.

Primer edukativnog materijala za bolesnike sa primerima preporučenih namirnica prema principima DASH dijete su prikazani u Tabeli 2.

Zaključak

Arterijska hipertenzija, jedna od najčešćih KVB, predstavlja faktor rizika za razvoj akutnog infarkta miokarda i cerebrovaskularnog insulta, bolesti koje predstavljaju vodeće uzroke umiranja odraslih osoba u svetu. Redovnom, umerenom i racionalnom ishranom, kao i fizičkom aktivnošću, moguće je sprečiti komplikacije arterijske hipertenzije.

Jedan od najpoznatijih načina ishrane koji ima za cilj smanjenje arterijskog krvnog pritiska kao i normalizovanje lipidnog statusa jeste DASH dijeta. Osnovni principi DASH dijete podrazumevaju povećan unos svežeg voća i povrća, dijetnih vlakana iz žitarica od celog zrna, smanjenje unosa soli, prostih šećera, zamenu životinjske masti biljnim uljima. Pored navedenih principa, za kontrolu arterijskog krvnog pritiska važno je održavanje optimalne telesne mase, redovno upražnjavanje fizičke aktivnosti, kao i prestanak pušenja i ograničen unos alkohola.

Uloga nutricioniste-dijetetičara u prevenciji i lečenju arterijske hipertenzije podrazumeva nutritivnu procenu, procenu faktora rizika i edukaciju viskorizične iopšte populacije o pravilnoj ishrani, fizičkoj aktivnosti i promenama drugih životnih navika.

Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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that are similar to estrogens. The most famous source of the above mentioned compounds are soy isoflavones. A moderate intake helps to lower the risk of CVD and malignant diseases (28). Vitamin D from fish and eggs influences the regulation of high blood pressure. An elevated plasma homocysteine, which is associated with the occurrence of peripheral arterial disease, may significantly be reduced with the help of the DASH diet rich in vegetables and pholates (29).

The role of a nutritionist-dietician in the prevention and treatment of arterial hypertension

Nutritionists-dieticians have a significant role in the prevention and treatment of major non-communicable diseases, especially in primary healthcare. Together with nurses, nutritionists-dieticians educate patients about the adequate diet and lifestyle change at the level of primary and secondary healthcare.

One of the main tasks of a nutritionist-dietician is to assess eating habits with the help of nutritional estimates, as well as the weight status and other risk factors important for the occurrence of CVDs. After the nutritional assessment, that is, identified risk factors, it is necessary to establish diet-related problems and plan the nutritional intervention. Together with the patient, it is necessary to determine individual goals of the treatment, give advice and motivate patients to change lifestyles (30).

Education about the healthy diet is applied through individual and group counseling in nutrition counseling offices in primary healthcare. These are places when one may get advice on healthy diet, the energy value of food, daily energy requirements, energy and nutrient composition of foods, optimal meal plan, thermal processing of foods and influence of physical activity on energy expenditure (31).

A nutritionist-dietitian should offer different possibilities for lifestyle change and motivate patients to accept changes in their diet.

An example of educational material for patients with the examples of recommended foods according to the principles of the DASH diet are shown in Table 2.

Conclusion

Arterial hypertension, one of the most common CVDs, is a risk factor of myocardial infarction and cerebrovascular insult, which are the leading causes of death of adults globally. A regular, balanced and rational diet, as well as physical activity may prevent the complications of arterial hypertension.

One of the most known dietary eating patterns, whose goal is the reduction of arterial blood pressure, as well as the normalization of lipid status, is the DASH diet. The main principles of the DASH diet include the increased intake of fresh fruit and vegetables, dietary fibers from whole grains, the reduction of salt intake, simple sugars intake and the use of vegetable oil instead of animal fat. In addition to the above mentioned principles, in order to control arterial blood pressure, it is important to maintain optimal body mass, regular physical activity, as well as to stop smoking and limit the intake of alcohol.

The role of a nutritionist-dietician in the prevention and treatment of arterial hypertension includes a nutritional assessment, the assessment of risk factors, as well as the education of population at risk and general population about the healthy diet, physical activity and change of other life habits.

Competing interests

Authors declare no competing interests.

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