

## SPECIFIČNOSTI I IZAZOVI U ISHRANI ADOLESCENATA

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### SAŽETAK

Cilj ovog preglednog rada je da analizira specifičnosti ishrane adolescenata. Podaci su prikupljeni na osnovu pretraživanja sledećih baza podataka: PubMed, SCOPUS i Google scholar. Loše navike u ishrani adolescenata mogu dovesti do pojave zdravstvenih problema kao što su odloženo polno sazrevanje, osteoporoza, smanjenje u konačnoj telesnoj visini, hiperlipidemija, anemija, gojaznost, anoreksija, bulimija, karijes, a uravnotežena ishrana može da prevenira nastanak dugoročnih zdravstvenih problema kao što su karcinomi, ateroskleroza, moždani udar, osteoporoza, dijabetes, hipertenzija i dr. Procenjuje se da će između 25% i 58% adolescenata koji imaju prekomernu telesnu težinu postati odrasle osobe s prekomernom težinom, a između 24% i 90% gojaznih adolescenata će postati gojazne odrasle osobe. U brojnim radovima uočena je značajna povezanost između preskakanja doručka i veće učestalosti javljanja gojaznosti. Devojčice (26%) značajno češće preskaču doručak u odnosu na dečake (18%). Takođe, adolescenti koji preskaču doručak značajno češće jedu hranu visoke energetske gustine, što ih čini gladnijim i vodi prejedanju i gojaznosti. Preskakanje doručka može dovesti do rizičnih ponašanja, poput, konzumiranja alkohola, sedentarnog načina života, pušenja, nižeg nivoa obrazovanja i pojave simptoma depresije. Fizička neaktivnost je prisutna u nekim zemljama čak kod 50% mladih uzrasta 11-25 godina. Neophodna je edukacija adolescenata po pitanju zdravog načina ishrane i važnosti sprovođenja fizičke aktivnosti, ali je još važnije započeti sa ovom edukacijom od najranijeg uzrasta.

**Ključne reči:** adolescent, ishrana, fizička aktivnost, gojaznost, prevencija

### Uvod

Adolescencija je period odrastanja, tj. prelazno doba između detinjstva i odrasle osobe (1-3). Navike stečene u ovoj dobi, uključujući i navike u ishrani, se u većini slučajeva nastavljaju i kasnije tokom života (1-3). Svetska zdravstvena organizacija (SZO) navodi da je adolescencija razdoblje između 10. i 19. godine života i da započinje pubertetom i karakteriše se kao razdoblje između detinjstva i odrasle osobe (3). Međutim, tokom istorije, starosne granice su se menjale, tako da današnja gornja granica označava 21 godinu života, čime počinje ulazak u odraslo doba. Što se tiče razdoblja adolescencije, ona se najčešće deli u tri faze: rana, srednja i kasna (4).

Adolescenti često konzumiraju brzu hranu, grickalice, drže dijete i preskaču obroke i zbog ovakvog neodgovarajućeg unosa hranljivih materija adolescenti pripadaju nutritivno osetljivoj grupi. Smatra se da je glavni razlog nepravilne ishrane adolescenata neznanje o pravilnom načinu ishrane, što dovodi do usvajanja nezdravih prehrambenih navika i negativnog uticaja nezdrave hrane na zdravlje adolescenata (2). SZO navodi da su 1,3 milijarde svetske populacije adolescenti. Ova populacija podnosi duge periode izloženosti zdravstvenim rizicima i njihovim posledicama, ali nisu često u stanju da utiču na svoju okolinu i da donose

## SPECIFICITIES AND CHALLENGES IN ADOLESCENT NUTRITION

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### SUMMARY

The aim of this review is to analyze the specificities of adolescent nutrition. Data were collected based on the search of the following databases: PubMed, SCOPUS and Google scholar. Bad eating habits of adolescents can lead to health problems such as delayed puberty, osteoporosis, reduction in final body height, hyperlipidemia, anemia, obesity, anorexia, bulimia, caries, and a balanced diet can prevent long-term health problems such as cancers, atherosclerosis, stroke, osteoporosis, diabetes, hypertension, etc. It is estimated that between 25% and 58% of overweight adolescents will become overweight adults, and between 24% and 90% of obese adolescents will become obese adults. In numerous works, a significant connection between skipping breakfast and a higher incidence of obesity has been observed. Girls (26%) skip breakfast significantly more often than boys (18%). Also, adolescents who skip breakfast eat food with high energy density significantly more often, which makes them hungrier and leads to overeating and obesity. Skipping breakfast can lead to risky behaviors, such as alcohol consumption, sedentary lifestyle, smoking, lower level of education and symptoms of depression. Physical inactivity is present in some countries as much as 50% of young people aged 11-25. It is necessary to educate adolescents about a healthy diet and the importance of physical activity, but it is even more important to start this education from an early age.

**Key words:** adolescent, nutrition, physical activity, obesity, prevention

### Introduction

Adolescence is the phase of growth that is the transitional phase between childhood and adulthood (1-3). Habits acquired at this age, including eating habits, in most cases continue later in life (1-3). The World Health Organization (WHO) states that adolescence is the phase of life from ages 10 to 19, between childhood and adulthood and that it starts with puberty (3). However, throughout history, age limits have changed, so today the upper limit is 21 years, which is the beginning of adulthood. As far as the stages of adolescence are concerned, adolescence is most often divided into three stages: early, middle and late (4).

Adolescents often consume fast food, snacks, they are on a diet, they skip meals and due to this inadequate intake of nutrients, adolescents belong to a nutritionally sensitive group. It is believed that the main reason for the improper nutrition of adolescents is ignorance about proper diet, which leads to the adoption of unhealthy eating habits and the negative impact of unhealthy food on adolescents' health (2). The WHO states that 1.3 billion of the world's population are adolescents. This population bears long periods of exposure to health risks and their consequences, but they are often unable to influence their environment and

odluke za svoju dobrobit (3). Studija preseka, autora *Kalkan* i sar., iz 2019. godine, koja je rađena u Turskoj na uzorku od 276 adolescenata, pokazala je da su navike u ishrani bile značajno bolje kod adolescentkinja, u odnosu na adolescente, kao i da su zdrave prehrambene navike adolescenata bile značajno pozitivno povezane sa znanjem o pravilnoj ishrani (1). Cilj ovog preglednog rada je da analizira specifičnosti ishrane adolescenata.

## Metode

U okviru ovog preglednog rada korišćena je literatura dobijena pretraživanjem naučne medicinske literature objavljene u poslednjih deset godina, s posebnim osvrtom na originalne naučne članke objavljene u poslednjih 5 godina, u naučnim bazama podataka: *PubMed*, *SCOPUS* i *Google scholar*. Pretraživanje je urađeno korišćenjem sledećih ključnih reči: adolescencija, ishrana, zdravi stilovi života, gojaznost, prevencija i fizička aktivnost. Uključeni su samo oni radovi koji su bili objavljeni na engleskom jeziku.

## Gojaznost adolescenata

Gojaznost kod adolescenata jedan je od najvećih problema javnog zdravlja dvadeset i prvog veka i dokazano je da će između 25% i 58% adolescenata koji imaju višak kilograma postati odrasle osobe s prekomernom težinom, a između 24% i 90% gojaznih adolescenata će postati gojazne odrasle osobe (4). SZO procenjuje da je preko pet miliona smtnih ishoda usled nezaraznih bolesti zabeleženo kod lica sa indeksom telesne mase (ITM) većim od optimalnog. Zabrinjava činjenica daljeg porasta broja gojaznih. Kod osoba uzrasta 5-19 godina, u periodu 1990-2020. godine, došlo je do porasta gojaznih sa 2% na 8%, a kod osoba uzrasta 18 i više godina sa 7% na 16% (5).

## Ishrana adolescenata

Postoji nekoliko značajnih faktora koji utiču na pojavu loših navika u ishrani adolescenata. Prvi faktor je sam prelazak iz detinjstva u period puberteta, kada mladi teže da budu nezavisni, a samim tim su osetljiviji na socijalne i spoljašnje uticaje van kuće (2). Drugi značajan faktor koji utiče na pojavu loših navika u ishrani adolescenata je široka dostupnost nezdravoj hrani (automati sa grickalicama, čokoladicama, sokovima, itd.) u školama, gradovima, čak i bolnicama. Studija preseka, autora *Ha-*

*mulka* i saradnika (6), rađena u Poljskoj na uzorku od 1569 studenata, obuhvatila je i 464 studenta edukacionom interventnom studijom, pri čemu su studenti tokom 9 meseci edukovani o pravilnoj ishrani, a njihovo znanje i stavovi su upoređivani pre i posle edukacije. Rezultati su pokazali da je korišćenje automata u školama bilo značajno povezano sa manjim konzumiranjem voća i povrća, kao i sa većim kalorijskim unosom, i značajno većim indeksom telesne mase (ITM) studenata (6).

Lošim navikama u ishrani doprinosi i marketing nezdrave hrane. Marketing nezdrave hrane povećava izloženost adolescenata namirnicama koje podstiču gojaznost, jer oni, za razliku od odraslih osoba, ne shvataju negativan uticaj marketinga na njihov odabir hrane (6). Istraživanja su pokazala da mladi koji preskaču doručak u toku dana konzumiraju veće porcije obroka i grickalice u ostatku dana, pa redovan doručak predstavlja značajnu meru prevencije gojaznosti kod adolescenata. Metaanaliza, autora *Ardeshirlarijani* i sar. (7), rađena 2019. godine, u kojoj je analizirano 16 studija (14 studija preseka i 2 kohortne studije), pokazala je da, deca od 4. godine i adolescenti do 18. godina koji preskaču doručak imaju manju potrošnju celovitih žitarica, mlečnih proizvoda i voća u odnosu na one koji redovno doručkuju. Takođe, u ovoj studiji je pronađena značajna povezanost između preskakanja doručka i veće učestalosti javljanja gojaznosti (OR: 1,43; 95%CI: 1,32; p<0,05). Međutim, veći rizik je bio kod dečaka (OR: 1,64; 95% CI: 1,38, 1,95; I2: 38,3%, p = 0,18) nego devojčica OR:1,56 (95% CI: 1,38, 1,77, I2: 0,0%, p = 0,49) (4). *Moncani* i sar. (6), su u svom sistematskom pregledu, gde su analizirali 39 naučnih članaka, objavljenih u periodu od 2008. do 2018. godine, na ukupnom uzorku od 286.804 dece i adolescenata, pokazali da 10-30% dece od 4. godine i adolescenti do 18. godina preskaču doručak. Takođe, uočili su da je kod 94,7% ispitanika preskakanje doručka značajno pozitivno povezano sa prekomernom telesnom težinom i gojaznošću. Pored toga, preskakanje doručka je bilo povezano i sa pojavom lošijeg lipidnog profila, višim nivoima arterijskog krvnog pritiska, insulinskom rezistencijom i pojavom metaboličkog sindroma. Takođe, adolescenti koji preskaču doručak značajno češće jedu hranu visoke energetske gustine, kao što su npr. brza hrana i grickalice, koje ih čine još gladnijima, što vodi ka pojavi prejedanja i gojaznosti (8). *Kaskales* i sar. (9) su u svojoj studiji, sprovedenoj u

make decisions about their own well-being (3). A cross-sectional study by Kalkan et al. from 2010, which was conducted in Turkey on a sample of 276 adolescents, showed that eating habits were significantly better in adolescent girls compared to male adolescents, as well as that healthy eating habits of adolescents were significantly positively associated with knowledge about proper nutrition (1). The aim of this review article was to analyze the specificities of adolescent nutrition.

## Methods

Within this review article, we used literature that was obtained by searching the medical literature published in the last ten years, with a special insight into original scientific articles, which were published in the last five years, in the following scientific databases: PubMed, SCOPUS and Google Scholar. The search was conducted using the following key words: adolescence, nutrition, healthy lifestyles, obesity, prevention and physical activity. Only studies that were published in English were included.

## Adolescent obesity

Adolescent obesity is one of the major public health problems of the twenty-first century, and it has been proven that 25% to 58% of overweight adolescents will become overweight adults, while 24% to 90% of obese adolescents will become obese adults (4). The WHO estimates that over five million deathly outcomes caused by non-communicable diseases have been recorded in persons with a body mass index (BMI) higher than optimal. The fact that the number of obese people further increases is worrying. In persons aged 5-19 years, in the period 1990-2020, there was an increase in the number of obese persons from 2% to 8%, while in persons aged 18 years and over, this number increased from 7% to 16% (5).

## Nutrition of adolescents

There are several significant factors that influence the appearance of bad eating habits in adolescents. The first factor is the very transition from childhood to the period of puberty, when young people tend to be independent, and therefore, they become more susceptible to social and external influences outside their homes (2). Another significant factor that influences the

occurrence of bad eating habits among adolescents is the wide availability of unhealthy food (vending machines with snacks, chocolate bars, juices, etc.) in schools, cities, even in hospitals. A cross-sectional study by Hamulka and associates (6), which was conducted in Poland on a sample of 1,569 students, included 464 students in an educational intervention study, where students were educated about proper nutrition for 9 months, while their knowledge and attitudes were compared before and after the education. The results showed that the use of vending machines in schools was significantly associated with lower consumption of fruit and vegetables, as well as with higher caloric intake and significantly higher body mass index (BMI) of students (6).

Marketing of unhealthy foods also contributes to bad eating habits. Marketing of unhealthy foods increases adolescents' exposure to foods that cause obesity, because they, in contrast to adults, do not understand the negative impact of marketing on their food selection (6). Research has shown that young people who skip breakfast during the day consume larger portions of food and snacks later during the day, and therefore, regular breakfast is a significant measure of obesity prevention in adolescents. A meta-analysis by Ardeshirlarijani et al. (7), which was conducted in 2019 based on the analysis of 16 studies (14 cross-sectional studies and 2 cohort studies), showed that children from the age of 4 and adolescents to the age of 18, who skip breakfast have a lower consumption of whole grains, dairy products and fruit in comparison to those who regularly have breakfast. Also, a significant association was found between skipping breakfast and higher incidence of obesity (OR: 1.43; 95% CI: 1.32;  $p < 0.05$ ). However, the risk was higher in boys (OR: 1.64; 95% CI: 1.38, 1.95; I<sup>2</sup>: 38.3%,  $p = 0.18$ ) than in girls (OR: 1.56; 95% CI: 1.38, 1.77, I<sup>2</sup>: 0.0%,  $p = 0.49$ ) (4). Monzani et al. (6) in their systematic review, in which they analyzed 39 scientific articles that were published between 2008 and 2018, on a total sample of 286,804 children and adolescents, showed that 10-30% of children from the age of 4 and adolescents to the age of 18 skip breakfast. Also, they found that in 94.7% of respondents, skipping breakfast was significantly positively correlated with overweight and obesity. In addition, skipping breakfast was also associated with the occurrence of worse lipid profile, higher levels of arterial blood pressure,

Španiji, 2018. godine, na uzorku od 527 adolescenata, uočili da preskakanje doručka može dovesti do pojave zdravstveno rizičnih ponašanja, poput, konzumiranja alkohola, sedentarnog načina života, pušenja, nižeg nivoa obrazovanja i pojave simptoma depresije. Ovi autori navode da je preskakanje doručka značajno povezano i sa nižim kvalitetom i zadovoljstvom života, češćom pojavom hroničnog stresa i povećanim rizikom za nastanak kardiovaskularnih bolesti. Preskakanje doručka često može uzrokovati i mučninu tokom jutra i ometati procese pamćenja i učenja, dok tokom dana može dovesti do povećanog unosa hrane bogate mastima, a siromašne vlaknima (9).

Studija rađena u Hrvatskoj, od strane autora Kuzmana i sar. (10), je pokazala da samo 41% dečaka i 46% devojčica redovno doručkuje radnim danima, međutim, između dečaka i devojčica nije uočena značajna razlika u učestalosti preskakanja doručka. Druge studije, takođe potvrđuju ove rezultate. Studija preseka *Tumbalis* i sar. (11), sprovedena 2015. godine u Grčkoj na uzorku od 177.091 dece, uzrasta od 8 do 17 godina, je pokazala da skoro jedno od četvoro adolescenata (22,4% dečaka i 23,1% devojčica, bez razlika u učestalosti po polu) preskače doručak, i da je preskakanje doručka značajno češće kod žena, starijih, lica sa prekomernom telesnom težinom ili gojaznošću, lošijim navikama u ishrani, neadekvatnom fizičkom aktivnošću, nedostatkom sna (manje od 8 sati sna dnevno) i većim vremenskim periodom tokom dana provedenim za televizorom, kompjuterom ili telefonom (više od dva sata dnevno). Dodatne analize su pokazale da loše navike u ishrani značajno povećavaju rizik od preskakanja doručka za skoro 80% (95% CI: 1,78–1,82), od nedovoljnog sna za 23% (95% CI: 1,20–1,26), a od sedentarnog načina života (tj. više vremena provedenog za ekranom tokom dana) za 22,5% (95% CI: 1,19–1,26) (9). Studija *Yahia* i sar. (12), rađena od 2011. do 2012. godine u SAD, u Mičigenu, na uzorku od 237 adolescenata je utvrdila da samo 53% adolescenata redovno doručkuje, dok je 39% izjavilo da im se doručak sastoji od mleka/kafe/jogurta, a trećina ispitanih adolescenata doručkuje samo voćni sok (12).

Iako je iz prethodno navedenih studija (10-12) uočljivo da devojčice češće preskaču doručak u odnosu na dečake, u većini studija nije uočena značajna razlika u odnosu na pol. Međutim, metaanaliza rađena 2017. godine, autora *Gafari*-a i sar. (13), u kojoj su od prvobitnih 322, analizirana

24 naučna članka, je pokazala da devojčice ipak značajno češće preskaču doručak u odnosu na dečake (26% vs. 18%) (13). Studija rađena u Poljskoj na uzorku od 3009 adolescenata je pokazala da 20-30% adolescenata mlađeg uzrasta od 11 do 15 godina ne jede redovno svako jutro pre polaska u školu, a 30% ne uzima nikakav obrok tokom boravka u školi (14). Doručak ne konzumira 12,5% devojčica i oko 9,3% dečaka (14). Slična istraživanja u Holandiji i Portugalu su pokazala da 10% dece dobi do 11 godina i 30% dece dobi do 15 godina ne doručkuju redovno, dok je taj procenat značajno veći u Sloveniji i Rumuniji, pri čemu u ovim zemljama redovan doručak nema oko 40% adolescenata (10,15). Prema istraživanju *Sile* i sar. (16), koje je rađeno u Hrvatskoj 2019. godine na uzorku od 802 adolescenta i dece, utvrđeno je da 39,5% adolescenata uopšte ne doručkuje, a da su adolescenti koji su redovno doručkovali imali značajno niži ITM, ali i veći ukupni dnevni energetske unos u odnosu na adolescente koji ne doručkuju redovno (16).

Rezultati istraživanja zdravlja stanovnika Republike Srbije u 2013. godini su pokazali da je 93,8% mladih uzrasta od 7 do 14 godina svakodnevno doručkovalo, što je više u odnosu na 2006. godinu (90,5%) (17). Poseban izazov u ishrani dece i adolescenata je povećana učestalost konzumiranja grickalica i slatkiša, a najviše slanah grickalica, čokoladica i bombona, kao i brze hrane. Pokazano je da istovremeno sa porastom stope gojaznosti među adolescentima dolazi i do porasta učestalosti konzumiranja grickalica i slatkiša (18). U odnosu na ostale dobne skupine, adolescenti konzumiraju najveću količinu hrane slabijeg kvaliteta. Unos jako kalorične brze hrane, koja je bogata rafinisanim šećerima i zasićenim mastima, dovodi do pojave gojaznosti, što predstavlja zdravstveni problem koji je u današnje vreme sve prisutniji kod dece i adolescenata (18).

Konzumiranje brze hrane može dovesti do zavisnosti u smislu pojave trajne sklonosti ka ovoj vrsti hrane, a posledica može biti i pojava poteškoća u učenju i pamćenju, što je i pokazala studija *Reichert*-a i *Rank*-a iz 2017. godine (19). Brza hrana koja se prodaje na kioscima i restoranima je visoke energetske gustine, a nutritivno je veoma siromašna, bogata je rafinisanim šećerima, žitaricama i solju, a siromašna voćem i povrćem. Konzumiranje ovakve hrane je značajno povezano sa gojaznošću i metaboličkim promenama koje vode nastanku dijabetesa, kao i kardiovaskularnih bolesti (20).

insulin resistance and the appearance of metabolic syndrome. Also, adolescents who skip breakfast eat food of high energy density significantly more often, such as fast food and snacks, which make them even hungrier, thus leading to overeating and obesity (8). Cascales et al. (9) in their study, which was conducted in Spain in 2018, on a sample of 527 adolescents, found that skipping breakfast can lead to the occurrence of health-risk behaviors, such as alcohol consumption, sedentary lifestyle, smoking, lower levels of education and the occurrence of the symptoms of depression. These authors state that skipping breakfast is significantly associated with lower quality of life and satisfaction, more frequent appearance of chronic stress and increased risk of cardiovascular diseases. Skipping breakfast can often cause nausea in the morning and disturb the processes of memorizing and learning, while during the day it can lead to the increased intake of food rich in fats and poor in fibers (9).

A study by Kuzman et al. (10), which was conducted in Croatia, showed that only 41% of boys and 46% of girls ate breakfast regularly on weekdays. However, there was no significant difference between boys and girls regarding the frequency of skipping breakfast. Other studies have also confirmed these results. A cross-sectional study by Tambalis et al. (11), which was conducted in Greece in 2015 on a sample of 177,091 participants aged between 8 and 17 years, showed that almost one in four adolescents (22.4% of boys and 23.1% of girls with no differences in frequency by gender) skipped breakfast and that skipping breakfast was significantly more common in women, elderly, in overweight and obese persons, in persons with poor eating habits, inadequate physical activity, lack of sleep (less than 8 hours of sleep a day) and a longer period of time spent in front of TV, computer or phone (more than two hours a day). Additional analyses showed that bad eating habits significantly increased the risk of skipping breakfast by almost 80% (95% CI: 1.78-1.82), insufficient sleep by 23% (95% CI: 1.20-1.26), and of a sedentary lifestyle (that is, more time spent in front of a screen) by 22.5% (95% CI: 1.19-1.26) (9). A study by Yahia et al. (12), which was conducted in the USA, in Michigan from 2011 to 2012 on a sample of 237 adolescents, found that only 53% of adolescents had breakfast regularly, while 39% of them stated that their breakfast consisted of milk/

coffee/yoghurt, while one third of the examined adolescents had only fruit juice for breakfast (12).

Although it can be concluded from the above mentioned studies (10-12) that girls skip breakfast more frequently than boys, in most studies there was no significant difference in relation to sex. However, a meta-analysis by Ghafari et al. (13), which was conducted in 2017, and which included the analysis of 24 scientific articles out of the original 322, showed that girls skip breakfast significantly more often than boys (26% vs. 18%) (13). A study, which was conducted in Poland on a sample of 3009 adolescents showed that 20-30% of younger adolescents aged 11 to 15 years did not eat regularly every morning before going to school, while 30% of them did not take any meals during their stay at school (14). Breakfast was not consumed by 12.5% of girls and about 9.3% of boys (14). Similar research in the Netherlands and Portugal showed that 10% of children to the age of 11 and 30% of children to the age of 15 did not have breakfast regularly, while this percentage was significantly higher in Slovenia and Romania, where 40% of adolescents did not have regular breakfast (10,15). According to a study by Sila et al. (16), which was conducted in Croatia in 2019 on a sample of 802 adolescents and children, it was found that 39.5% of adolescents did not have breakfast at all, and that adolescents who regularly had breakfast had a significantly lower BMI, but also a higher total daily energy intake in comparison to adolescents who did not have breakfast regularly (16).

The results of the National Health Survey in the Republic of Serbia in 2013 showed that 93.8% of young people between the ages of 7 and 14 had breakfast every day, which is more in comparison to 2016 (90.5%) (17). A special challenge in the nutrition of children and adolescents is the increased frequency of consumption of snacks and sweets, mostly salty snacks, chocolates and candies, as well as fast food. It was shown that simultaneously with the increase in the obesity rate among adolescents there came to the increase in the frequency of consumption of snacks and sweets (18). Compared to other age groups, adolescents consumed the largest amount of poor quality food. The intake of high-calorie food rich in refined sugars and saturated fats leads to obesity, which is a health problem that is increasingly present in children and adolescents today (18).

S obzirom na ove podatke, Američka akademija pedijataru preporučuje ograničavanje unosa brze hrane i navodi ovu meru kao jedan od načina prevencije gojaznosti, ipak, adolescenti u Sjedinjenim Američkim Državama, jedu u restoranima brze hrane najmanje dva puta nedeljno (21). Prema metaanalizi, autora *Beal*-a i sar. (22), iz 2019. godine, u kojoj je ispitan obrazac konzumiranja voća, povrća i brze hrane od strane adolescenata, utvrđeno je da 93% adolescenata koji potiču iz zemalja sa srednjim i niskim dohotkom konzumiraju brzu hranu najmanje jednom nedeljno (22). *Adams* i sar. (18) su uočili da deca uzrasta od 5 do 8 godina jedu grickalice u proseku tri puta na dan, što čini oko 25% energetske unosa, a 31% njih svakodnevno konzumira slatkiše. Ukoliko roditelji od ranog detinjstva dece koriste strategiju kontrole unosa grickalica i slatkiša to može pozitivno uticati na stvaranje samokontrole kod ove dece i u kasnijem periodu života, što je puno bolja opcija od potpunog zabranjivanja njihovog konzumiranja, što kasnije može dovesti do njihovog prekomernog konzumiranja (18).

Prema studiji preseka *Jongenelis*-a i sar. (23), objavljenoj 2018. godine, a rađenoj u dva perioda u Australiji, kod dece uzrasta od 12 do 17 godina, u prvom periodu 2009-2010. godine obuhvaćen je 1501 ispitanik, a u drugom 2012-2013. godine 1406 ispitanika, samo 14% adolescenata u prvoj studiji preseka i 13% adolescenata u drugoj studiji preseka, je unosilo preporučene količine povrća (preporuka je pet porcija povrća dnevno), dok je 68% u prvoj studiji, a 71% u drugoj studiji unosilo u organizam preporučene količine voća (preporuka je dve porcije voća dnevno). Takođe, rezultati ove studije su pokazale da devojčice značajno češće ne unose preporučene količine povrća u odnosu na dečake, a samo je 50% adolescenata prepoznalo da njihov sopstveni unos voća i povrća na dnevnom nivou nije adekvatan (23). Koliko je za redovan unos dovoljnih količina voća i povrća u organizam adolescenta važna navika, pokazuje istraživanje *Skaljoni*-a i sar. (24) iz 2018. godine, u kome se navodi da mlade osobe koje se u ranoj adolescenciji redovno imale obroke sa roditeljima, tokom adolescencije jedu značajno više porcija voća i povrća i u periodu kasnije adolescencije i u starijoj dobi, u odnosu na vršnjake koji nikada nisu redovno doručkovali, ručali ili večerali sa roditeljima ili ostatkom porodice (24).

## Fizička aktivnost adolescenata

*Kumar* i sar. (25) navode da su pozitivni efekti umerene svakodnevne fizičke aktivnosti toliko značajni da nadmašuju učinkovitost bilo kakvih lekova ili drugih načina lečenja. U Velikoj Britaniji, samo 21% dečaka i 16% devojčica adolescentske dobi ispunjava minimalne preporuke za zdravu ishranu i fizičku aktivnost, dok je 50% stanovništva Velike Britanije uzrasta od 11 do 25 godina nedovoljno fizički aktivno (25).

*Al Kudari* i sar. (26) navode da je trenutno najbolja mera za lečenje gojaznosti kod adolescenata mlađih od 18 godina upravo kombinovana primena svakodnevne fizičke aktivnosti uz primenu zdrave, uravnotežene ishrane (26). Dosadašnje studije su potvrdile značajnu povezanost fizičke neaktivnosti i gojaznosti kod dece i adolescenata (26).

## Posledice nezdrave ishrane

Nepravilna ishrana je jedan od najznačajnijih problema kod dece i adolescenata, jer je preduslov za pojavu velikog broja psihofizičkih oboljenja (26). Loše navike u ishrani adolescenata mogu dovesti do pojave zdravstvenih problema kao što su odloženo polno sazrevanje, osteoporoza, smanjenje u konačnoj telesnoj visini, hiperlipidemija, anemija, gojaznost, anoreksija, bulimija, karijes, a uravnotežena ishrana može da prevenira nastanak dugoročnih zdravstvenih problema kao što su karcinomi, ateroskleroza, moždani udar, osteoporoza, dijabetes i hipertenzija (26-28).

## Prevenција nezdrave ishrane

U nekim studijama se navodi, da je trenutno najbolja mera za lečenje gojaznosti kod adolescenata mlađih od 18 godina upravo kombinovana primena svakodnevne fizičke aktivnosti uz primenu zdrave, uravnotežene ishrane (28,29). Energetske potrebe treba prilagoditi potrebama svakog adolescenta pojedinačno, i to zavisi od velikog broja faktora: fizičke aktivnosti, prisustva nekog poremećaja ishrane poput prekomerne telesne težine ili gojaznosti, komorbiditeta itd. Takođe, pol ima značajan uticaj, jer je dokazano da su energetske potrebe značajno veće kod dečaka u odnosu na devojčice, zbog značajno većeg i bržeg porasta u telesnoj visini, telesnoj težini i porastu nemasne telesne mase (1,2). U zavisnosti od brzine rasta, pola i sprovođenja svakodnevne fizičke aktivnosti, dnevne potrebe za energijom kod dece i adolescenata se značajno razlikuju (6,30). U tabeli 1 je pri-

Consuming fast food can lead to addiction in the sense of the appearance of permanent preference for this kind of food, which can result in difficulties in learning and memory, as it was shown in the study by Reichelt and Rank from 2017 (19). Fast food that is sold at kiosks and restaurants has high energy density, while it is nutritionally very poor, rich in refined sugars, grains and salt and poor in fruits and vegetables. Consuming this kind of food is significantly associated with obesity and metabolic changes that lead to the occurrence of diabetes and cardiovascular diseases (20).

Considering these data, the American Academy of Pediatrics recommends limiting the intake of fast food and states this measure to be one of the ways to prevent obesity. However, adolescents in the United States of America eat at fast food restaurants at least twice a week (21). According to a meta-analysis by Beal et al. (22) from 2019, in which the pattern of consumption of fruit, vegetables and fast food among adolescents was examined, it was found that 93% of adolescents from middle and low-income countries consumed fast food once a week (22). Adams et al. (18) observed that children between the ages of five and eight ate snacks three times a day on average, which accounted for about 25% of their energy intake, while 31% of them consumed sweets every day. If parents use the strategy of controlling the intake of snacks and sweets from an early age, this can have a positive effect on the creation of self-control in these children in the later period of life, which is a lot better option than completely prohibiting their consumption, because it can lead to the excessive consumption of sweets later in life (18).

According to a cross-sectional study by Jongenelis et al. (23), which was published in 2018, conducted in Australia in two periods among children aged 12 to 17, and which included 1501 respondents in the first period 2009-2010 and 1406 respondents in the second period 2012-2013, only 14% of adolescents in the first cross-sectional study and 13% of adolescents in the second cross-sectional study, consumed the recommended amount of vegetables (the recommendation is five servings of vegetables per day), while 68% in the first study and 71% in the second study consumed the recommended amount of fruit (the recommendation is two servings of fruit per day). Also, the results of this study showed that girls significantly more often did not consume the

recommended amount of vegetables compared to boys, and only 50% of adolescents recognized that their intake of fruits and vegetables on a daily basis was not adequate (23). How important habit is for the regular intake of sufficient amounts of fruit and vegetables in adolescents was shown by the study conducted by Scaglioni et al. (24) in 2018, in which it was stated that young people who regularly had meals with their parents in early adolescence eat significantly more servings of fruit and vegetables in the period of late adolescence and in older age, in comparison to their peers who never had breakfast, lunch or dinner regularly with their parents or the rest of the family (24).

### Physical activity of adolescents

Kumar et al. (25) state that the positive effects of moderate daily physical activity are so significant that they surpass the effectiveness of medications or other treatment methods. In the UK, only 21% of boys and 16% of girls in the adolescent period meet the minimal recommendations for healthy nutrition and physical activity, while 50% of the UK population aged 11 to 25 years are not physically active enough (25).

Al-Khudairy et al. (26) state that currently the best measure for the treatment of obesity in adolescents younger than 18 is precisely the combined application of daily physical activity with the application of a healthy, balanced diet (26). Previous studies have confirmed a significant correlation between physical inactivity and obesity in children and adolescents (26).

### Consequences of unhealthy diet

Improper nutrition is one of the most significant problems in children and adolescents, because it is a prerequisite for the occurrence of a large number of psychophysical diseases (26). Bad eating habits in adolescent nutrition can lead to the occurrence of health problems, such as delayed puberty, osteoporosis, reduction in final body height, hyperlipidemia, anemia, obesity, anorexia, bulimia, caries, while balanced diet can prevent long-term health problems such as cancer, atherosclerosis, stroke, osteoporosis, diabetes and hypertension (26-28).

### Prevention of unhealthy diet

In some studies, it is stated that the best measure for the treatment of obesity in adolescents under



kazan preporučeni dnevni energetska unos za decu i adolescente prema uzrasnim grupama i polu (31). U adolescentnom periodu mladi razvijaju odgovornost za zdravlje svog tela, pa je ovaj period veoma pogodan za edukaciju mladih o zdravim životnim navikama, jer se na ovaj način mogu sprečiti kasnije komplikacije (32).

Prema preporukama iz SAD iz 2005. godine, koje važe i danas, adolescenti bi za optimalno funkcionisanje organizma trebali unositi 3,5 do 6,5 porcija voća i povrća na dnevnom nivou. Nacionalna istraživanja su pokazala da, ipak, manje od 2% adolescenata unosi manje od preporučene dnevne količine voća i povrća. Uočeno je da je prelaz u adolescenciju posebno kritičan period za unos voća i povrća. Pre adolescencije prehrambene navike dece su više pod kontrolom roditelja, dok su nakon početka adolescencije deca ta koja najviše kontrolišu šta će unositi u svoj organizam (33). Značajni faktori koji utiču na smanjenje unosa voća i povrća u organizam u periodu adolescencije su povećanje nezavisnosti, brži način života, izbor hrane, a sve ovo dovodi do oslanjanja na brzu hranu koja je prilično jeftina i štetna (33).

Jedna od dokazano važnijih preventivnih mera za nastanak nezadovoljstva sopstvenim telom, kao i prevenciju nastanka prekomerne telesne težine ili gojaznosti, kao i drugih poremećaja do kojih dovodi loša, neuravnotežena ishrana u adolescenciji, je primena umerene svakodnevne fizičke aktivnosti. Postoje naučni dokazi da fizički aktivan način života donosi zdravstvene dobrobiti i prevencira nastanak velikog broja hroničnih nezaraznih obolenja, dok fizička neaktivnost i sedentarni način života doprinose nastanku istih oboljenja (34). Preporuke bi bile da u školu treba ići peške, ili biciklom i podsticati učešće u lakim ili umerenim fizičkim aktivnostima, uz smanjenje vremena provedenog za kompjuterom, mobilnim telefonom ili televizorom na manje od 2 sata dnevno (35,36).

U cilju unapređenja ishrane neophodno je izmeniti kurikulum u osnovnim i srednjim školama i formirati obavezan školski predmet na kojem bi se dobijala znanja o pravilnoj ishrani, kao i zdravstvenim posledicama loše, neredovne i nezdrave ishrane. Na nivou države treba formirati nutritivnu komisiju koje će kontrolisati vrste namirnica, njihov kvalitet i distribuciju hrane koja se prodaje u školama za vreme malog i velikog odmora i koja će uticati na poboljšanje kvaliteta hrane, kako bi obrok u školi bio kvalitetan i hranljiv (37).

## Zaključak

Adekvatnom edukacijom adolescenta može se podstići smanjivanje broja gojaznih i brojnih drugih hroničnih nezaraznih poremećaja zdravlja. Neophodno je da deca i adolescenti steknu dobre životne navike, i to da doručkuju, kao i da ishranom unose više voća, povrća, integralnih žitarica i složenih ugljenih hidrata, kao i da redovno sprovedu fizičku aktivnost.

## Konflikt interesa

Autori su izjavili da nema konflikta interesa.

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the age of 18 is the combined application of daily physical activity with the application of a healthy, balanced diet (28,29). Energy requirements should be adapted to the needs of each adolescent individually, and it depends on numerous factors: physical activity, the presence of some eating disorder such as overweight or obesity, comorbidities, etc. Also, gender has a significant influence, because it has been proven that energy needs are significantly higher in boys compared to girls, due to significantly greater and faster growth related to height, weight and lean body mass (1,2). Depending on the speed of growth, gender and daily physical activity, the daily energy needs of children and adolescents differ significantly (6,30). Table 1 shows the recommended daily energy intake for children and adolescents according to age groups and gender (31). In the adolescent period, young people develop responsibility for the health of their bodies, so this period is very suitable for the education of young people about healthy lifestyle habits, because in this way later complications can be prevented (32).

According to recommendations from the USA from 2005, which are still valid today, adolescents should consume 3.5 to 6.5 servings of fruit and vegetables per day for optimal body functioning. However, national surveys have shown that less than 2% of adolescents consume less than the recommended daily amount of fruit and vegetables. It has been observed that the transition to adolescence is a particularly critical period for fruit and vegetable intake. Before adolescence, eating habits of children are under the control of their parents, while after the beginning of adolescence, the intake of food is mostly under the control of children (33). Significant factors that influence the reduction in the intake of fruit and vegetables in the adolescent period include the increase in independence, faster lifestyle, choice of food, while this leads to reliance on fast food, which is quite cheap and harmful (33).

One of important preventive measures for the occurrence of dissatisfaction with one's own body, as well as for the prevention of excess body weight or obesity and other disorders caused by poor, unbalanced nutrition in adolescence, is the application of moderate daily physical activity. There is scientific evidence that a physically active lifestyle brings health benefits and prevents the occurrence of a large number of chronic non-

communicable diseases, while physical activity and a sedentary lifestyle contribute to the occurrence of these diseases (34). The recommendations would include walking to school or going by bus, as well as participating in light-intensity or moderate physical activities, thus reducing the time spent in front of the computer screen, mobile phone or TV to less than 2 hours a day (35,36).

In order to improve nutrition, it is necessary to change the curriculum in primary and secondary schools and create a mandatory school subject that would provide knowledge about proper nutrition, as well as the health consequences of poor, irregular and unhealthy nutrition. At the state level, a committee for nutrition should be formed that would control the types of groceries, their quality and the distribution of food sold in schools during short and long breaks, which would influence the improvement of the quality of that food, so that school meals would be of good quality and nutritious (37).

## Conclusion

The adequate education of adolescents can encourage the reduction in obesity and numerous other chronic non-communicable health disorders. It is necessary for children and adolescents to acquire good lifestyle habits, to have breakfast, as well as to use more fruit, vegetables, whole grains and complex carbohydrates in their diet, as well as to engage in regular physical activity.

## Competing interests

The authors declared no competing interests.

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