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*Ništa što imamo ne može nas učiniti
toliko srećnim, koliko nas nesrećnim
može učiniti ono što nemamo.*
Duško Radović

Iako je tema i ideja za urednički komentar u poslednje vreme napretek, ovog puta je dilema bila kako odabrati najilustrativniju priču za trenutak koji živimo. A bitišemo u vremenu gde je prezir prema istini, pravdi, moralnim vrednostima, nauci i kulturi potpuno institucionalizovan. Kao da nam je život pretvoren u karikaturu, jer pravo stanje stvarnosti, koje svi i vide i osećaju, poluintelektualci (čitaj vladari naših života) predstavljaju kao vrhunsko dostignuće.

Zato je aktuelna svakodnevica u stvari privid odnosno lebdenje između društvene realnosti i medijskog propagiranja stvarnosti. Društvena matrica bazira se na neistinama i propagandi, na negovanju haosa i primitivizma, na kulturi agresije i nasilja, odnosno derogiranju vladavine prava. Društvenu scenu oblikuju neuki i bahati, poslušni i podobni, uglavnom sa falsifikovanim ili kupljenim diplomama i čiji je osnovni manir patološka agresivnost, bezočna arogancija i cinična empatija.

Naša naučna i kulturna svakodnevica je takođe na „pijedestalu“ ispod koga se više ne može, a sloboda mišljenja i govora „izolovana“ je iz društvenog života kao najopasniji virus.

Zato je osnovna suština ovog uredničkog komentara jedan intervju velikana pisane (ali i izgovorene) reči pesnika Matije Bečkovića. Njegova razmišljanja najbolje definišu našu sadašnjost, distancu, ali i šizofreni odnos između realnosti i osnovnih civilizacijskih vrednosti. To je sigurno najdetaljniji i najiskreniji manifest naše stvarnosti. „Preučeni“ dominiraju na „važnim“ mestima, a kič, primitivizam, laž i moralno beščašće oblikuju sve segmente našeg života i rada. Najboljih kao da nigde nema. Danas se profesori ponose svojim nekad najgorim đacima i posle izvesnog vremena naknadno ih proglašavaju najboljima. Najgori su na svakoj televiziji, oni glume najvažnije uloge, oni najbolje „prosipaju“ mudrost i genijalnost, oni su „krem“ i šlag na našoj torti od blata. Najgori se sahranjuju u aleji zaslužnih, dobijaju nagrade za životno delo, škole i ulice dobijaju imena po najgorim učenicima. Zato današnjim profesorima jedino preostaje da najgore proglašavaju najboljima i da na njihovim primerima vaspitavaju nove generacije. Potreba za razjašnjavanjem ovog paradoksa smanjuje i etiku i moral i elementarne civilizacijske vrednosti.

Aktuelni trenutak je iznedrio i neke nove pojave na univerzitetima, koje nisu neuobičajene, ali su samo postale legalne i institucionalizovane. Zloupotreba funkcija i nepotizam su naša realnost. Nije neuobičajeno da na „legalnim“ konkursima posao dobijaju ćerke ili supruge, ili da sin dekana bude primljen na predmetu koji vodi njegov otac.

Mnogo je primera gde u vremenu „zabrane“ zapošljavanja bivši i aktuelni dekani zapošljavaju članove bliže i dalje familije bez ikakvih konkursa i u vreme kada to niko nije ni očekivao.

Ovo je, naravno, jedino moguće u trenutku i vremenu gde su strah i pretnja dominantne emocije, gde su sloboda mišljenja i govora duboko zakopane u pesku besmisla aktuelne svakodnevice.

Iako je hrabrost slobodno mislećih ljudi jedini recept za uspeh, borba za istinu, znanje za visoka moralna načela i odgovornost moraju biti osnovni preduslovi za promenu, ali i put i destinacija za izvesniju budućnost.

Odlučnost, čestitost i potpuna posvećenost i istrajnost u svakom poslu su samo znakovi pored puta koji mogu pokrenuti našu društvenu stvarnost, a izbor kompetentnih, obrazovanih i nadasve moralnih može dati odgovore na svekoliike izazove aktuelnog trenutka.

I ovaj urednički komentar ću završiti citatom velikog Šekspira: „Da bi ostao veran sebi, ne smeš lagati drugoga“, jer je neistina u svim oblastima našeg bitisanja paradigma sadašnjeg trenutka i istovremeno i uzrok i posledica naših sopstvenih iluzija.

Prof. dr Slavoljub Živković

Oral health effects on the nutritional status of elderly people

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SUMMARY

Introduction The aim of the study was to establish the association between oral health and malnutrition in people over the age of 65.

Material and Methods Cross-sectional study included 146 respondents residing in gerontology center, and 300 respondents who lived in their own homes or with their families. Nutritional status was evaluated using the Mini Nutritive Scale and standardized questionnaire. Dental status was evaluated by clinical examination using inspection method. The presence and absence of teeth was evaluated in each dental arch (third molars were not taken into consideration). Also, the presence of prosthetic restorations (total and partial dentures) was noticed without analyzing their adequacy and functionality. Self-assessment of health with categorical components assessed the overall health status. The research was conducted in 2018.

Results Most of respondents who had malnutrition or were at risk of malnutrition had worse dental status; they were completely or partially edentulous. There was high statistically significant difference in dental status of the upper ($\chi^2 = 47,797$; $p < 0,001$) and lower jaw ($\chi^2 = 66,680$; $p < 0,001$). The number of lost teeth had an impact on self-assessment of general health ($\chi^2 = 47,270$; $p < 0,001$).

Conclusion Oral health status in elderly people had significant influence on nutritional status.

Keywords: malnutrition; oral health; old people

INTRODUCTION

Nutritional status disorders and malnutrition usually occur as a result of changes in appetite, limited mobility, socio-economic constraints, chronic illness, depression, cognitive impairment, multiple types of medication, frequent complications and hospitalizations [1]. According to Chen [2], malnutrition of elderly is defined as inadequate nutritional status or malnutrition, followed by inadequate food intake, loss of appetite, loss of body mass and decreased muscle mass. Numerous studies have shown that the prevalence of this problem increases with age so that after 65 years of life it is 15% to 85% (depending on the parameters used, as well as the place of residence) [3, 4, 5]. Oral health, as one of the indicators of general health status, has great significance in determining nutritional status in older people [6, 7, 8]. This population often has loss of large number of teeth or all teeth, presence of caries lesions and periodontally compromised teeth, xerostomia and oral pre-cancer. The loss of teeth significantly reduces masticatory efficiency that affects the choice of food and eating habits. Soft food rich in saturated fatty acids and cholesterol are more consumed than fiber-rich food. Inability to chew food due to loss of teeth, lack or inadequate dental restorations or dentures is often associated with difficult swallowing, malnutrition or serious risk of malnutrition [9]. Numerous prospective studies have shown that the most frequent problems in elderly is the problems of chewing (42%) and xerostomia

(63%) [10, 11]. Also, worse oral and nutritional status is observed in higher percentages in elderly people residing in gerontological centers [12, 13, 14].

Previous studies were mostly focused on the association of oral health with malnutrition in elderly residing in gerontological institutions [12, 13, 14], but there is very little information on the impact of oral health on general health and risk of malnutrition in elderly people living in the community. The aim of the study was to establish the association between oral health and malnutrition in people over 65 years of age.

MATERIAL AND METHODS

Respondents

The cross-sectional study was carried out in the period from April to September 2018 among elderly people in four municipalities of Republika Srpska: East Sarajevo, Rogatica, Pale and Foca. The sample consisted of 446 respondents of both genders, divided into the two groups depending on their place of residence; 146 participants were from gerontology institutions while 300 respondents were community-based. Living in the community is defined as residing in your own or family home. Respondents in the community were selected using a register of patients older than 65 years of age in the family medicine services

of local health centers. By software, every third person according to specific criteria was included in the study. If the selected person did not meet criteria for inclusion in the study, the following one would be included until certain number of respondents was reached. The criteria for inclusion in the study was: person was orientated in time, space and able to recognize faces, while criteria for excluding were bad general condition, disorientation, inability to establish cooperation, the presence of mental illness, dementia, malignant diseases and chronic renal insufficiency. All users of gerontology centers, East Sarajevo, Pale and Rogatica who fulfilled the inclusion criteria and signed the informed consent were included in the study.

Research Instruments

A standardized questionnaire was used to collect socio-demographic data on respondents in the study (gender, age of respondents, education, residence, income, social activity and integration, cohabitation, socializing, hobby, use of mobility aids). Dental status was evaluated by clinical examination, using inspection method. The presence of complete or partial edentulism (third molars were not taken into consideration) for each jaw was assessed. The presence of prosthetic restorations (complete and partial dentures) was assessed without analyzing their adequacy and functionality. General health was analyzed with one question: "For your age, what would you say in general, that your health is?" The answers offered were: "Excellent", "Good", "Medium Good", "Average", "Bad" and "Very Bad". Nutritional status was investigated using the Mini Nutritional Scale Short Version-MNA-SF, which included two steps: screening (MNA-SF1) and evaluation (MNA-SF2). The maximum total score for MNA was 30 points (> 23.50 and indicated adequate nutritional status, $17 - 23.49$ risk for malnutrition and < 17 points indicates malnutrition) [15].

Statistical analysis

Data analysis was done using descriptive statistical analysis measures in SPSS packages 22 (SPSS IBM, Inc., Chicago, IL, United States). Results were presented as mean values $\pm$ SD for continuous variables and numbers / percentages for categorical variables. Differences were tested using Chi square test. As the level of statistical significance, usual value of $p < 0.05$ was considered.

Ethical considerations

The study was approved by the Ethics Committee of the Faculty of Medicine in Foca, University of East Sarajevo, with the decision: 01-2-1. All respondents gave written informed consent. Data were presented in a way that it hides the identity of all participants.

THE RESULTS

The study enrolled 446 respondents aged over 65 years. There were 251 female (56.3%) and 195 male (43.7%). The

youngest person was 65 years old (5.2%) and the oldest 99 years old (0.2%). The majority of respondents (87%) were married, had a certain hobby (55.8%) while 70% of them did not use mobility aids. Upper complete edentulous jaw was present in 62 respondents (13.9%), partially edentulous in 167 (37.4%), natural dental arch in 2 (0.4%), and prosthetic restorations in 215 (48.2%). Lower complete edentulous jaw was found in 92 subjects (20.6%), partially edentulous in 184 (41.3%), natural dental arch in 4 (0.9%) and prosthetic restorations in 166 (37.2%). The results of the study showed that 51.3% of respondents had complete or partially edentulous upper jaw while 61.9% had complete or partially edentulous lower jaw.

According to self-evaluation of general health, only 1.6% of respondents had excellent health, 43.8% good health, 38.1% medium-well, 16.1% poor and 0.4% very poor. The highest number of respondents in gerontology institutions (93.2%) was either in malnutrition or at risk of malnutrition, as opposed to community respondents (40.8%). People with lower educational level ($\chi^2=30,221$; $p < 0,001$) who stayed in geriatric institutions ($\chi^2=126,224$; $p < 0,001$) used mobility aids ($\chi^2=94,192$; $p < 0,001$) and did not have hobby ($\chi^2 = 68,155$; $p < 0,001$) had higher risk of malnutrition (Table 1). Table 2 shows the results of the overall nutritional status assessment in relation to dental status of respondents. It was found that respondents, who had malnutrition or were at risk of malnutrition, had poorer dental status. There was high statistically significant difference in dental status of upper ($\chi^2 = 47,797$; $p < 0,001$) and lower jaw ($\chi^2 = 66,680$; $p < 0,001$). Respondents who had poorer nutritional and dental status were considered to have poorer overall health status, while among respondents without risk of malnutrition, good health was observed ($\chi^2=47,270$; $p < 0,001$) (Table 3).

DISCUSSION

The study found link between oral health and nutritional status in elderly subjects. Study subjects with poorer dental status also had poorer nutritional status, ie. they were malnourished. Our results confirmed the results of previous studies [12, 14]. Earlier it was believed that loss of teeth and edentulism is expected and normal result of aging. However, age, by itself, does not cause teeth loss. The most common causes of teeth loss are: periodontal disease, tooth decay, worsened general health condition of the patient [16, 17]. Meta-analysis of results from about 1000 publications published in English in the last 20 years have shown negative impact of teeth loss on the quality of life, regardless of where studies were conducted or methodology used [16]. Today it is considered that changes in periodontium, loosening and loss of tooth in older age, are the consequence of cumulative effects of many risk factors during life. Aging cannot be considered the main risk factor for the occurrence and progression of periodontal diseases if some other factors are not present: decrease of the amount of saliva, poor oral hygiene, systemic illness, poor diet, some medications, mental state or social status of the person. Namely, periodontal disease is not specific for elderly people and diet is one of

Table 1. Nutritional status of participants in relation to socio-demographic characteristics**Tabela 1.** Nutritivni status ispitanika u odnosu na sociodemografske karakteristike

SOCIODEMOGRAPHIC CHARACTERISTICS SOCIODEMOGRAFSKE KARAKTERISTIKE	MNA			x ²	p
	< 17.00 N	17.00–23.49 N	> 23.50 N		
Education Obrazovanje					
Elementary school Osnovna škola	11	189	100	30.221	< 0.001
High school Srednja škola	6	43	74		
University Fakultet	1	9	13		
Place of residence Mesto boravka					
Community Zajednica	1	121	177	126.224	< 0.001
Gerontological institution Gerontološka ustanova	17	120	10		
Hanging out with friends Druženje sa prijateljima					
Yes Da	16	226	184	7.170	0.028
No Ne	2	15	3		
Hobby Hobi					
Yes Da	1	104	144	68.155	< 0.001
No Ne	17	137	43		
Use mobility aids Upotreba pomagala za mobilnost					
Yes Da	14	108	12	94.192	< 0.001
No Ne	4	133	175		

MNA – Mini nutritional scale; N – number of respondents

MNA (engl. mini nutritional scale) – Mini nutritivna skala; N – broj ispitanika

Table 2. Nutritional status of participants in relation to dental status**Tabela 2.** Nutritivni status ispitanika u odnosu na stanje zuba

DENTAL STATUS STATUS ZUBA	MNA			x ²	p
	< 17.00 N	17.00–23.49 N	> 23.50 N		
Upper jaw Gornja vilica					
– complete edentulous – bezuba	6	45	11	47.797	< 0.001
– partially edentulous – krezuba	9	106	52		
– natural dental arch – pun prirodan zubni niz	0	1	1		
– total or partial dentures – mobilne zubne nadoknade	3	89	123		
Lower jaw Donja vilica					
– complete edentulous – bezuba	7	76	9	66.680	< 0.001
– partially edentulous – krezuba	8	101	75		
– natural dental arch – pun prirodan zubni niz	0	3	1		
– total or partial dentures – mobilne zubne nadoknade	3	61	102		

MNA – Mini nutritional scale; N – number of respondents

MNA (engl. Mini nutritional scale) – Mini nutritivna skala; N – broj ispitanika

Table 3. Nutritional status of participants in relation to subjective assessment of health status**Tabela 3.** Nutritivni status ispitanika u odnosu na subjektivnu procenu zdravstvenog statusa

SUBJECTIVE HEALTH ASSESSMENT SUBJEKTIVNA PROCENA ZDRAVLJA	MNA			x2	P
	<17.00 N	17.00–23.49 N	> 23.50 N		
Excellent Odlično	0	3	4	47.270	<0.001
Good Dobro	3	79	113		
Average Srednje dobro	10	103	57		
Bad Loše	5	55	12		
Very bad Veoma loše	0	1	1		

MNA – Mini nutritional scale; N – number of respondents

MNA (engl. mini nutritional scale) – Mini nutritivna skala; N – broj ispitanika

the main factors contributing to the maintenance of good oral health [18]. In regards to socio-demographic characteristics of respondents, significant correlation was observed between gender, degree of education, cohabitation, as well as place of residence and assessment of oral and nutritional status. These results are in accordance with findings of other studies. Knowing the influence of oral clinical variables on self-assessment of health is of great importance for obtaining clearer insight into association with objectively and subjectively assessed mouth and tooth health [19].

Based on the results of our research it was found that the incidence of malnutrition was present in subjects with poorer dental status. Inadequate food also affects oral health [20], and poor oral health affects the choice of consumed food. Nutrition with no vitamins, minerals, proteins and low calories affect immune system and is associated with oral health, and especially dental diseases in older people [21]. The lack of appetite in elderly people is common, especially in individuals who suffer from anorexia, nausea, vomiting, or xerostomy caused by medications. Food intake has been further reduced in individuals with chronic diseases. The Swiss study conducted in hospitalized elderly was focused on the relationship between clinical parameters of malnutrition, serum albumin levels, and oral health indicators (dental status, oral hygiene, chewing function) [22]. Choosing the type of food largely depends on the ability to consume food with pleasure, and some food is refused due to inability to chew. The function of chewing in elderly can be called into question in the case of loss of teeth and inadequate dentures. Individuals living in institutions are more likely to have this problem and need help of appropriately trained staff [23].

The results obtained with MNA weight loss questionnaires were logical and expected. Previous research suggests connection between poor oral health and weight loss, where it is evident that tooth loss is a risk factor for body weight loss. Poor oral health may be related to systemic

diseases in a bidirectional manner, and weakening the chewing ability and food consumption may affect nutrition [24]. Social relationships also play an important role since they are optimized for the benefit of elderly. Many authors [25] described a model of social relations that clearly point to the relationship between behavior and social behavior and their influence on the quality of life associated with oral health (OHRQOL). Petersen et al. [26] determined the life expectancy index for elderly people in a community in Denmark where they found close association between poor dental health and reduced life activity. In addition, indexes for measurement of health support in relation to inclusion in social activity (families, friends or neighbors) are registered. Numerous studies [27] have shown that isolated seniors have the poorest dental health status and rarely use health services. Results of our study showed that malnourished subjects differed significantly in terms of dental status than those who did not have malnutrition. Important risk factors for oral health are eating habits, as well as some bad habits. Inadequate nutrition habits were found in our research that contributed to the risk of malnutrition. Our research showed that great number of respondents took more than 3 drugs per day (74.4%), 53.4% did not consume meat, fish or chicken every day, 43.7% of respondents did not consume two or more portions of fruits and vegetables daily, while 49.3% of respondents consumed up to five cups of liquid per day. The results of the research suggested that 55.8% of respondents reduced food intake due to chewing problems and swallowing difficulties, and 34.3% of respondents believed that there was no adequate diet. Previous research has shown that older people usually consume sweets and snacks (63.0%), juices, sweet drinks and carbonated drinks (54.0%) every day, which is inadequate diet. Similar data have been published and other authors have confirmed consumption of inadequate food due to poor dental status [28].

Older people around the world have issues with health-care, as access to dental services is limited, especially in rural areas. Health promotion programs dedicated to elderly are rare, therefore the evaluation of oral and nutritional status can provide important information that will lead to improved oral health promotion and health care of elderly.

CONCLUSION

Dental status in older people is associated with the risk of malnutrition. Socio-demographic characteristics and their own perception of health are important factors in assessing the effect of oral health on the nutritional status of elderly. Concerning that treatment of oral diseases is costly and requires high level of engagement of dental staff and resources, the prevention of oral diseases should focus also on nutrition. Establishing co-operation between a dentist and a family physician, family nurses as well as improving dental care of the elderly can play a significant role in preservation of dental health and malnutrition.

Authors declare that there are no conflicts of interest.

REFERENCES

- Macintosh C, Morley J, Chapman I. The anorexia of aging. *Nutrition* 2000; 16:983–5. [PMID: 11054605]
- Chen CC, Schilling LS, Lyder CH. A concept analysis of malnutrition in elderly. *J Adv Nurs* 2001; 36:131–46. [PMID: 11555057]
- Tsutsumi R, Tsutsumi YM, Horikawa YT. Decline in anthropometric evaluation predicts a poor prognosis in geriatric patients. *Asia Pac J Clin Nutr*. 2012; 21:44–51. [PMID: 22374559]
- Diekmann R, Winning K, Uter W, Kaiser MJ, Sieber CC, Volkert D, et al. Screening for malnutrition among nursing home residents: comparative analysis of the mini nutritional assessment, the nutritional risk screening and the malnutrition universal screening tool. *J Nutr Health Aging*. 2013; 17:326–31. [DOI: 10.1007/s12603-012-0396-2] [PMID: 23538654]
- Nasri H, Baradaran A, Shirzad H, Rafieian-Kopaei M. New concepts in nutraceuticals as alternative for pharmaceuticals. *Int J Prev Med*. 2014; 5:1487–99. [PMID: 25709784]
- Kaye EK. Nutrition, dietary guidelines and optimal periodontal health. *Periodontology* 2012; 58:93–111. [DOI: 10.1111/j.1600-0757.2011.00418.x]
- Quiles JL, Varela-López A. The role of nutrition in periodontal diseases. In: *Studies on Periodontal Disease*; Springer: New York, NY, USA. 2014; 251–78. [DOI: 10.3390/nu8090530]
- Ghezzi EM. Developing pathways for oral care in elders: evidence-based interventions for dental caries prevention in dentate elders. *Gerodontology* 2014; 3(1):31–6. [DOI: 10.1111/ger.12081]
- Alagü AS, Bhat SG. Ascorbic acid: New role of an age-old micro-nutrient in the management of periodontal disease in older adults. *Geriatr Gerontol Int*. 2015; 15:241–54. [DOI: 10.1111/ggi.12408]
- World Health Organization. Promoting Oral Health in Africa; 2015. p. 5e120. Available at: <http://apps.who.int/iris/bitstream/10665/205886/1/9789290232971.pdf?ua=1&ua=1>. Accessed July 10, 2017.
- van der Putten GJ. Poor Oral Health, a Potential New Geriatric Giant: Significant Oral Health (Care) Issues in Frail Older People. Nijmegen, Netherlands: Radboud Universiteit Nijmegen; 2011: 204.
- Halfens R, Meesterberends E, Neyens J, Rondas A, Rijcken S, Wolters S, et al. Landelijke Prevalentiemeting Zorgproblemen Rapportage resultaten 2015.
- Chauhan B, Kumar G, Kalam N, Ansari SH. Current concepts and prospects of herbal nutraceutical: A review. *J. Adv Pharm Technol Res*. 2013; 4:4–8. [DOI: 10.4103/2231-4040.107494]
- Adam H, Preston AJ. The oral health of individuals with dementia in nursing homes. *Gerodontology*. 2006; 23:99–105. [DOI: 10.1111/j.1741-2358.2006.00118.x]
- Vellas B, Villars H, Abellan G, Soto ME, Rolland Y, Guigoz Y, et al. Overview of the MNA® - Its History and Challenges. *J Nutr Health Aging*. 2006; 10(6):456–65. [PMID: 17183418]
- Gerritsen AE, Allen PF, Witter DJ, Bronkhorst EM, Creugers NH. Tooth loss and oral health-related quality of life: a systematic review and meta-analysis. *Health Qual Life Outcomes*. 2010; 8:126. [DOI: 10.1186/1477-7525-8-126]
- Avlund K, Schultz-Larsen K, Christiansen N, Holm-Pedersen P. Number of Teeth and Fatigue in Older Adults. *J Am Geriatr Soc*. 2011; 59:59–64. [DOI: 10.1111/j.1532-5415.2011.03502.x]
- Gil-Montoya JA, Guardia-López I, González-Moles MA. Evaluation of the clinical efficacy of a mouthwash and oral gel containing the antimicrobial proteins lactoperoxidase, lysozyme and lactoferrin in elderly patients with dry mouth—a pilot study. *Gerodontology* 2008; 25:3–9. [DOI: 10.1111/j.1741-2358.2007.00197.x]
- Zivanović D, Kulić LJ, Zuza A, Davidović B, Radović I. Uticaj oralnih kliničkih faktora na samoprocjenu zdravlja usta i zuba. *Stomatološki glasnik Srbije* 2015; 62(3):137–42. [DOI: 10.1515/sdj-2015-0015]
- Soini H, Routasalo P, Lauri S, Ainamo A. Oralni i prehrambeni status kod krhkih starijih osoba. *Spec Care Dentist*. 2003; 23:209–15.
- Moynihan P, Petersen PE. Ishrana, prehrana i sprječavanje dentalnih bolesti. *Public Health Nutr*. 2004; 7:201–26.
- Dormenvil V, Budtz-Jørgensen E, Mojon P, Bruyère A, Rapin CH. Prehrana, opći zdravstveni status i oralni zdravstveni status kod hospitaliziranih starijih osoba. *Gerodontology*. 1995; 12:73–80.
- Petersen PE, Kjølner M, Christensen LB, Krusturup U. Promjene dentalnog statusa kod odraslih osoba, korištenje stomatoloških usluga, te postizanje nacionalnih ciljeva o dentalnom zdravlju u Danskoj do 2000. godine. *J Public Dent Health*. 2004; 64:127–35.
- Walls AW, Steele JG, Sheiham A, Marcenes W, Moynihan PJ. Oralno zdravlje i prehrana kod starijih osoba. *J Public Health Dent*. 2000; 60:304–7.
- Slade GD, Strauss RP, Atchinson KA, Kressin NR, Locker D, Reisine ST. Sažetak s Konferencije: procjenjivanje ishoda oralnog zdravlja – mjerenje zdravstvenog statusa i kvalitete života. *Community Dent Health*. 1998; 15:3–7.
- Petersen PE, Nortov B. Opće i dentalno zdravlje u odnosu na životni stil i društvene aktivnosti kod Danaca u dobi od 67 godina. *Scand J Prim Health Care*. 1989; 7:225–30.
- Institut za javno zdravlje Srbije “Dr Milan Jovanović Batut”. Rezultati istraživanja zdravlja stanovništva Srbije, 2013. godina. Beograd, 2014.
- Kebede B, Kemal T, Abera S. Oral health status of patients with mental disorders in Southwest Ethiopia. *PLoS ONE*. 2012; 7(6):39142. [DOI: 10.1371/journal.pone.0039142] [PMID: 22723950]

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Uticaj oralnog zdravlja na nutritivni status starih osoba

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KRATAK SADRŽAJ

Uvod Cilj studije je bio utvrditi povezanost oralnog zdravlja sa malnutricijom kod osoba starijih od 65 godina.

Materijal i metode rada Studija preseka je obuhvatila 146 ispitanika, korisnika gerontološkog centra, i 300 ispitanika koji žive u vlastitom domu ili sa porodicom. Nutritivni status je evaluiran korišćenjem Mini nutritivne skale i standardizovanog upitnika. Za procenu dentalnog statusa korišćen je klinički pregled, metod inspekcije. Utvrđivano je prisustvo bezubosti, krezubosti, prirodnog zubnog niza za svaku vilicu zasebno, kao i prisustvo mobilnih zubnih nadoknada bez analize njihove adekvatnosti i funkcionalnosti. Samoprocenom zdravlja uz kategoričke komponente procenjen je opšti zdravstveni status. Istraživanje je sprovedeno 2018. godine.

Rezultati Veći broj ispitanika koji su bili u malnutriciji i u riziku od malnutricije imali su lošiji dentalni status, bezubost i krezubost. Između ispitanika je uočena visoko statistički značajna razlika u odnosu na dentalni status gornje ($\chi^2 = 47,797$; $p < 0,001$) i donje vilice ispitanika ($\chi^2 = 66,680$; $p < 0,001$). Broj zuba koji je nedostajao imao je uticaja na samoprocenu zdravlja ($\chi^2 = 47,270$; $p < 0,001$).

Zaključak Oralno zdravlje starih osoba ima značajan uticaj na nutritivni status.

Ključne reči: malnutricija; oralno zdravlje; stare osobe

UVOD

Poremećaji nutritivnog statusa i nastanak malnutricije obično se javljaju kao posledica promena apetita, ograničene pokretljivosti, socioekonomskih ograničenja, prisustva hroničnih bolesti, depresije, oštećenja kognitivnih funkcija i uzimanja više vrsta lekova, čestih komplikacija i većeg broja hospitalizacija [1]. Prema Chenu [2], malnutricija starih osoba se definiše kao neadekvatan nutritivni status ili pothranjenost, praćen nedovoljnim unosom hrane, gubitkom apetita, gubitkom telesne mase i smanjenjem mišićne mase. Brojna istraživanja pokazuju da se prevalencija ovog problema povećava starenjem, tako da posle 65. godine života iznosi od 15% do 85% (u zavisnosti od korišćenih parametara, kao i mesta stanovanja) [3, 4, 5]. Oralno zdravlje, kao jedan od pokazatelja opšteg zdravstvenog stanja osobe, ima veliki značaj u determinisanju nutritivnog statusa kod osoba starije životne dobi [6, 7, 8]. Kod ovih osoba često se uočava loš oralni status kao posledica: gubitka velikog broja ili svih zuba, prisustva karijesnih i parodontopatičnih zuba, kserostomije i oralnih prekanceroza. Gubitkom većeg broja zuba značajno je redukovana žvaćna efikasnost, što utiče na izbor hrane i prehrambene navike, više se konzumira mekša hrana bogata zasićenim masnim kiselinama i holesterolom u odnosu na hranu bogatu vlaknima. Nemogućnost osoba starije životne dobi da sažvaću hranu usled gubitka zuba, nepostojanje ili postojanje neadekvatnih zubnih nadoknada često udruženo sa problemima gutanja dovodi do toga da je veliki procenat ovih osoba neuhranjeno ili u ozbiljnom riziku za malnutriciju [9]. Brojne prospektivne studije pokazuju da su najučestaliji oralni problemi kod neuhranjenih starih osoba problemi žvakanja (42%), kao i kserostomija (63%) [10, 11]. Takođe, lošiji oralni i nutritivni status u većem procentu je uočen kod osoba starije životne dobi koje borave u gerontološkim centrima [12, 13, 14].

Prethodna istraživanja su se uglavnom bavila povezanošću oralnog zdravlja sa malnutricijom kod korisnika gerontoloških ustanova [12, 13, 14], ali je veoma malo podataka o uticaju oralnog zdravlja na opšte zdravlje i rizik za nastanak malnutricije kod starih osoba koje žive u zajednici. Cilj studije je bio utvrditi povezanost oralnog zdravlja sa malnutricijom kod osoba preko 65 godina starosti.

MATERIJAL I METODE

Ispitanici

Studija preseka je sprovedena u periodu od aprila do septembra 2018. godine kod osoba starije životne dobi u četiri opštine Republike Srpske: Istočno Sarajevo, Rogatica, Pale i Foča. Uzorak su činila 446 ispitanika oba pola, podeljena u dve grupe zavisno od mesta boravka, 146 ispitanika iz gerontoloških ustanova i 300 ispitanika koji žive u zajednici. Boravak u zajednici je definisan kao stanovanje u vlastitom ili porodičnom domu. Ispitanici u zajednici su izabrani pomoću registra pacijenata starijih od 65 godina života službi porodične medicine lokalnih domova zdravlja. Softverski, svaka treća osoba prema specifično zadatim kriterijumima je uključivana u studiju. Ako izabrana osoba nije ispunjavala kriterijume uključivanja u studiju, uključivana je sledeća, sve dok se nije dobio određeni broj ispitanika. Kriterijumi za uključivanje u studiju su bili orijentisanost u vremenu, prostoru i prema licima, a kriterijumi za isključivanje loše opšte stanje, dezorijentisanost, nemogućnost uspostavljanja saradnje, te prisustvo psihičkih oboljenja, demencije, malignih oboljenja i hronične bubrežne insuficijencije. Svi korisnici gerontoloških centara Istočno Sarajevo, Pale i Rogatica koji su ispunili kriterijume uključivanja i potpisali informisani pristanak uključeni su u studiju.

Instrumenti istraživanja

Standardizovani upitnik korišćen je za prikupljanje sociodemografskih podataka o ispitanicima u studiji (pol, dob ispitanika, obrazovanje, mesto stanovanja, primanja, socijalna aktivnost i integracija, kohabitacija, druženje, hobi, korišćenje pomagala za mobilnost).

Dentalni status je procenjen pomoću kliničkog pregleda, metodom inspekcije. Utvrđivano je prisustvo bezubosti, krezubosti, prirodnog zubnog niza (treći molari nisu se uzimali u obzir) za svaku vilicu zasebno, kao i prisustvo mobilnih zubnih nadoknada bez analize njihove adekvatnosti i funkcionalnosti.

Opšte zdravlje je analizirano pomoću jednog pitanja: „Za Vaše godine, da li biste rekli uopšteno da je Vaše zdravlje...?“

Ponudjeni odgovori su glasili: „odlično“, „dobro“, „srednje dobro“, „prosečno“, „loše“ i „veoma loše“.

Nutritivni status se ispitivao pomoću upitnika Mini nutritivna skala (engl. Mini nutritional scale short version-MNA-SF), koji sadrži dva koraka: skrining (MNA-SF1) i procenu (MNA-SF2). Maksimalan ukupni skor za MNA iznosi 30 bodova (> 23,50 označava adekvatan nutritivni status; od 17 – 23,49 rizik za malnutriciju i < 17 bodova malnutriciju) [15].

Statistička analiza

Postupak obrade podataka vršen je pomoću 22 SPSS paketa (SPSS IBM, Inc., Chicago, IL, United States). Za analizu prikupljenih podataka korišćene su deskriptivne statističke mere analize. Ishodi su opisani putem srednjih vrednosti ($\pm$ SD) za kontinuirane varijable i brojeva/postotaka za kategorijske varijable. Razlike su testirane pomoću hi-kvadrat testa. Kao nivo statističke značajnosti razlika uzeta je uobičajena vrednost $p < 0,05$.

Etička razmatranja

Istraživanje je odobreno od strane Etičkog komiteta Medicinskog fakulteta u Foči, Univerziteta u Istočnom Sarajevu odlukom broj: 01-2-1. Svi ispitanici su dali pisani informisani pristanak. Podaci su predstavljeni na način koji prikriva identitet svih učesnika.

REZULTATI

Studijom je bilo obuhvaćeno 446 ispitanika starosti preko 65 godina, od kojih je bilo 251 (56,3%) žena i 195 (43,7%) muškaraca. Najmlađi ispitanik je imao 65 godina (5,2%), a najstariji 99 godina (0,2%). Većina ispitanika (87%) bila je u braku, određeni hobi je imalo 55,8% ispitanika, dok njih 70% nije koristilo pomagala za mobilnost.

U gornjoj vilici bezubost je bila prisutna kod 62 ispitanika (13,9%), krezubost kod 167 (37,4%), pun prirodan zubni niz imala su dva ispitanika (0,4%), a saniran zubni niz zubnim nadoknadama 215 ispitanika (48,2%). U donjoj vilici bezubost je pronađena kod 92 ispitanika (20,6%), krezubost kod 184 (41,3%), pun prirodan zubni niz kod četiri (0,9%) i saniran zubni niz zubnim nadoknadama kod 166 ispitanika (37,2%). Rezultati istraživanja pokazali su da je kod 51,3% ispitanika gornja vilica, a kod 61,9% donja vilica bezuba ili krezuba.

Prema samoproceni zdravlja samo 1,6% ispitanika je imalo odlično zdravlje, 43,8% dobro zdravlje, 38,1% srednje dobro, 16,1% loše i 0,4% veoma loše. Najveći broj ispitanika u gerontološkim ustanovama (93,2%) bilo je u malnutriciji ili u riziku za malnutriciju, za razliku od ispitanika u zajednici (40,8%). Osobe sa manjim stepenom obrazovanja ($\chi^2 = 30,221$; $p < 0,001$), koje su boravile u gerontološkim ustanovama ($\chi^2 = 126,224$; $p < 0,001$), koristile pomagala za mobilnost ($\chi^2 = 94,192$; $p < 0,001$) i koje nisu imale hobi ($\chi^2 = 68,155$; $p < 0,001$) imale su veći rizik za malnutriciju (Tabela 1). U Tabeli 2 prikazani su rezultati ukupne procene nutritivnog statusa u odnosu na dentalni status ispitanika. Utvrđeno je da su ispitanici koji su bili u malnutriciji i u riziku za nastanak malnutricije imali lošiji dentalni status, bezubost i krezubost. Između ispitanika je uočena visoko statistički značajna razlika u odnosu na dentalni status gornje (χ^2

$= 47,797$; $p < 0,001$) i donje vilice ispitanika ($\chi^2 = 66,680$; $p < 0,001$). Ispitanici koji su imali lošiji nutritivni i dentalni status smatrali su da imaju i lošiji opšti zdravstveni status, dok je kod ispitanika bez rizika za malnutriciju konstatovano dobro zdravlje ($\chi^2 = 47,270$; $p < 0,001$) (Tabela 3).

DISKUSIJA

Studija je utvrdila vezu između oralnog zdravlja i nutritivnog statusa kod starih osoba. Ispitanici studije sa lošijim dentalnim statusom su imali i lošiji nutritivni status, odnosno bili su neuhranjeni. Naši rezultati potvrđuju rezultate prethodnih studija [12, 14]. Ranije se verovalo da su gubitak zuba i pojava bezubosti očekivana i normalna pojava u starosti. Međutim, starost, sama po sebi, ne dovodi do gubitka zuba. Najčešći razlozi gubitka zuba su: parodontopatije, karijes zuba, pogoršano opšte zdravstveno stanje bolesnika [16, 17]. Rezultati metaanalize kojom je obuhvaćeno oko 1000 publikacija objavljenih na engleskom jeziku u poslednjih 20 godina su pokazali da sve analizirane studije potvrđuju negativni uticaj gubitka zuba na kvalitet života, nezavisno od mesta gde su studije sprovedene i od korišćene metodologije [16]. Danas se smatra da su promene na parodonticijumu, labavljenje i gubitak zuba do kojih može doći u starosti posledica kumulativnog delovanja više faktora rizika, koji deluju tokom celog života. Starenje se ne može smatrati glavnim faktorom rizika za pojavu i napredovanje oboljenja parodonticijuma ukoliko nisu prisutni i drugi faktori: smanjena količina pljuvačke, loša oralna higijena, sistemska oboljenja, loš način ishrane, uzimanje nekih lekova, psihičko stanje osobe, materijalno stanje osobe. Naime, starije osobe nisu sklonije obolevanju od parodontopatije od mlađih osoba, a način ishrane je jedan od glavnih faktora koji doprinose očuvanju kvaliteta zuba [18]. Od ispitivanih sociodemografskih karakteristika ispitanika, značajna povezanost je uočena između pola, stepena obrazovanja, kohabitacije, kao i mesta boravka i procene oralnog i nutritivnog statusa. Ovi rezultati su u skladu sa nalazima drugih studija koje ukazuju na značajnost procene oralnog zdravlja starih osoba. Poznavanje uticaja oralnih kliničkih varijabli na samoprocenu zdravlja od velikog je značaja zbog dobijanja jasnijeg uvida o povezanosti objektivno sa subjektivno procenjenim zdravljem usta i zuba [19].

Na osnovu rezultata našeg istraživanja utvrđeno je da je učestalost malnutricije prisutna kod većeg broja ispitanika sa lošijim dentalnim statusom. Neodgovarajuća ishrana utiče na oralno zdravlje [20], a slabo oralno zdravlje utiče na izbor konzumirane hrane. Ishrana u kojoj nedostaju vitamini, minerali, belančevine i kalorije utiče na pad imuniteta i zbog toga je ishrana povezana s oralnim zdravljem, a posebno sa stomatološkim bolestima kod starijih osoba [21]. Manjak apetita kod starijih osoba je uobičajen, posebno kod pojedinaca koji pate od anoreksije, mučnine, povraćanja ili kserostomije uzrokovane lekovima. Unos hrane još je više smanjen kod pojedinaca s hroničnim bolestima. Švajcarsko istraživanje hospitalizovanih starijih osoba bilo je usmereno na odnos između kliničkih parametara neuhranjenosti, nivoa seruma albumina i indikatora povezanih s oralnim zdravljem (dentalnog statusa, oralne higijene, funkcije žvakanja) [22]. Odabir vrste hrane u velikoj meri zavisi od sposobnosti konzumiranja hrane sa zadovoljstvom, te se neka hrana odbija ukoliko je smanjena sposobnost žva-

kanja. Funkcija žvakanja kod starih osoba može biti dovedena u pitanje ako se radi o gubitku zuba i starosti zubne proteze. Pojedinci koji žive u ustanovama češće imaju ovaj problem, te im je potrebna pomoć osoblja koje je primereno obučeno za to [23]. Dobijeni rezultati pomoću upitnika MNA za gubitak težine su logični i očekivani. Dosadašnja istraživanja ukazuju na povezanost lošeg oralnog zdravlja i gubitka težine, gde je evidentno dokazano da je manjak zuba rizični faktor koji dovodi do gubitka telesne težine. Loše oralno zdravlje može biti povezano sa sistemskim bolestima na dvosmeran način, a slabljenje sposobnosti žvakanja i konzumiranja hrane može uticati na stepen uhranjenosti [24]. Takođe, društveni odnosi imaju važnu ulogu, jer optimiziraju dobrobit starijih osoba. Mnogi autori [25] opisali su model društvenih odnosa koji jasno ukazuje na povezanost samog ponašanja i društvenog delovanja i njihov uticaj na kvalitet života povezan s oralnim zdravljem (OHRQOL). Petersen i saradnici [26] odredili su indeks životne aktivnosti kod starijih osoba u jednoj zajednici u Danskoj gde su pronašli usku povezanost lošeg dentalnog zdravlja i smanjene životne aktivnosti. Pored toga, registrovani su indeksi za merenje zdravstvene podrške u odnosu na uključenost u društveno delovanje (porodice, prijatelji ili komšije). Brojna istraživanja [27] pokazala su da izolovane starije osobe imaju najslabiji dentalni zdravstveni status i retko koriste zdravstvene usluge. Rezultati našeg istraživanja govore da se neuhranjeni ispitanici statistički značajno razlikuju u pogledu dentalnog statusa u odnosu na ispitanike koje nisu u malnutriciji, tj. u većoj meri su prisutni bezubost i krezubost. Bitni faktori rizika za oralno zdravlje jesu i navike u ishrani, kao i neke loše navike. Neadekvatne navike u ishrani su pronađene i u našem istraživanju i doprinose riziku za nastanak neuhranjenosti. Naše istraživanje je pokazalo da veći broj ispitanika uzima više od tri leka dnevno (74,4%), da njih 53,4% ne konzumira meso, ribu ili piletinu svakodnevno, 43,7% ispitanika ne troši dve ili više porcija voća i povrća dnevno, dok 49,3% ispitanika konzumira do pet šoljica tečnosti dnevno. Dobijeni rezultati istraživanja idu u prilog

činjenici da 55,8% ispitanika ima smanjen unos hrane zbog problema žvakanja i teškoća sa gutanjem, a samim tim 34,3% ispitanika smatra da nema adekvatan način ishrane. Dosadašnja istraživanja su evidentirala da stare osobe najčešće svakodnevno konzumiraju slatkiše i grickalice (63%), sokove, zaslađene napitke i gazirana pića (54%), što ukazuje na neadekvatan način ishrane. Slične podatke su objavili i drugi autori koji su potvrdili konzumiranje neadekvatne hrane zbog nemogućnosti žvakanja upravo zbog lošeg dentalnog statusa [28].

Velike probleme sa oralnim zdravljem imaju stare osobe širom sveta, pri čemu je dostupnost korišćenja stomatoloških usluga veoma mala, naročito u ruralnim krajevima. Programi promocije zdravlja posvećeni starim osobama su retki, pa procjena oralnog i nutritivnog statusa može pružiti važne informacije koje će dovesti do poboljšanja promocije oralnog zdravlja, kao i unapređenja zdravstvene zaštite starih osoba u trećem životnom dobu.

ZAKLJUČAK

Dentalni status kod starih osoba je povezan sa rizikom za nastanak malnutricije. Sociodemografske karakteristike i sopstvena percepcija zdravlja su važani faktori u proceni uticaja oralnog zdravlja na nutritivni status starih osoba. S obzirom na to da saniranje oralnih oboljenja podrazumeva velike materijalne izdatke i visok stepen angažovanosti stomatološkog osoblja i resursa, u prevenciji oralnih oboljenja akcenat treba usmeriti prema ishrani. Rezultati do kojih smo došli predstavljaju samo jedno od mogućih polazišta u procesu istraživanja i unapređivanja života starih osoba i mogu biti podsticaj za dalja istraživanja ovog fenomena. Uspostavljanje saradnje između stomatologa, lekara porodične medicine i patronažnih sestara, te poboljšanje stomatološke zaštite starih osoba, može imati značajnu ulogu u očuvanju dentalnog zdravlja i prevenciji malnutricije.

Autori izjavljuju da nemaju sukob interesa.

The assessment of primary teeth condition in 6 year-old children in Podgorica municipality

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SUMMARY

Introduction The most frequent oral disease in children is tooth decay. The aim of this study was to determine the health status of primary teeth in 6 year-old children.

Material and method The study included 203 children of both genders living in the territory of Podgorica municipality. Only children whose parents gave consent were included. The parameters used for assessing oral health condition were: number of decayed, missing, and filled teeth due to caries (dmft) and Significant Caries Index (SiC). One dentist clinically examined all respondents in accordance with methodology and criteria of the World Health Organization (WHO).

Results The average value of dmft in 6-year-olds in Podgorica was 4.9. On average, 80.3% of examined children had dental decay. The SiC Index was 8.3. Among examined children, 12.3% had at least one tooth with fissure sealant. In dmft structure dominated untreated decay (92.6%).

Conclusion Results showed high prevalence of primary teeth decay in 6 years old children, indicating the absence of preventive measures and programs in Montenegro.

Keywords: children; dental decay; primary teeth; 6 year-olds

INTRODUCTION

Oral health is an important part of general health and as such is of primary importance for the functioning and quality of life. Preventive programs can improve oral health significantly with low financial implications [1].

Dental decay is the most common oral disease. It is a chronic, infectious, progressive, multifactorial disease, where nutrition plays a key role in its development. Children are particularly predisposed to the development of dental decay. Its complications have significant effect on overall child health, nutrition, growth and weight [2, 3, 4]. Also, dental decay causes discomfort, pain, sleeping problems, learning and absence from school [5, 6, 7]. Odontogenic infections as a result of untreated dental decay are the most common cause of hospitalization of young children [7].

Primary teeth are extremely important for nutrition and speech, they preserve space for permanent teeth and serve as guides, and there is also aesthetic role. In addition, primary teeth condition influences permanent teeth health as well. Oral hygiene habits and children's diet are encouraged by the family [8]. Early start of dental decay is an indicator of missed opportunities for preventive care and endangers children's general health. Therefore, it is necessary to include preventive-prophylactic methods early in life. Epidemiological data provide insight into disease developing and can be used to create preventative programs with the aim of improving oral health [9].

Montenegro health system is currently focused on a curative approach rather than preventative measures. Mon-

tenegro is an area with low fluoride content in drinking water (from 0.05 to 0.2mg / L).

The aim of this study was to determine the health status of primary teeth in 6 year-old children.

METHODOLOGY

The survey included 203 children of both genders living in the territory of Podgorica Municipality, who came to dental examinations at the Faculty of Medicine, during 2017. Only children who were not older than 6 years were included in the study, medically healthy and without a mental, physical and sensory handicap. One dentist according to the principles of good clinical practice performed all clinical exams. Kappa statistics were used to test the researcher reliability. Kappa's value was 0.94.

The parameters used to assess oral health condition were: number of decayed, missing, and filled teeth due to caries (dmft) and Significant Caries Index (SiC), according to the World Health Organization recommendations [10]. All children that participated in the study were screened with standard dental diagnostic tools on dry teeth, in dental chair using overhead light. Clearly visible lesions with formed cavity on the tooth surface were registered as tooth decay, while changes in the transparency or initial demineralization of enamel with intact surface, without cavitation, was registered as healthy tooth. The state of deciduous dentition was estimated using the dmft index as described by the WHO criteria and procedures for ep-

idemiological research [10]. In addition, demographical data, age, gender, school and address of residence (urban or suburban) were entered:

- Decayed teeth - d, missing teeth - m, filled teeth - f (dmft) (for primary dentition) is a method to numerically express the caries experience and it is obtained by calculating the number of decayed (d), missing (m) and filled (f) teeth (t).
- dmft free and application of preventive measures - fissure sealants.

The SiC index (significant caries index) represents the upper third of the frequency distribution of dmft. It is introduced with the aim of pointing to respondents with the highest caries values in each population. This index is used as an addendum to mean values of dmft, and gives true picture of patients with highest caries risk. It is obtained in the following way: all examined children are distributed by dmft values; then one third of children with the highest values of dmft are selected and obtained number represents the subset of SiC; the resulting dmft score for this subset represents the value of SiC [11, 12].

Statistical data processing was done in SPSS v.11.5 for Windows (SPSS Inc., Chicago, IL, USA). Descriptive and analytical statistics were used to describe the results. To test statistical significance in the mean values between the two independent samples, Student's t-test I X² test were used. Values of $p < 0.05$ were considered statistically significant.

RESULTS

A total of 203 children, 99 girls and 104 boys from urban and suburban areas of Podgorica municipality were examined. No statistically significant difference was found in regards to gender and place of residence (χ^2 test, $p > 0.05$). The distribution of six-year-olds according to gender and place of residence is shown in Table 1.

On average, 80.3% of examined children had dental decay. The average value of dmft index in 6-year-olds in Podgorica was 4.9 (4.5 to 5.6). Lower dmft index was recorded in girls compared to boys. Also, children from urban residence had lower values of this index than the children from the suburban residences. However, there were no statistically significant differences in the values of this index in relation to sex and place of residence (t-test, $p > 0.05$; Table 2).

In the dmft structure dominated decayed teeth (92.6%) followed by filled teeth (5.7%) and small percentage of extracted teeth (1.2%). Statistically significant differences were not found in the dmft structure in relation to the gender and place of residence (Table 3).

SiC's subgroup included 67 children. The index (upper third of the frequency allocation dmft) was 8.36. Among the examined children, 12.3% had at least one tooth with fissure sealant.

DISCUSSION

Primary teeth are very important. They stimulate normal growth and development of jaws, allow chewing, partici-

Table 1. Distribution of respondents (6 year-olds) by gender and place of residence

Tabela 1. Raspodela šestogodišnjaka prema polu i mestu stanovanja

Residence Mesto stanovanja	Gender Pol			
	Boys (n, %) Dečaci (n, %)		Girls (n, %) Devojčice (n, %)	
Urban Grad	68	49.6%	69	50.4%
Suburban Prigradski deo	36	54.5%	30	45.5%
Total Ukupno	104	51.2%	99	48.8%

Table 2. Caries distribution (dmft persons and dmft) in relation to gender and place of residence

Tabela 2. Raspodela kep i kep šestogodišnjaka prema polu i mestu stanovanja

Index	Urban Gradski deo	Suburban Prigradski deo	Total Ukupno
	B/G/B+G	B/G/B+G	B/G/B+G
dmft persons kep osoba	77.9/76.8/77.3	86.1/86.6/86.3	80.7/79.7/80.3
dmft kep	4.7/4.5/4.6	5.6/5.2/5.4	5.0/4.7/4.9

B – boys; G – girls; B+G – boys+girls (t-test, $p > 0.05$)

B – dečaci; G – devojčice; B+G – dečaci+devojčice (t-test, $p > 0.05$)

Tabela 3. Structure of dmft index presented in percentage

Tabela 3. Struktura dmft indeksa u procentima

Index	Parameters of dmft Dmft parametri	Boys (%) Dečaci (%)	Girls (%) Devojčice (%)
dmft	d (k)	93.3	91.1
	m (e)	m (e)	1.1
	f (p)	5.4	7.8

dmft – decay, missing, filled teeth
(t-test, $p > 0.05$)

pate in speech development, preserve the space for their successors, and participate in aesthetic appearance. Healthy primary teeth allow permanent teeth to grow in healthy environment. The condition of deciduous dentition is largely reflected on the state of permanent dentition.

The results of our study showed that primary teeth did not receive adequate attention. The percentage of children with all healthy teeth in our study was low (19.9%). High values of dmft index indicated high distribution of decay in primary teeth both in boys and girls, with somewhat worse picture in Podgorica's suburban area. When compared with similar epidemiological studies from neighboring countries, it is not encouraging picture. Average values of number of decayed primary teeth per respondent ranged from 4.17 in Republika Srpska, while the percentage of children with all healthy teeth was 3.94% [8]. In Serbia, 20.6% of children aged 6 years had all healthy teeth [13]. In Croatia, the value of the dmft index for six-year-olds was 4.7 [14], while in Kosovo the value of the dmft index ranged from 6.31 for boys to 6.56 for girls [15]. The average dmft index for children from Poland was 5.56 [16]. However, in developed countries dmft index ranged from 2.1 in Austria [17], 2.0 in Australia [18], 1.9 in Switzerland [19], 0.9 in Germany [20].

Special attention was paid to high-risk individuals, and an analysis of the average dmft index of one third of

the most affected respondents was performed giving SiC index. The average dmft index for 6-year-olds in Austria was 2.1 and the SiC was 5.3 [17]. The SiC value in Italy amounted to 3.8 a dmft index 1.4 [21]. In Ireland, the SiC index for children 6 years was 4.0, and dmft 1.3 [22]. The value of this index for children in Montenegro was 8.36, which is much higher than the above-mentioned values.

The percentage of our respondents with at least one tooth with fissure sealant was very low (12.3%). Small percentages of fissure sealants also had children from Kosovo (1.3%) [15], while no children were found with fissure sealant of this age in Republika Srpska [8]. Fissure sealants have proved to be good prophylactic measures in the prevention or control of decay, and therefore should be applied.

Efficiency of the organization of dental health care can be best achieved by observing the dmft structure. After analyzing individual components of dmft, it was observed that decayed teeth in our subjects were dominant. Dental caries was the most represented in the structure of dmft both in boys and girls. There was very small percentage of filled teeth. Similar results were found in Republika Srpska [8]. Although the Health Insurance Fund offers free dental services in Montenegro to this population group, the prevalence of decay is high. This situation is likely the result of non-educated parents who believe that primary dentition will be replaced by permanent and children would be brought to dentist mainly when they have toothache. Health habits and nutrition control are very important in preventing oral diseases [23]. It is therefore necessary to propose a plan of preventive activities towards the education of parents and children.

CONCLUSION

The main reasons for poor oral health in 6 years old children is the absence of population prevention programs and dental services oriented mostly toward treating disease. It is important to stress preventive and prophylactic measures, and raise the level of oral health consciousness, both at individual and social levels.

REFERENCES

- Petersen PE. Global policy for improvement of oral health in the 21st century-implications to oral health research of World Health Assembly 2007. *World Health Organization. Community Dent Oral Epidemiol.* 2009; 37(1):1–8. [DOI: 10.1111/j.1600-0528.2008.00448.x]
- Heinrich-Weltzien R, Monse B, Benzan H, Heinrich J, Kromeyer-Hauschild K. Association of dental caries and weight status in 6- to 7-year-old Filipino children. *Clin Oral Investig.* 2013; 17(6):1515–23. [DOI: 10.1007/s00784-012-0849-3] [PMID: 23053701]
- Duijster D, Sheiham A, Hobdell MH, Itchon G, Monse B. Associations between oral health-related impacts and rate of weight gain after extraction of pulpally involved teeth in underweight preschool Filipino children. *BMC Public Health.* 2013; 13:533. [DOI: 10.1186/1471-2458-13-533] [PMID: 23731717]
- Benzan H, Monse B, Heinrich-Weltzien R, et al. Untreated severe dental decay: a neglected determinant of low Body Mass Index in 12-year-old Filipino children. *BMC Public Health.* 2011; 11:558. [DOI: 10.1186/1471-2458-11-558] [PMID: 21752286]
- Leal SC, Bronkhorst EM, Fan M, Frencken JE. Untreated cavitated dentine lesions: impact on children's quality of life. *Caries Res.* 2012; 46(2):102–6. [DOI: 10.1159/000336387] [PMID: 22398411]
- Seirawan H, Faust S, Mulligan R. The impact of oral health on the academic performance of disadvantaged children. *Am J Public Health.* 2012; 102(9):1729–34. [DOI: 10.2105/AJPH.2011.300478] [PMID: 22813093]
- Agaku IT, Olutola BG, Adisa AO, Obadan EM, Vardavas CI. Association between unmet dental needs and school absenteeism because of illness or injury among U.S. school children and adolescents aged 6-17 years, 2011–2012. *Prev Med.* 2015; 72:83–8. [DOI: 10.1016/j.ypmed.2014.12.037] [PMID: 25575801]
- Janković S, Davidović B, Tpmić S. Assessment of Deciduous Dentition in 6 -10 Year Old School Children. *Stomatološki glasnik Srbije.* 2012; 59(4):183–9. [DOI: 10.2298/sgs1204183]
- Martinović B, Ilić A, Cvetković A, Milojković Z, Stošović-Kalezić I, Mladenović R, et al. The status of dental health in children aged 12 and 15 years. *Praxis Medica.* 2016; 45(1):11–5. [DOI: 10.5937/pramed1601011M]
- World Health Organization. *Oral Health Surveys. Basic Methods.* 4th edn. Geneva: World Health Organization; 1997.
- Bratthall D. Introducing the Significant Caries Index together with a proposal for a new oral health goal for 12-year-olds. *Int Dent J.* 2000; 50:378–84. [DOI: 10.1111/j.1875-595X.2000.tb00572.x] [PMID: 11197197]
- Nishi M, Stjernswärd J, Carlsson P, Bratthall D. Caries experience of some countries and areas expressed by the Significant Caries Index. *Community Dent Oral Epidemiol.* 2002; 30:296–301. [DOI: 10.1034/j.1600-0528.2002.00054.x] [PMID: 12147171]
- Ivanović M, Carević M, Marković D. *Protokoli u stomatologiji.* Beograd: Stomatološki fakultet; 2009.
- Jokić NI, Bakarić D, Janković S, Malatestinić G, Dabo J, Majstorović M, et al. Dental caries experience in Croatian school children in Primorsko-Goranska county. *Cent Eur J Public Health.* 2013; 21:39–42. [DOI: 10.21101/cejpha3752] [PMID: 23741899]
- Ferizi L, Dragidella F, Staka G, Bimbashi V, Mrasori S. Oral Health Status Related to Social Behaviors among 6 - 11 Year Old School-children in Kosovo. *Acta stomatol Croat.* 2017; 51(2):122–32. [DOI: 10.15644/asc51/2/5]
- Bagińska J, Rodakowska E, Wilczyńska-Borawska M, Jamiołkowski J. Index of clinical consequences of untreated dental caries (pufa) in primary dentition of children from north-east Poland. *Adv Med Sci.* 2013; 58(2):442–7. [DOI: 10.2478/v10039-012-0075-x] [PMID: 23793065]
- Personal Communication – Dr Andrea Bodenwinkler, GÖG, 2012.
- Armfield JM, Spencer AJ, Berennan DA. Dental Health of Australia's teenagers and pre teen children: the Child Dental Health Survey, Australia 2003-04. *Dental Statistics and Research Series no. 52.* Cat no Den 199. Canberra: AOHW. (Full Report)
- Waltimo T, Menghini G, Weber C, Kulik EM, Schild S, Meyer J. Caries experience in 7-, 12-, and 15-year-old schoolchildren in the canton of Basel-Landschaft, Switzerland, from 1992 to 2011. *Community Dent Oral Epidemiol.* 2016; 44(3):201–8. [DOI: 10.1111/cdoe.12206] [PMID: 26709202]
- Grund K, Goddon I, Schüler M, Lehmann T, Heinrich-Weltzien R. Clinical consequences of untreated dental caries in German 5- and 8-year-olds. *BMC Oral Health.* 2015; 15:140. [DOI: 10.1186/s12903-015-0121-8] [PMID: 26538196]
- Ferro R, Besostri A, Olivieri A. Caries prevalence and tooth surface distribution in a group of 5-year-old Italian children. *Eur Arch Paediatr Dent.* 2009; 10:33–7. [PMID: 19254525]
- Whelton H, Crowley E, O'Mullane D, Harding M, Guiney H, Cronin M, et al. North South Survey of Children's Oral Health in Ireland 2002. Dublin: Department of Health and Children; 2006.
- Đorđević A. Parents' Knowledge about the Effects of Oral Hygiene, Proper Nutrition and Fluoride Prophylaxis on Oral Health in Early Childhood. *Balk J Dent Med.* 2018; 2–31. [DOI: 10.2478/bjdm-2018-0005]

Procena stanja mlečnih zuba kod dece uzrasta šest godina na teritoriji opštine Podgorica

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KRATAK SADRŽAJ

Uvod Najčešće oralno oboljenje kod dece je karijes zuba.

Cilj ove studije je bio utvrđivanje stanja zdravlja mlečnih zuba dece uzrasta šest godina.

Metodologija Istraživanjem je obuhvaćeno 203 dece oba pola koja žive na teritoriji opštine Podgorica. U istraživanje su bila uključena samo ona deca čiji su roditelji svojim potpisom dali saglasnost. Parametri korišćeni za procenu stanja oralnog zdravlja bili su indeksi prosečnog broja karijesnih, izvađenih i zuba plombiranih zbog karijesa (kep) i indeksi značajnog karijesa (SiC). Jedan stomatolog klinički je pregledao sve ispitanike u skladu sa metodologijom i kriterijumima Svetske zdravstvene organizacije (SZO).

Rezultati Procenat dece sa obolelim mlečnim zubima iznosio je 80,3%. Prosečan broj obolelih mlečnih zuba po ispitaniku iznosio je 4,9. SiC je iznosio 8,3. Među ispitanom decom 12,3% je imalo najmanje jedan zub sa prisutnim zalivačem fisura. U strukturi kep-a dominirao je nesansirani karijes (92,6%).

Zaključak Naši rezultati pokazali su veliku prevalenciju karijesa mlečnih zuba kod dece uzrasta šest godina, što upućuje na nepostojanje preventivnih mera i programa u Crnoj Gori.

Ključne reči: deca; karijes; mlečni zubi; šestogodišnjaci

UVOD

Oralno zdravlje je važan deo opšteg zdravlja i kao takvo je od primarnog značaja za funkcionisanje i kvalitet života. Kvalitet oralnog zdravlja se može poboljšati na ekonomičan način, koristeći preventivne programe [1].

Najčešća bolest usne duplje je karijes zuba. Karijes je hronično, infektivno, progresivno, multikauzalno oboljenje, pri čemu ishrana ima ključnu ulogu u njegovom razvoju. Deca su posebno predisponirana za razvoj dentalnog karijesa. Komplikacije dentalnog karijesa imaju značajan uticaj na opšte zdravlje dece, ishranu, rast i telesnu težinu [2, 3, 4] izazivajući neprijatnost, bol, probleme sa spavanjem, učenjem i odsustvo iz škole [5, 6, 7]. Nadalje, odontogene infekcije kao posledica nelečenog zubnog karijesa su najčešći razlog hospitalizacije male dece [7].

Primarni zubi su izuzetno važni, jer oni učestvuju u funkciji ishrane, govora, čuvaju mesto za stalne zube i služe im kao vodiči, pri čemu ne smemo zaboraviti i estetsku ulogu. Zdravlje primarnih zuba je važno zbog zdravlja trajnih zuba, između ostalog. Oralno higijenske navike i navike u ishrani dece potiču iz porodice [8]. Rani početak karijesa predstavlja indikator propuštenih prilika za preventivnu negu i ugrožava opšte zdravlje deteta. Zato je potrebno što ranije uključiti preventivno-profilaktičke metode. Epidemiološki podaci pružaju uvid u rasprostranjenost oboljenja i mogu se upotrebiti za izradu preventivnih programa sa ciljem unapređenja oralnog zdravlja [9].

Zdravstveni sistem Crne Gore trenutno je fokusiran na kurativni pristup, a ne na preventivne mere. Crna Gora je područje sa niskim sadržajem fluorida u vodi za piće (od 0,05 do 0,2 mg/L). Cilj ove studije je bio da se utvrdi zdravstveni status mlečnih zuba dece uzrasta šest godina.

METODOLOGIJA

Istraživanjem je obuhvaćeno 203 dece oba pola koja žive na teritoriji opštine Podgorica a koja su dolazila na stomatološke

preglede na Medicinskom fakultetu tokom 2017. godine. U studiju su bila uključena samo deca koja nisu bila starija od šest godina, medicinski zdrava i bez mentalnog, fizičkog i senzoričnog hendikepa. Sve kliničke preglede obavio je jedan stomatolog po principima dobre kliničke prakse. U testiranju pouzdanosti istraživača primenjena je statistika kappa. Kappa vrednosti procenjene posle ponovnog pregleda za intrakonzistenciju istraživača iznosile su 0,94.

Parametri korišćeni za procenu stanja zdravlja mlečnih zuba bili su indeksi prosečnog broja karijesnih, izvađenih i plombiranih mlečnih zuba zbog karijesa (kep) i indeksi značajnog karijesa (SiC) prema preporukama Svetske zdravstvene organizacije [10].

Sva deca koja su učestvovala u istraživanju pregledana su standardnim stomatološkim dijagnostičkim sredstvima na suvim zubima, pri veštačkom osvetljenju na stomatološkoj stolici. Jasno vidljive lezije sa formiranim kavitetom na površini zuba registrovane su kao karijes zuba, dok su promene u transparentnosti ili početne demineralizacije gledali sa intaktnom površinom, bez kavitacije, registrovani kao zdravi zubi. Stanje denticije procenjeno je korišćenjem kep indeksa, kao što je opisano u kriterijima i postupcima SZO za epidemiološka istraživanja [10]. Uz to, upisivani su demografski podaci, uzrast, pol, škola i mesto stanovanja (gradsko i prigradsko naselje):

– zub s karijesom – k, izvađeni zub – e, zub s ispunom – p i kep indeks. Kep indeks (za mlečnu denticiju) metoda je numeričke ekspresije incidencije karijesa, a dobija se zbirom broja karioznih (k), ekstrahiranih zuba (e) i zuba s ispunom (p).

– kep je nula i primena preventivnih mera – zalivanje fisura.

Indeks SiC predstavlja Indeks značajnog karijesa i gornju trećinu frekvencijske raspodele kep/kep-a. Uveden je sa ciljem da ukaže na osobe sa najvišim vrednostima karijesa u svakoj populaciji. Ovaj indeks se koristi kao dopuna srednjim vrednostima kep/kep-a, i daje pravu sliku pacijenata sa rizikom od karijesa. Dobija se na sledeći način: sva pregledana deca sortiraju se prema vrednostima kep/kep-a; zatim se jedna trećina pregledane dece sa najvišim vrednostima kep/kep-a selektuje i

dobijeni broj predstavlja podskup SiC, te tako dobijeni rezultat kep/kep-a za ovaj podskup predstavlja vrednost SiC [11, 12].

Statistička obrada podataka urađena je u programu SPSS v.11.5 for Windows (SPSS Inc., Chicago, IL, USA). Za opis rezultata korišćene su metode deskriptivne i analitičke statistike. Za testiranje statističke značajnosti u prosečnim vrednostima između dva nezavisna uzorka korišćen je Studentov t-test i χ^2 test. Vrednosti p manje od 0,05 smatrale su se statistički značajnim.

REZULTATI

Ukupno je pregledano 203 dece, 99 devojčica i 104 dečaka iz gradskog i prigradskog dela podgoričke opštine. Analizom podataka utvrđeno je da ne postoji statistički značajna razlika kada su u pitanju pol i mesto stanovanja (χ^2 test, $p > 0,05$). Zastupljenost ispitivanih šestogodišnjaka prema polu i tipu naselja prikazana je u Tabeli 1.

Procenat dece sa obolelim mlečnim zubima iznosio je 80,3%. Najniži procenat dece sa obolelim zubima zabeležen je kod devojčica, a najviši kod dečaka. Statistički značajnih razlika u vrednostima ovog indeksa nije bilo u odnosu na pol i mesto stanovanja (t-test, $p > 0,05$; Tabela 2).

Prosečan broj obolelih mlečnih zuba po ispitaniku iznosio je 4,9, a kretao se od 4,5 do 5,6. Vrednosti ovog indeksa u odnosu na pol bile su veoma ujednačene. Deca gradskog područja imala su niže vrednosti ovog indeksa u odnosu na svoje vršnjake iz prigradskog naselja, ali ta razlika nije bila statistički značajna (t-test, $p > 0,05$). Vrednosti kep indeksa u odnosu na pol i mesto stanovanja prikazane su u Tabeli 2.

U strukturi kep-a dominirao je nesanirani karijes (92,6%), zatim slede zubi sa ispunima (5,7%) i mali postotak ekstrahiranih zuba (1,2%). Statistički značajne razlike nisu zabeležene u strukturi kep-a u odnosu na pol i mesto stanovanja (Tabela 3).

Podskup SiC-a činio je 67 dece. SiC indeks (gornja trećina frekvencijske raspodele kep-a) iznosio je 8,36.

Bilo je 12,3% dece koja su imala makar jedan prisutan zalivač fisura u ustima.

DISKUSIJA

Mlečni zubi su veoma značajni. Oni podstiču normalan rast i razvoj vilice, omogućavaju žvakanje, učestvuju u razvoju govora, čuvaju mesto za svoje zamenike i učestvuju u estetskom izgledu lica. Zdravi mlečni zubi omogućavaju stalnim zubima da niknu u zdravoj sredini. Stanje mlečne denticije u velikoj meri se odražava na stanje stalne denticije.

Rezultati naše studije pokazuju da se mlečnim zubima ne posvećuje adekvatna pažnja. Procenat dece sa svim zdravim zubima u našem istraživanju bio je nizak i iznosio je 19,9%. Dobijene vrednosti KIP-a upućuju na visoku rasprostranjenost karijesa mlečnih zuba i kod dečaka i kod devojčica, sa nešto nepovoljnijom slikom u prigradskim naseljima Podgorice. Ako se izvrši poređenje sa sličnim epidemiološkim istraživanjima iz

okruženja, ali i šireg područja, dobija se nimalo ohrabrujuća slika. Prosečne vrednosti broja obolelih mlečnih zuba po jednom ispitaniku kretale su se u rasponu od 4,17 u Republici Srpskoj, dok je procenat dece sa svim zdravim zubima iznosio 3,94% [8]. U Srbiji je 20,6% dece uzrasta šest godina imalo sve zube bez karijesa [13]. U Hrvatskoj je vrednost KIP-a za šestogodišnjake iznosila 4,7 [14], dok se na Kosovu vrednost KIP-a kretala od 6,31 za dečake do 6,56 za devojčice [15]. Vrednost KIP-a za decu iz Poljske iznosio je 5,56 [16]. Upoređivanje vrednosti kep-a kod dece uzrasta od šest godina u Crnoj Gori sa onima ustanovljenim za istu populacionu grupu, koje se kreću u rasponu od 2,1 u Austriji [17], 2,0 u Australiji [18], 1,9 u Švajcarskoj [19], 0,9 u Nemačkoj [20], upućuje na činjenicu da stanje oralnog zdravlja naših šestogodišnjaka nije zadovoljavajuće.

Posebna pažnja posvećuje se visokorizičnim pojedincima, i vrši se analiza prosečnog kep indeksa trećine najviše pogođenih ispitanika. Vrednost prosečnog kep indeksa za šestogodišnjake u Austriji iznosio je 2,1 a indeks SiC 5,3 [17]. Vrednost SiC u Italiji iznosila je 3,8, a kep indeksa 1,4 [21]. U Irskoj je SiC indeks za šestogodišnjake iznosio 4,0, a DMFT 1,3 [22]. Zabeležena vrednost ovog indeksa za mališane iz Crne Gore bila je 8,36, što je mnogo više od navedenih vrednosti.

Procenat naših ispitanika sa barem jednim prisutnim zalivačem fisura bio je vrlo nizak (12,3%). Mali procenat zalivenih fisura imala su i deca sa Kosova (1,3%) [15], dok kod dece ovog uzrasta u Republici Srpskoj nije pronađen nijedan zalivač [8]. Zalivači fisura dokazani su kao dobra profilaktička mera u prevenciji, odnosno kontroli karijesa, pa se zbog toga moraju primenjivati.

Efikasnost načina organizovanja stomatološke zdravstvene zaštite najbolje se može ostvariti posmatranjem strukture kep-a. Posle analize pojedinih komponenti kep-a primećeno je da su karijesni zubi kod naših ispitanika dominantni. Karijes je dominirao i kod dečaka i kod devojčica. Učesnici naše studije imali su veoma mali procenat plombiranih zuba. Slični rezultati ustanovljeni su u Republici Srpskoj [8]. Iako Fond za zdravstveno osiguranje nudi besplatne stomatološke usluge u Crnoj Gori ovoj populacionoj grupi, rasprostranjenost karijesa je visoka. Ovakvo stanje verovatno je rezultat neprosvećenosti roditelja koji smatraju da će se mlečna denticija zameniti stalnom i decu dovode kod stomatologa uglavnom kad imaju zubobolju. Zdravstvene navike i kontrola ishrane su veoma značajne u prevenciji oralnih oboljenja [23]. Zato je neophodno predložiti plan preventivnih aktivnosti usmerenih na edukaciju roditelja i dece.

ZAKLJUČAK

Glavni razlozi za ovakvo stanje oralnog zdravlja šestogodišnjaka su odsustvo populacionih preventivnih programa i uglavnom kurativno usmerena stomatološka politika, kao i nedostatak promocije oralnog zdravlja.

Potrebno je preduzeti neophodne mere za poboljšanje oralnog zdravlja, sa posebnim akcentom na preventivnim i profilaktičkim merama, kao i za podizanje nivoa zdravstvene svesti na individualnom i društvenom nivou.

Oral-health awareness among pregnant women in the region of Republika Srpska

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SUMMARY

Introduction Oral diseases during pregnancy are an important reason for enhanced dental care of this vulnerable population. The aim of this study was to determine the degree of oral health awareness among pregnant women and examine their oral hygiene habits, attitudes and behaviors in relation to the professional qualification.

Material and methods The study was conducted in Foča, East Sarajevo, Bijeljina and Pale (Republika Srpska, Bosnia and Herzegovina). A total of 198 respondents voluntarily filled an anonymous survey, specially created for this research.

Results In addition to toothbrush and toothpaste, 39.8% of pregnant women did not use any additional oral hygiene resources. When brushing their teeth, 60.1% of pregnant women had bleeding gums. Also, 54.1% of pregnant women visited dentist, while 34.3% did not. Obstetrician did not advise 69.7% of respondents that they should visit dentist during pregnancy. Furthermore, 80.8% of pregnant women thought that they were more susceptible to pregnancy caries, and 29.6% of them thought that caries is disease that cannot be prevented. Respondents with university education understood that minerals from the mother's teeth were not lost during pregnancy, which was statistically significant compared to pregnant women with secondary education.

Conclusion The level of oral health awareness of pregnant women is low. It is important that all women perform regular dental examination during pregnancy, as they will receive useful information from their dentist how to prevent oral diseases.

Keywords: pregnancy; oral health; primary prevention; oral hygiene

INTRODUCTION

Pregnancy is dynamic period in the life of a woman followed by numerous physiological and emotional changes. A healthy lifestyle and proper nutrition in pregnancy play a key role in general health of women, as well as proper growth and development of a child. Oral diseases during pregnancy are an important reason for enhanced dental care of this vulnerable population [1]. During pregnancy the level of sex hormones (estrogen and progesterone) is significantly increased in relation to non-pregnant women [2]. As result of a hormonal disbalance soft tissue changes in mouth are visible and followed by various degrees of tissue inflammation and bleeding marginal gingiva [3].

Periodontal diseases during pregnancy can be associated with preeclampsia, premature birth, and birth of a baby with low body weight [4]. Literature data indicate that transfer of cariogenic microorganisms from mother to child is one of the key factors in development of children's decay [5]. Modern dentistry aims to promote health and favors preventive over curative measures [6, 7]. Prophylactic-preventive measures in pregnant women have dual function: create optimal conditions for intra-

uterine formation and teeth development and prevent the occurrence of oral diseases in pregnant women. However, the fact is that only when a disease occurs, future mothers show interest in prevention [8]. Therefore, it is especially important that dentists insist on applying timely preventive measures in the period of early pregnancy.

The American Academy of Dentistry recommends that oral health care in children should begin in prenatal period by their parents oral health improvement [9]. A large number of pregnant women have not developed awareness of the impact of their own oral health and poor oral hygiene during pregnancy on the child's oral health. It is the fact that pregnant women, in most cases, have need for frequent and increased intake of sweet or sour food and beverages and ignore oral hygiene habits [8].

Parents play an important role in children's life, therefore their oral health knowledge and attitudes have major impact on the child's behavior model [10]. Many women during pregnancy are not visiting dentists. Literary evidence show that dental services are provided to low number of pregnant women even in industrialized countries: USA (23–49%), Great Britain (33–64%) and Greece (27%) [11]. During pregnancy, dental visits should be obligatory with the goal to obtain adequate information on how to

preserve oral health of a child [12]. Advices should be understandable and practically applicable so that future mothers could easily implement their knowledge toward oral and general health [13].

The aim of the study was to determine the degree of oral health awareness among pregnant women as well as oral hygiene habits, attitudes and behaviors in relation to the professional qualifications.

MATERIALS AND METHODS

The study was conducted in 4 municipalities: Foča, Istočno Sarajevo, Bijeljina and Pale (Republika Srpska, B&H). Criteria for inclusion in the study were pregnant women regardless of age, education and social status chosen by random selection in obstetrical ambulances during regular checkups. All respondents gave written consent to participate in research. A total of 198 subjects, who were examined in the period from 8th to 38th week of gestation, voluntarily filled an anonymous survey, specially created for this research. The questionnaire consisted of 25 questions in order to receive the following information: socio-demographic data, oral hygiene habits of pregnant women, acquired knowledge and patterns of behavior during pregnancy as well as perception of pregnant woman about the harmfulness of dental interventions and medications on fetus. The obtained data were numerically processed using standard statistical procedures in statistical program SPSS 19.0 for Windows. Chi-square test was used to test the difference between the survey responses. Values $p/q < 0.05$ were considered statistically significant.

RESULTS

The average age of examined subjects was 33.3 years. Most pregnant women (67.7%) had secondary education; slightly more than half of them were unemployed. 39.9% of respondents were pregnant for the first time (Table 1).

Table 2 shows oral hygiene habits and behavior of pregnant women. In addition to toothbrushes and toothpastes, 39.8% subjects did not use any other oral hygiene resources. More than three-quarters of pregnant women (76.9%) with university education used additional oral hygiene resources and that was significantly different from pregnant women with secondary education, ($p < 0.05$). When brushing teeth, 60.1% of pregnant women had bleeding gums, while nausea and vomiting were present in 55.0%. The survey showed that 15.1% of respondents would eat at nighttime, 13.6% were smokers, and 2.0% pregnant women consumed alcohol. One third of respondents (30.6%) had fear of dental intervention. More than half of respondents (54.1%) visited dentist during pregnancy, while 34.3% declared that they did not have any intention to do so. The survey showed that 69.7% of obstetricians did not advise women to visit dentists during pregnancy (Table 2).

Table 3 shows level of knowledge, behavior and opinion of pregnant women about the impact of dental interven-

Table 1. Socio-demographic characteristics of respondents
Tabela 1. Sociodemografske karakteristike ispitanica

General Generalije		n	%	SS SZ
Age Godine starosti	< 30 years < 30 godina	78	39.4	$p < 0.05$
	> 31 years > 31 godine	120	60.6	
Education Obrazovanje	Secondary education Srednja stručna sprema	134	67.7	$p < 0.05$
	University education Visoka stručna sprema	64	32.3	
Employment status Radni status	Employed Zaposlena	97	48.1	$p > 0.05$
	Unemployed Nezaposlena	101	51.9	
Pregnancy number Redosled trudnoće	First Prva	79	39.9	$p < 0.05$
	Second and more Druga ili više	119	60.1	
Months of pregnancy Meseći trudnoće	≤ 4 months ≤ 4 meseca	46	23.3	$p < 0.01$
	> 4 months > 4 meseca	152	76.7	

n – number of respondents; SSS – secondary education; VSS – university education;
SS – statistical significance

n – broj ispitanica; SSS – srednja stručna sprema, VSS – visoka stručna sprema;
SZ – statistička značajnost

tion on the fetus. About two-thirds of pregnant women thought that during pregnancy they should not remove or treat unhealthy teeth, and they should not receive local anesthetic. Also, 80.8% of pregnant women thought that pregnancy makes teeth more susceptible to decay, and almost one third (29.6%) believed that caries is disease that cannot be prevented. Respondents with university education in a significantly higher percentage considered that minerals from mother's teeth couldn't be lost during pregnancy ($p < 0.05$) (Table 3).

DISCUSSION

Research of oral hygiene habits, knowledge and behavior of pregnant women in our areas are very scarce. This study was conducted with the aim of gaining information about knowledge of pregnant women about oral health, in order to develop adequate preventive measures and raise awareness of oral health importance. Pregnancy is period when women are highly motivated to acquire knowledge in order to improve both their own and their child's health. Therefore this period is suitable for identifying existing risk factors, educating women (future mothers) to be conscious that oral health can be preserved and improved.

Adequate oral hygiene is a prerequisite for teeth and complete mouth health. Pregnant women are usually occupied by their condition and positive habits may be ignored. There is no doubt that eating habits change during pregnancy, but the question is which bad habits may increase incidence of dental diseases. Good oral-hygiene habits are result of good oral health education. In

Table 2. Oral hygiene habits and behavior during pregnancy
Tabela 2. Oralnihigijenske navike i ponašanje u toku trudnoće

Questions Pitanja	Answer Odgovor	Total Ukupno %	Education Obrazovanje		SS SZ
			SSS Secondary education (%)	VSS University education (%)	
How often do you brush your teeth? Koliko često perete zube?	1-2 times 1-2 puta	23.0	18.2	2.9	p<0.001 q<0.05
	>2 times >2 puta	77.0	81.8	97.1	
Do your gums bleed while brushing your teeth? Da li vam desni krvare prilikom pranja zuba?	Yes Da	60.1	65.2	50.0	p<0.01 q>0.05
	No Ne	39.9	34.8	50.0	
Do you use some additional means of maintaining oral hygiene in addition to brushes and pastes? Osim četkice i paste, da li koristite neka dodatna sredstva za održavanje oralne higijene?	Yes Da	60.2	54.2	76.9	p<0.05 q<0.01
	No Ne	39.8	45.8	23.1	
Do you smoke during pregnancy? Da li pušite u toku trudnoće?	Yes Da	13.6	19.7	5.9	p<0.001 q>0.05
	No Ne	86.4	80.3	94.1	
Do you consume alcohol during pregnancy? Da li konzumirate alkohol u toku trudnoće?	Yes Da	2.0	4.0	5.9	p<0.001 q>0.05
	No Ne	98.0	96.0	94.1	
Do you get up at night to eat? Da li ustajete noću radi konzumiranja hrane?	Yes Da	15.1	19.7	5.9	p<0.001 q>0.05
	No Ne	84.9	80.3	94.1	
Do you have nausea and vomiting during pregnancy? Da li imate mučninu i povraćanje tokom trudnoće?	Yes Da	55.0	57.6	50.0	P>0.05 q>0.05
	No Ne	45.0	42.4	50.0	
If this is not your first pregnancy, have you changed your oral hygiene habits in relation to previous pregnancies? Ako vam ovo nije prva trudnoća, da li ste promenili svoje oralnihigijenske navike u odnosu na prethodne trudnoće?	Yes Da	47.5	52.6	39.1	p>0.05 q>0.05
	No Ne	52.5	47.4	60.9	
Did you visit a dentist during your pregnancy? Da li ste u trudnoći posetili stomatologa?	Yes Da	54.1	51.4	61.5	p>0.05 q>0.05
	No Ne	45.9	48.6	38.5	
Do you intend to visit a dentist during pregnancy? Da li nameravate posetiti stomatologa tokom trudnoće?	Yes Da	65.7	63.9	69.2	p<0.001 q>0.05
	No Ne	34.3	36.1	30.8	
Did your obstetrician advise you to visit a dentist? Da li vam je ginekolog savetovao da posetite stomatologa?	Yes Da	30.3	31.9	26.9	p<0.001 q>0.05
	No Ne	69.7	68.1	73.1	
Do you have any fear of visiting a dentist during pregnancy? Da li imate strah od posete stomatologu tokom trudnoće?	Yes Da	30.6	36.1	15.4	p<0.001 q<0.05
	No Ne	69.4	63.9	84.6	

SSS – secondary education; VSS – university education; SZ – statistical significance; p – statistical significance in responses when the whole sample of respondents concerned; q – statistical significance in responses in relation to the professional qualifications of respondents

SSS – srednja stručna sprema, VSS – visoka stručna sprema, SZ – statistička značajnost; p – statistička značajnost u odgovorima kada je celokupan uzorak ispitanica u pitanju; q – statistička značajnost u odgovorima u odnosu na stručnu spremu ispitanica

this study, 77.0% of pregnant women brushed their teeth after each meal, while the remaining 23.0% brushed teeth 1-2 times a day. Similar results were obtained by Nogueira et al. [8] where 75.5% of pregnant women brushed their teeth after every meal, while in the study Shabir et al. [14] 98.5% of pregnant women brushed their teeth 1-2 times a day. Thomas et al. [15] indicated that the frequency of brushing teeth and use of additional means of maintain-

ing oral hygiene is in correlation with professional qualifications. This research showed that pregnant women with university education brushed their teeth more often and that they used other oral hygiene products.

Gingivitis is one of the most common oral complications during pregnancy. It usually occurs after the second month of pregnancy and is followed by the most common bleeding gums during brushing teeth. This research showed that

Table 3. Knowledge and attitudes of pregnant women about the influence of dental interventions on the fetus**Tabela 3.** Znanje i stavovi trudnica o uticaju stomatoloških intervencija na fetus

Questions Pitanja	Answer Odgovor	Total Ukupno %	Education Obrazovanje		SS SZ
			SSS Secondary education (%)	VSS University education (%)	
Do you think that extracting and treating your teeth is safe during pregnancy? Da li smatrate da su vađenje i lečenje zuba sigurni tokom trudnoće?	Yes Da	33.0	37.9	23.5	p<0.001 q>0.05
	No Ne	67.0	62.1	76.5	
Do you think anesthesia can be received during pregnancy? Da li smatrate da se anestezija može primati u toku trudnoće?	Yes Da	28.0	27.3	29.4	p<0.001 q>0.05
	No Ne	72.0	72.7	70.6	
Do you think that teeth in pregnancy are more susceptible to caries? Da li smatrate da su zubi u trudnoći podložniji karijesu?	Yes Da	80.8	81.9	77.9	p<0.001 q>0.05
	No Ne	19.2	18.1	22.1	
Do you know that caries can be prevented? Da li znate da se nastanak karijesa može sprečiti?	Yes Da	70.4	69.4	73.1	p<0.001 q>0.05
	No Ne	29.6	30.6	26.9	
Do you think that the mother's teeth can affect the early development of caries in children? Da li smatrate da oboleli zubi kod majke mogu uticati na rani nastanak karijesa kod dece?	Yes Da	60.2	54.2	76.9	p<0.05 q<0.05
	No Ne	39.8	45.8	23.1	
Have you received instructions from a professional about maintaining oral hygiene for baby? Da li ste dobili uputstvo od stručnog lica o održavanju oralne higijene bebe?	Yes Da	26.6	23.6	38.5	p<0.001 q<0.05
	No Ne	73.4	76.4	61.5	
Do you know that there are gels, varnishes and fissure sealants for the prevention of caries in children? Da li znate da postoje gelovi, lakovi i zalivači koji služe za prevenciju karijesa kod dece?	Yes Da	79.8	83.3	69.2	p<0.001 q>0.05
	No Ne	20.2	16.7	30.8	
Do you consider that pregnancy as a condition affects the loss of calcium from the mother's teeth? Da li smatrate da trudnoća kao stanje utiče na gubitak kalcijuma iz zuba majke?	Yes Da	58.0	65.2	44.1	p>0.05 q<0.05
	No Ne	42.0	34.8	55.9	

SSS – secondary education; VSS – university education; SS – statistical significance; p – statistical significance in responses when the whole sample of respondents concerned; q – statistical significance in relation to the professional qualifications of the respondents

SSS – srednja stručna sprema; VSS – visoka stručna sprema; SZ – statistička značajnost; p – statistička značajnost u odgovorima kada je celokupan uzorak ispitanica u pitanju; q – statistička značajnost u odnosu na stručnu spremu ispitanica

60.1% of subjects had bleeding gums while brushing their teeth. Bleeding can be reason for not maintaining proper oral hygiene, causing rapid development of caries and teeth loss [16]. Factors such as tobacco and alcohol increase the risk of low body weight in newborns, premature birth and other complications [17]. The results of this research showed that 13.6% of pregnant women smoked during pregnancy, while 2% of them consumed alcohol. Results of Esposito et al. [17] showed that 22.3% of women in Italy smoked during pregnancy, while 28.9% consumed alcohol before pregnancy, and 7.2% of them continued using alcohol during pregnancy. These numbers are significantly higher compared to our results. On the other hand research from United States and Great Britain showed that 57.4%, and 46.0% of pregnant women, respectively, were consuming cigarettes during pregnancy [17, 18].

There is no known relation between pregnancy and decay. However, in our study, as many as 80.8% of respondents considered that teeth in pregnancy were more susceptible to decay. Even though there is belief that “every pregnancy is taking one tooth”, no data actually

confirmed this thesis. Increased risk of developing caries lesions, gingivitis and periodontal diseases during pregnancy is primarily due to the change in hormonal status and change in eating habits [1]. In our study it was found that pregnant women with secondary education in higher percentage contemplated that every pregnancy resulted in a loss of minerals from the mother's teeth. Loss of teeth during pregnancy is primarily consequence of continuation of poor oral or hygienic habits that existed even before pregnancy.

Dental interventions (restorations, endodontic treatment and tooth extraction) can be safely administered in any trimester of pregnancy, while more complex and time-consuming interventions are recommended after giving birth [15]. In the current study, large percentage of pregnant women (67.0%) considered that dental interventions are not safe during pregnancy. When it comes to receiving local anesthesia 72.0% said that it was not recommended.

Different factors influenced dental visits of pregnant women: material status, lack of consciousness about the

importance of teeth health, biases about the impact of pregnancy on teeth and concern about safety of fetus during dental treatment [8]. In our study, 45.9% of respondents did not visit dentist, while 34.3% had no intention to do so. These values are slightly higher than results of Mangskau et al. [19] where 39% of pregnant women declared that they had not visited dentist during pregnancy. Hashim et al. [20] found that more than 40% of pregnant women did not visit dentist, even though dental interventions for pregnant women are free. Most of dental interventions in pregnant women happened due to certain painful conditions in the mouth. Also, more than half of pregnant women in Australia and USA did not visit dentist during pregnancy [15]. On the other hand, Christensen et al. [21] reported that 90% of Danish pregnant women visited dentists during pregnancy. In our study, significant difference in dental visits in relation to professional qualifications was not recorded.

73.4% of pregnant women reported that they did not receive any advice related to maintenance of their oral health and oral health of children. Similar results were obtained in the research of Rogers et al. [22] and Gunay et al. [23], where it was shown that only less than one-third of respondents received advice about the effects of women's oral health on pregnancy and newborns. 69.7% of pregnant women reported that they did not receive advice from their obstetrician about dental visits. Research of Bassier et al. [24] showed poor oral health knowledge among obstetricians, who first come in contact with pregnant women, providing them adequate medical care and advice. Similar results were shown in the studies of Zanata et al. [25] and Rocha et al. [26]. Therefore, education and motivation of health workers, in the first place obstetrician, is one of the possible preventive measures to improve oral health of pregnant women. Cardenas et al. [27] found in their research that knowledge of pregnant women was significantly improved after 10 minutes of oral health presentations by dentist and the same women 4 weeks after testing retained most of the informations.

It is necessary to emphasize that in the area where our study was conducted there is no organized counseling for pregnant women in which the dentist is involved. It is therefore desirable to achieve better cooperation with obstetrician, because teamwork is the guarantee of successful prevention.

CONCLUSION

The level of oral health education among pregnant women is low. It is important that all women perform regular dental examinations during pregnancy even if they have healthy oral tissues. Dentist is important to spread useful information about the prevention of oral diseases that will contribute to improvement of pregnant women overall health as well as the health of a future child.

REFERENCES

1. Blagojević D, Brkanić T, Stojić S. Oralno zdravlje u trudnoći. *Med Pregl*. 2002; LV (5-6):213–6.
2. Steinberg BJ, Hilton IV, Iida H, Samelson R. Oral health and dental care during pregnancy. *Dent Clin North Am*. 2013; 57(2):195–210. [DOI: 10.1016/j.cden.2013.01.002] [PMID: 23570802]
3. Bobetsis AY, Borbnakke SW, Pappanou PN. Periodontal infections and Adverse Pregnancy Outcomes. In: Glick M. *Systemic Oral Health Connection*. Illinois: Quinessence Publishing Co Inc; 2014; p. 201–15.
4. Gupta S, Jain A, Mohan S, Bhaskar N, Walia PK. Comparative Evaluation of Oral Health Knowledge, Practices and Attitude of Pregnant and Non-Pregnant Women, and Their Awareness Regarding Adverse Pregnancy Outcomes. *J Clin Diagn Res*. 2015; 9(11):26–32. [DOI: 10.7860/JCDR/2015/13819.6756] [PMID: 26674176]
5. Wan AK, Seow WK, Purdie DM, Bird PS, Wash LJ, Tudehope DI. Oral colonisation of streptococcus mutans in six-months-old preterm infants. *J Dent Res*. 2001; 80(12):2060–5. [DOI: 10.1177/00220345010800120701] [PMID: 11808762]
6. Kurien S, Kattimani VS, Sriram RR, Sriram SK, Rao VKP, Bhupathi A, et al. Management of pregnant patient in dentistry. *J Int Oral Health*. 2013; 5(1):88–97. [PMID: 24155583]
7. Patil S, Thakur R, Madhu K, Paul ST, Gadicherla P. Oral health coalition: Knowledge, attitude, practice behaviours among gynaecologists and dental practitioners. *J Int Oral Health*. 2013; 5(1):8–15. [PMID: 24155572]
8. Nogueira BML, Nogueira BCL, Fonseca RRS, Brandio GAM, Menezes TOA, Tembra DPS. Knowledge and attitudes of pregnant women about oral health. *Int J Odontostomat*. 2016; 10(2):297–302.
9. American Academy on Pediatric Dentistry Clinical Affairs Committee-Infant Oral Health Subcommittee; American Academy on Pediatric Dentistry Council on Clinical Affairs. Guideline on infant oral health care. *Pediatr Dent*. 2008-2009; 30(Suppl):90–3.
10. Davidović B, Ivanović M, Janković S, Lečić J. Knowledge, attitudes and behavior of children in relation to oral health. *Vojnosanit Pregl*. 2014; 71(10):949–56. [DOI: 10.2298/VSP130714034D] [PMID: 25518275]
11. George A, Dahlenet HG, Reath J, Ajwani S, Bhole S, Korda A, et al. What do antenatal care providers understand and do about oral health care during pregnancy: a cross-sectional survey in New South Wales, Australia. *BMC Pregnancy and Childbirth*. 2016; 16:382. [DOI: 10.1186/s12884-016-1163-x] [PMID: 27903257]
12. Geisinger ML, Geurs NC, Bain JL, Kaur M, Vassilopoulos PJ, Cliver SP, et al. Oral health education and therapy reduces gingivitis during pregnancy. *J Clin Periodontol*. 2013; 41(2):141–8. [DOI: 10.1111/jcpe.12188] [PMID: 24164645]
13. George A, Johnson M, Blinkhorn A, Ajwani S, Bhole S, Yeo AE, et al. The oral health status, practices and knowledge of pregnant women in south-western Sydney. *Aust Dent J*. 2013; 58(1):26–33. [DOI: 10.1111/adj.12024] [PMID: 23441789]
14. Shabbir S, Zahid M, Qazi A, Muneeb A. Practices and knowledge of oral hygiene among pregnant women in a Pakistani tertiary care hospital. *Biomedica*. 2014; 30(2):134–8.
15. Thomas N, Middleton PF, Crowther CA. Oral and dental health care practices in pregnant women in Australia: a postnatal survey. *BMC Pregnancy Childbirth*. 2008; 8(1):13. [DOI: 10.1186/1471-2393-8-13] [PMID: 18426558]
16. Hemalatha V, Manigandan T, Sarumathi T, Aarthi Nisha V, Amudhan A. Dental considerations in pregnancy – a critical review on the oral care. *J Clin Diagn Res*. 2013; 7:948–53. [DOI: 10.7860/JCDR/2013/5405.2986] [PMID: 23814753]
17. Esposito G, Ambrosio R, Napolitano F, Giuseppe GD. Women's Knowledge, Attitudes and Behavior about Maternal Risk Factors in Pregnancy. *PLoS One*. 2015; 10(12):e0145873. [DOI: 10.1371/journal.pone.0145873] [PMID: 26714032]
18. Orton S, Bowker K, Cooper S, Naughton F, Ussher JM, Pickett KE, et al. Longitudinal cohort survey of women's smoking behaviour and attitudes in pregnancy: study methods and baseline data. *BMJ Open*. 2014; 4:e004915. [DOI: 10.1136/bmjopen-2014-004915] [PMID: 24833689]

19. Mangskau KA, Arrindell B. Pregnancy and oral health utilization of the oral health care system by pregnant women in North Dakota. *Northwest Dent.* 1996; 75(6):823–8. [PMID: 9487880]
20. Hashim R. Self reported oral health, oral hygiene habits and dental service utilization among pregnant women in United Arab Emirates. *Int J Dent Hyg.* 2012; 10(2):142–6. [DOI: 10.1111/j.1601-5037.2011.00531.x] [PMID: 22040165]
21. Christensen LB, Jeppe-Jensen D, Petersen PE. Self-reported gingival conditions and self-care in the oral health of Danish women during pregnancy. *J Clin Periodontol.* 2003; 30(11):949–53. [DOI: 10.1034/j.1600-051X.2003.00404.x] [PMID: 14761116]
22. Rogers SN. Dental attendances in a sample of pregnant women in Birmingham, UK. *Community Dent Health.* 1991; 8(4):361–69. [PMID: 1790481]
23. Gunay H, Goepel K, Stock KH, Schneller T. Position of health education knowledge concerning pregnancy. *Oralprophylaxe.* 1991; 13:4–7. [PMID: 1931189]
24. Baseer MA, Rahman G, Asa'ad F, Alamoudi F, Albluwi F. Knowledge, attitude and practices of gynecologists regarding the prevention of oral diseases in Riyadh city, Saudi Arabia. *Oral Health Dent Manag.* 2014; 13(1):97–102. [PMID: 24603924]
25. Zanata RL, Fernandes KB, Navarro PS. Prenatal dental care: Evaluation of professional knowledge of obstetricians and dentists in the cities of Londrina/PR and Bauru/SP Brazil, 2004. *J Appl Oral Sci.* 2008; 16(3):194–200. [DOI: 10.1590/S1678-77572008000300006] [PMID: 19089217]
26. Rocha JM, Chaves VR, Urbanetz AA, Baldissera R, Rdos S, Rosing CK. Obstetrician's knowledge of periodontal disease as a potential risk factor for preterm delivery and low birth weight. *Braz Oral Res.* 2011; 25(3):248–54. [DOI: 10.1590/S1806-83242011000300010] [PMID: 21670856]
27. Cardenas LM, Ross DD. Effects of an oral health education program for pregnant women. *J Tenn Dent Assoc.* 2010; 90(2):23–6. [PMID: 20698433]

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Oralnozdravstvena prosvetćenost kod trudnica na području Republike Srpske

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KRATAK SADRŽAJ

Uvod Oralna oboljenja tokom trudnoće predstavljaju važan razlog za pojačanu stomatološku zaštitu ove vulnerabilne populacije. Cilj studije je bio da se utvrdi stepen oralnozdravstvene prosvetćenosti trudnica, kao i da se ispituju oralnohigijenske navike, stavovi i ponašanje u odnosu na stručnu spremu.

Materijal i metode Studija je sprovedena u Foči, Istočnom Sarajevu, Bijeljini i Palama (Republika Srpska, BiH). Ukupno 198 ispitanica dobrovoljno su ispunile anonimnu anketu, posebno kreiranu za ovo istraživanje.

Rezultati Osim četkice i paste za zube, 39,8% ispitanica za oralnu higijenu nije koristilo dodatna sredstva. Prilikom pranja zuba 60,1% trudnica je imalo krvarenje desni. Njih 54,1% su u toku trudnoće posetile stomatologa, dok se 34,3% izjasnilo da nema nameru da to učini. Ginekolog nije savetovao 69,7% ispitanica da posete stomatologa u toku trudnoće. Takođe, 80,8% trudnica bilo je mišljenja da su u trudnoći zubi podložniji karijesu, a 29,6% njih da je karijes oboljenje koje se ne može sprečiti. Ispitanice sa visokom stručnom spremom su smatrale da se u trudnoći ne gube minerali iz zuba majke, što je statistički značajna razlika u odnosu na trudnice sa srednjom stručnom spremom.

Zaključak Nivo zdravstvene prosvetćenosti trudnica o oralnom zdravlju je nizak. Važno je da sve žene u toku trudnoće obave redovan stomatološki pregled jer će od stomatologa dobiti korisne informacije o prevenciji oralnih oboljenja.

Ključne reči: trudnoća; oralno zdravlje; primarna prevencija; oralna higijena

UVOD

Trudnoća je dinamičan period u životu žene praćen brojnim fiziološkim i emocionalnim promenama. Zdrav način života i pravilna ishrana u trudnoći imaju ključnu ulogu na opšte zdravlje žene, kao i na pravilan rast i razvoj budućeg deteta. Oralna oboljenja tokom trudnoće predstavljaju važan razlog za pojačanu stomatološku zaštitu ove vulnerabilne populacije [1]. U trudnoći je nivo polnih hormona (estrogen i progesteron) značajno povišen u odnosu na žene koje nisu u drugom stanju [2]. Kao posledica hormonskog disbalansa javljaju se promene na mekim tkivima u usnoj duplji, a praćene su rastresitošću tkiva, različitim stepenom inflamacije i krvarenjem marginalne gingive [3].

Parodontalna oboljenja tokom trudnoće mogu se dovesti u vezu sa preeklampsijom, prevremenim porođajem i rođenjem beba male telesne težine [4]. Podaci iz literature ukazuju da je prenos kariogenih mikroorganizama sa majke na dete jedan od ključnih faktora u razvoju karijesa kod dece [5]. Savremena stomatologija ima za cilj promovisanje zdravlja i favorizovanje preventivnih nad kurativnim merama [6, 7]. Profilaktičko-preventivne mere kod trudnica imaju dvojaku funkciju: da stvore optimalne uslove za razvoj i formiranje zuba intrauterino i da spreče nastanak oralnih oboljenja trudnice. Međutim, činjenica je da tek kad nastane oboljenje, buduće majke pokažu interes za primenu sredstava za prevenciju [8]. Zbog toga je posebno važno da stomatolozi insistiraju na primeni rane prevencije, koju je najbolje početi primenjivati još u periodu trudnoće.

Američka akademija za dečju stomatologiju preporučuje da briga o oralnom zdravlju dece započne još u prenatalnom periodu oralnozdravstvenim prosvetćivanjem roditelja [9]. Kod većeg broja trudnica ne postoji razvijena svest o uticaju sopstvenog oralnog zdravlja i loše oralne higijene tokom trudnoće na oralno zdravlje deteta. Činjenice pokazuju da žene u trudnoći,

u većini slučajeva, ispunjavaju potrebe za čestim i povećanim unošenjem slatke ili kisele hrane i pića, a zanemaruju oralno-higijenske navike [8].

Roditelji igraju važnu ulogu u životu deteta, tako da će njihovo znanje i stavovi o oralnom zdravlju imati veliki uticaj na model ponašanja deteta [10]. Mnoge žene u toku trudnoće ne posećuju stomatologa. Literaturni navodi pokazuju da je korišćenje stomatološke službe tokom trudnoće na niskom nivou i u industrijski razvijenim zemljama: SAD (23–49%), Velikoj Britaniji (33–64%) i Grčkoj (27%) [11]. U toku trudnoće posete stomatologu bi trebale biti obavezne u cilju dobijanja adekvatnih informacija kako na najbolji način sačuvati oralno zdravlje svog deteta [12]. Saveti treba da budu razumljivi i praktično primenljivi kako bi budućim majkama poboljšali svest o značaju kako oralnog tako i celokupnog zdravlja [13].

Cilj studije bio je da se utvrdi stepen oralnozdravstvene prosvetćenosti trudnica, kao i da se ispituju oralnohigijenske navike, stavovi i ponašanje u odnosu na stručnu spremu.

MATERIJAL I METODE

Studija je sprovedena u četiri opštine: Foča, Istočno Sarajevo, Bijeljina i Pale (Republika Srpska, BiH). U studiju su bile uključene trudnice bez obzira na starost, obrazovanje i materijalni status, koje su odabrane metodom slučajnog izbora u ginekološkim ambulantama tokom redovne kontrole. Sve ispitanice su dale pisanu saglasnost za učešće u istraživanju. Ukupno 198 ispitanica, koje su bile u periodu od 8. do 38. nedelje gestacije, dobrovoljno su ispunile anonimnu anketu, posebno kreiranu za ovo istraživanje. Anketa je sastavljena od 25 pitanja kako bi se dobile sledeće informacije: sociodemografski podaci, oralno-higijenske navike trudnica, stečena znanja i obrasci ponašanja u trudnoći, kao i percepcija trudnica o štetnosti stomatoloških

intervencija i medikamentata na fetus. Dobijeni podaci su numerički obrađeni standardnim statističkim procedurama u statističkom programu SPSS 19,0 za Windows. Za testiranje razlike između anketnih odgovora upotrebljen je χ^2 test. Vrednosti $p/q < 0,05$ smatrane su statistički značajnim.

REZULTATI

Sve trudnice odgovorile su na ponuđena pitanja. Prosečna starost ispitanica bila je 33,3 godine. Većina trudnica (67,7%) imala je srednju stručnu spremu, nešto više od polovine njih je nezaposleno, dok je kod 39,9% ispitanica konstatovana prva trudnoća (Tabela 1).

Iz Tabele 2 može se videti koje oralnohigijenske navike su imale i kakvo je ponašanje ispitanica tokom trudnoće. Osim četkice i paste za zube, 39,8 % ispitanica za oralnu higijenu nije koristilo dodatna sredstva. Više od tri četvrtine trudnica (76,9%) sa visokom stručnom spremom upotrebljavale su dodatna sredstva, što je u odnosu na trudnice sa srednjom stručnom spremom statistički značajna razlika ($q < 0,05$). Prilikom pranja zuba 60,1% trudnica je imalo krvarenje desni, dok je mučninu i povraćanje navelo njih 55%. Anketa je pokazala da je 15,1% ispitanica ustajalo noću kako bi konzumirale hranu, 13,6% su pušači, a 2% trudnica je konzumiralo alkohol. U ovoj studiji trećina ispitanica (30,6%) imala je strah od stomatoloških intervencija. Više od polovine anketiranih (54,1%) posetile su stomatologa u toku trudnoće, dok se 34,3% izjasnilo da nema nameru da to učini. Anketa je pokazala da 69,7% ispitanica ginekolog nije savetovao da posete stomatologa u toku trudnoće (Tabela 2).

Tabela 3 pokazuje nivo znanja, ponašanje kao i mišljenja trudnica o uticaju stomatoloških intervencija na fetus. Oko dve trećine trudnica je smatralo da u toku trudnoće ne bi trebalo lečiti i vaditi zube, kao i da ne mogu primiti anesteziju. Takođe, 80,8% trudnica bilo je mišljenja da su u trudnoći zubi podložniji karijesu, a skoro trećina (29,6%) da je karijes oboljenje koje se ne može sprečiti. Ispitanice sa visokom stručnom spremom u značajno većem procentu su smatrale da se u trudnoći ne gube minerali iz zuba majke u odnosu na trudnice sa srednjom stručnom spremom ($q < 0,05$) (Tabela 3).

DISKUSIJA

Istraživanja o oralnohigijenskim navikama, znanju i ponašanju trudnica na našim prostorima su vrlo oskudna. Ova studija je sprovedena sa ciljem da se stekne uvid u oralnozdravstvenu prosvetćenost trudnica, kako bi se adekvatnim preventivnim merama delovalo na podizanje nivoa svesti o oralnom zdravlju. Trudnoća je period kada su žene izuzetno motivisane za usvajanje znanja u cilju unapređenja kako svog, tako i detetovog zdravlja. To čini ovaj period pogodnim za identifikaciju postojećih faktora rizika, edukaciju žena (budućih majki) i podizanje svesti da se zdravlje očuva i unapredi.

Adekvatna oralna higijena je preduslov za zdravlje usta i zuba. Trudnice su obično okupirane svojim stanjem tako da može doći do zanemarivanja pozitivnih navika koje nisu od primarnog značaja. Nesumnjivo je da se navike u ishrani tokom trudnoće menjaju, ali pitanje je koja od loših navika utiče na povećanje incidence stomatoloških oboljenja. Dobre oralnohi-

gijenske navike su rezultat dobre oralnozdravstvene prosvetćenosti. U ovom istraživanju učestalost pranja zuba posle svakog obroka navelo je 77% trudnica, dok je preostalih 23% to činilo 1-2 puta dnevno. Slične rezultate dobili su Nogueira i sar. [8], u kojima je 75,5% trudnica zube pralo posle svakog jela, dok u drugoj studiji Shabirra i sar. [14] 98,5% njih je navelo da zube pere 1-2 puta na dan. Thomas i sar. navode da su učestalost pranja zuba i korišćenje dodatnih sredstava za održavanje oralne higijene u korelaciji sa stručnom spremom [15]. U ovom istraživanju trudnice sa visokom stručnom spremom češće su prale zube i značajno više upotrebljavale ostala sredstva za oralnu higijenu.

Gingivitis predstavlja jednu od najčešćih oralnih komplikacija tokom trudnoće. Obično se javlja posle drugog meseca i najčešće je praćen krvarenjem desni prilikom pranja zuba. Ovo istraživanje je pokazalo da kod 60,1% ispitanica desni krvare prilikom pranja zuba. Krvarenje može da doprinese da se zapostavi oralna higijena, što uslovljava ubrzan razvoj karijesa i gubitak zuba [16].

Faktori kao što su duvan i alkohol povećavaju rizik od niske telesne težine novorođenčeta, prevremenog poroda i drugih komplikacija [17]. Rezultati ovog istraživanja su pokazali da je 13,6% trudnica pušilo tokom trudnoće, dok je 2% njih konzumiralo alkohol. Rezultati studije Esposito i sar. [17] pokazali su da je 22,3% žena u Italiji pušilo tokom trudnoće, dok je 28,9% konzumiralo alkohol pre trudnoće, a u trudnoći njih 7,2%. Ove vrednosti su po autorima bile značajno veće u odnosu na ranija istraživanja. Naši rezultati u pogledu navedenih faktora rizika su bolji od istih dobijenih u studijama sprovedenim u SAD i Velikoj Britaniji, gde se 57,4%, odnosno 46% trudnica izjasnilo da konzumira cigarete tokom trudnoće [17, 18].

Ne postoji uzajamna povezanost između trudnoće i karijesa. Međutim, u našem istraživanju čak 80,8% ispitanica je smatralo da su zubi u trudnoći podložniji karijesu. Iako je uvreženo mišljenje da „svaka trudnoća odnosi po jedan zub“, ne postoje literaturni podaci koji potvrđuju ovu tezu. Povećan rizik za nastanak karijesa, oboljenja gingive i parodonticijuma u trudnoći dešava se pre svega zbog promene hormonalnog statusa, promena navika u ishrani, kao i zbog okupiranosti trudnica stanjem u kom se nalaze [1]. U ovom istraživanju trudnice sa srednjim obrazovanjem u većem procentu su smatrale da svaka trudnoća dovodi do gubitka minerala iz zuba majke u odnosu na ispitanice sa visokom stručnom spremom. Gubitak zuba u trudnoći je prvenstveno posledica nastavka loših oralnohigijenskih navika koje su postojale i pre trudnoće.

Stomatološke intervencije (restauracija, endodontska terapija i ekstrakcija zuba) mogu se bezbedno sprovoditi u bilo kom trimestru trudnoće, dok se složeniji i dugotrajniji zahvati preporučuju nakon porođaja [15]. U ovom istraživanju veliki procenat trudnica (67%) smatrao je da pomenute intervencije nisu sigurne. Kada je u pitanju primanje lokalne anestezije, njih 72% je navelo da ona nije preporučljiva.

Različiti faktori utiču na posete trudnica stomatologu: materijalni status, nedostatak svesti o značaju zdravlja zuba, predrasude o uticaju trudnoće na zube, kao i zabrinutost za sigurnost fetusa tokom stomatološkog tretmana [8]. U ovom istraživanju 45,9% ispitanica se nije javilo stomatologu, dok se 34,3% izjasnilo da nema nameru da to učini. Ove vrednosti su nešto veće od rezultata koje imaju Mangskau i sar. [19], gde se 39% trudnica izjasnilo da nije posetilo stomatologa tokom

trudnoće. Hashim i sar. [20] navode da više od 40% trudnica nije posetilo stomatologa, iako su svi troškovi stomatoloških intervencija za trudnice besplatni, i da se najveći broj njih javljao uglavnom zbog određenih bolnih stanja u ustima. Takođe, više od polovine trudnica u Australiji i SAD nije posetilo stomatologa u trudnoći [15]. S druge strane, Christensen i sar. navode da je 90% danskih trudnica posetilo stomatologa tokom trudnoće, što je daleko bolji rezultat od istog u našem istraživanju [21]. U ovom istraživanju nije uočena značajnost razlike u posetama stomatologu u odnosu na stručnu spremu ispitanica.

Kada je u pitanju edukacija trudnica od strane stručnog lica, 73,4% trudnica se izjasnilo da nije dobilo savete vezane za održavanje oralnog zdravlja kod deteta. Slične rezultate dobili su u svojim istraživanjima Rogers i sar. [22] i Gunay i sar. [23], u kojima je takođe manje od jedne trećine ispitanica dobilo savete o uticaju oralnog zdravlja na trudnoću i novorođenče. Što se tiče saveta od strane ginekologa o poseti stomatologu, 69,7% trudnica je izjavilo da nisu dobili preporuku da to učine. Istraživanje Bassera i sar. [24] pokazalo je da je slaba oralnozdravstvena prosvetćenost među ginekolozima, koji prvi dolaze u kontakt sa trudnicama pružajući im adekvatnu medicinsku zaštitu i savete. Slično navode Zanata i sar. [25] i Rocha i sar. [26] u svojim stu-

dijama. Stoga su edukacija i motivacija zdravstvenih radnika, u prvom redu ginekologa, jedna od mogućih preventivnih mera kako bi se poboljšalo oralno zdravlje kod trudnica. Cardenas i sar. [27] u svom istraživanju su utvrdili da se znanje trudnica značajno poboljšalo nakon desetominutnih prezentacija o oralnom zdravlju od strane stomatologa i da su iste testiranjem posle četiri nedelje zadržale većinu usvojenih informacija.

Neophodno je istaći da na području na kojem je studija sprovedena ne postoji organizovano savetodavništvo za trudnice u koje je uključen stomatolog. Samim tim poželjno je ostvariti bolju saradnju sa ginekolozima, jer timski rad je garant uspešne prevencije.

ZAKLJUČAK

Nivo zdravstvene prosvetćenosti trudnica o oralnom zdravlju je nizak. Važno je da sve žene u toku trudnoće obave redovan stomatološki pregled i ako imaju zdrava oralna tkiva. Nesumnjivo je da će od stomatologa dobiti korisne informacije o prevenciji oralnih oboljenja koje će doprineti poboljšanju njihovog celokupnog zdravlja, kao i zdravlja budućeg deteta.

The main characteristics and application of the shape memory alloys in orthodontics and endodontics

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SUMMARY

Main characteristics of shape memory alloys (SMA) based on equiatomic nickel-titanium (TiNi) composition and their application in endodontics were analyzed in this paper. Particularly, phase transition between cubic body centered austenite phase and orthorhombic or monoclinic martensite phase was studied. Besides, main drawbacks of the conventional technology of SMA production were given, as well as a new technology approaches in enhancement of SMA properties, without changes of their super-elasticity.

Keywords: NiTi alloys; crystal transformation; endodontics; orthodontics

INTRODUCTION

Nickel-titanium-based shape memory alloys (TiNi SMA) are widely used in orthodontics due to their good mechanical properties, biocompatibility, ductility, corrosion resistance, low elastic modulus, and special characteristics such as super-elasticity and shape memory effect. Super-elasticity enables SMA wire to return to its original shape after unloading. The SMA can be deformed to 7-8% strain or almost forty-times more than the stainless steel wire of the same geometry. In other words, SMA are materials that can remember their original shape, after being elastically or pseudo-plastically deformed, due to its thermo-elastic martensitic transformation, where body-centered cubic parent phase (austenitic phase) transforms by a shear force into orthorhombic or monoclinic martensitic phase, passing or not passing through an intermediate tetragonal phase (R phase).

The main advantage of using SMA in root canal shaping instruments is the alloy's high flexibility. Martensitic transformation can be induced by stress from the austenitic phase over a narrow range of temperatures. Super-elasticity occurs when large reversible deformation occurs while during all this time, stress appears to be constant (plateau). If deformation (stress) increases, the super-elastic deformation appears, whereas strain remains constant.

CRYSTAL STRUCTURE OF SMA AND ITS PHASE TRANSFORMATIONS

In the lattice structures of all SMA easy changes happen, which consequently induce phase changes while receiving or releasing thermal energy. During this process, the

critical deformation and shape recovery is caused by the lattice parameter changes through the phase transformation between austenite and martensitic phases. Bearing in mind that SMA lattice parameters are stable at high temperatures and correspondent to body-centered cubic structure of austenite as parent phase, it seems that SMA, when cooled through critical-transformation temperature range, show specific changes in their modulus of elasticity (stiffness), yield strength, and electric resistance [1–4]. These changes are the result of changes in SMA crystal structures through martensitic transformation (Figure 1). The quantity of this transformation is a function of the starting (M_s) and finishing (M_f) temperature.

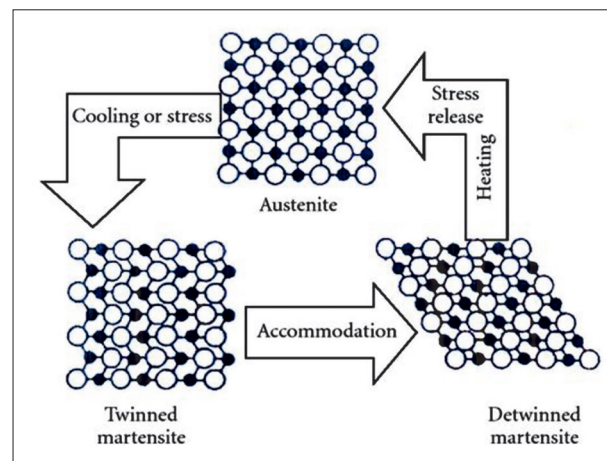


Figure 1. Changes in crystalline structure of SMA which influences super-elasticity (induced by stress) and memory shape effect (induced by heating)

Slika 1. Promene u kristalnoj strukturi SMA koje utiču na superelastičnost (indukovanu stresom) i efekat pamćenja oblika (indukovan zagrevanjem)

MEMORY SHAPE EFFECT AND SUPER-ELASTICITY OF SMA

Martensitic transformation is an instantaneous diffusion-less crystalline process, in which some atoms are moved from their initial position frequently by a shear-like mechanism, and body-centered cubic parent phase of austenite transforms to twinned martensitic phase, with the structure of closely packed hexagonal lattice. This change induces single (one-way), or double (two-way) memory shape effect, which allows returning SMA to their previous shape, recovering its large strains through heating and super-elasticity. The changes of their lattice structures induce phase transformation from a high temperature body-centered cubic (austenite form) to a low-temperature orthorhombic or monoclinic face-centered cubic form.

An intermediate trigonal phase between austenite and martensitic called R phase can occur as a result of a rhombohedral distortion of the cubic parent phase. Therefore, thin plates of R phase can nucleate from dislocations, which grow and join together enabling formations of many other plates, during complete transformation of SMA into R phase. When these plates shrink and disappear, SMA is returned to austenite. Inverse process can be induced by heating SMA above the transformation temperature, when SMA structure returns to its original austenite body-centered cubic parent phase, which is more stable at high-temperature conditions [5, 6, 7].

It is well known that the change of the alloy composition of only 0.1% induce change in the alloy transformation temperature of about 10°C and subsequently change in its mechanical characteristics. Nearly equiatomic composition of Ti and Ni in SMA, shows broad compositional limits in the area of eutectoid phase above 630°C, but generally, the austenite starting (A_s) and austenite finishing (A_f) temperatures are about 20°C above the martensite finishing (M_f) and martensite starting (M_s) temperatures, showing clearly expressed hysteresis above the range of the temperature transformation (Figure 2) [5, 6, 7].

Besides thermal treatment, the transformation from austenitic to martensitic phase can be also induced by mechanical stress. Namely, when sufficient shear stress is applied to an austenitic alloy, martensitic transformation starts, due to tendency of SMA to relief the excessive stress. Additionally, when mechanical stress is maintained, SMA is in martensitic phase and remains deformed, until shear stress is removed, while during all the time of stress duration, SMA remains in a non-stable martensitic phase, which will be transformed to austenite, immediately after SMA unloading. The enormous deformation capacity of SMA (up to 7-8% strain) and the ability of reverse deformation at lower stress are called super-elasticity or pseudo-elasticity [8, 9].

Super-elasticity is associated with thermo-elastic and stress-induced martensitic phase and its reverse phase transformation into austenite phase. Therefore, SMA may store the strain energy by the formation of mechanical twins, or twinning, due to shear force which influences atomic displacements on twin boundary and adequate volume changes induced by transition between martensitic and austenite phases. While super-elasticity is induced by stress,

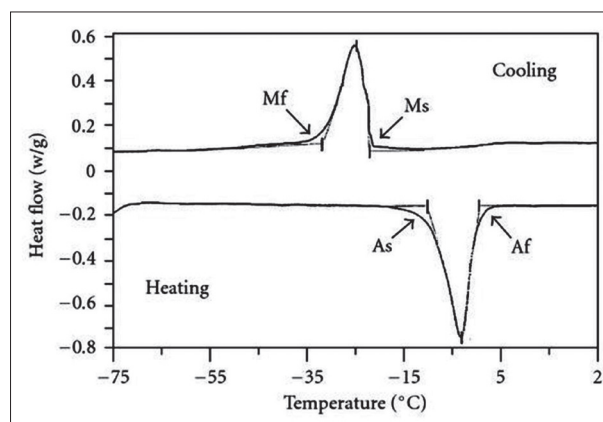


Figure 2. DSC curve of SMA shows the phase transformations as peaks and start and finish of martensite (M_s , M_f) and austenite (A_s , A_f) phases during heating and cooling

Slika 2. Kriva DSC legure SMA pokazuje faznu transformaciju kao pikove i početak i završetak martenzitne (M_s , M_f) i austenitne (A_s , A_f) faze tokom grejanja i hlađenja

shape memory is initiated by heating an alloy in martensitic stage and its transformation in more thermodynamically stable austenite phase [8, 9].

During cooling treatment single-step transformation is replaced by a two-step process that include transformation from austenite to R phase and then from R phase to martensitic phase. The R phase transformation is responsible for changes in hysteresis, which is smaller during a two-step transformation.

The reduction of grain size of SMA improves pseudo-elasticity, because it facilitates a desirable orientation of neighboring grains and their increased stiffness due to higher number of produced martensitic plates. From the other side, the composition of SMA influences the range of transition temperature. Additionally, very small excess of nickel in the structure of SMA can reduce transition temperature in SMA and increase the permanent yield strength of the austenite phase. Meanwhile, titanium-rich SMA, frequently contain a second phase Ti_2Ni , which possesses much higher transformation temperatures than nickel-rich or equiatomic SMA, influencing wide range of their fluctuation between -50 and +100°C. Reduction in transition temperature can be achieved through the changes in nickel-titanium ratio or by thermal treatment [7, 8, 9].

Knowing that manufacturing method, as it is rolling, and intermediate annealing applied to SMA wires during production process lead to breaking of the small crystals, its recrystallization is necessary for development of predictable average grain size and orientation. In addition, it is proved that with increase of Cu content, the starting temperature of the transformation from austenite to orthorhombic martensite phase does not change. Opposite, during the second step of transformation from orthorhombic to monoclinic phase, it decreases and only occurs in alloys of copper contents below 15%. Changes in Cu-based alloys composition resulting from Cu addition have positive effect to the mechanical properties of SMA, like reduction of the hysteresis of corresponding transformation, decrease of embrittlement, easier formability etc., because the rearrangement in the

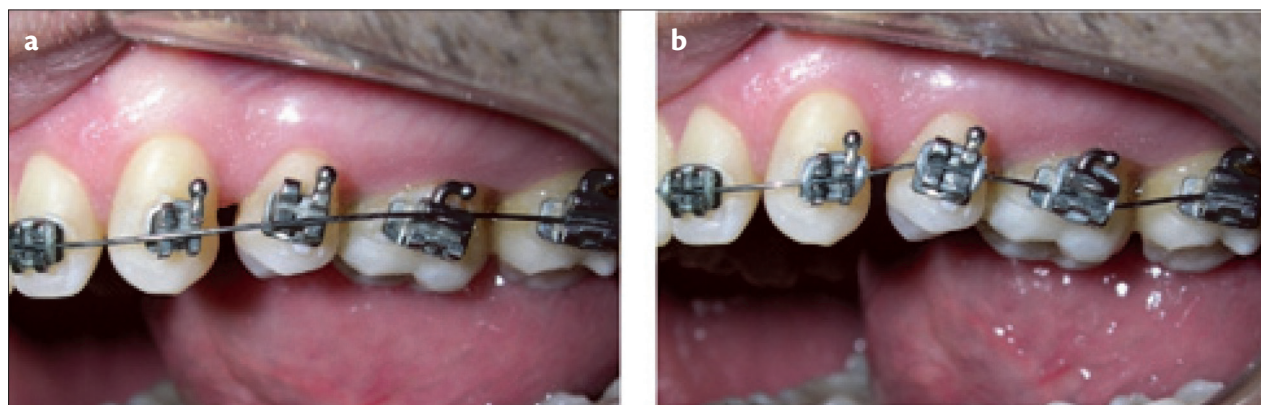


Figure 3. Maxillary arch during initial alignment. SMA wire (radius 0.31 cm) (a) before and (b) after brackets tightening. Note the degree of misalignment that the wire can tolerate due to its super-elastic properties.

Slika 3. Maksilarni luk u početnoj ortodontskoj fazi. SMA žica (poluprečnik 0,31 cm) (a) pre i (b) posle pritezanja konzola. Obratite pažnju na stepen odstupanja koje žica može da podnese zbog svojih superelastičnih svojstava.

martensitic structure, and its transformation in austenite structure is easier in Cu-NiTi alloys [10, 11, 12].

After that point conventional martensitic deformation - a classic linear stress/strain relationship is present. Thus, if the load is relieved before reaching the plastic deformation limit, the deformation will be reversible, both ordinary austenitic elasticity and pseudo-elastic deformation due to phase changes. Thermal modification shows that the hysteresis phenomenon is present and loading and unloading curves are not matched, because stress-strain curves can vary significantly depending on the diameter of the wire, temperature, and annealing properties. Testing instruments from several manufacturers, it was shown that the earlier generations of instruments were manufactured from a unique composition SMA (55%Ni-45%Ti). Some researchers consider that transformation temperatures of such alloys are highly sensitive to the composition and even 1% deviation in these percentages would almost yield a 100°C temperature threshold shift. As a direct consequence, melting plants must fulfill strict requirements in controlling nickel to titanium ratios to obtain the required final transformation temperatures [10, 11, 12].

Multiple reductions and frequent inter-pass annealing in the temperature range between 600 and 800°C are required to obtain the required product. Small voids regularly distributed throughout the bulk of alloy are generated as the consequence of the manufacturing process, because when nickel and titanium ingots are melted together there is a diffusion speed differential between the two elements, e.g. the speed of diffusion of nickel atoms into titanium is different from that of titanium atoms inside nickel, which in turn creates voids known as Kirkendall porosity, which show strong influence on the mechanical behavior of SMA.

Beside, some researchers have hypothesis that hydrogen uptake into the alloy from oral liquids, can be soaked through interstitial sites, dislocations, and grain boundaries creating hydride phases that are responsible for hydrogen embrittlement. In addition, this hydride phases form primarily near the alloy surface. Furthermore, since the thickness of the subsequent brittle layer is variable, microcracks formed on the surface due to the action of external forces induce

deformation or abrasion. Consequently, hydrogen adsorption may be very important factor in determining the lifespan of SMA when it is exposed to biologic media. Therefore, regular clinical procedure might be relevant during disinfection or sterilization protocols when an SMA is in contact with ionized fluids for extended periods [10, 11, 12].

SURFACE TREATMENT OF THE SMA

Since the SMA could not be changed at the time, alternative strategies of enhancement of orthodontic instrument behavior are based on its surface modification, to prevent microcrack formation, and other similar drawbacks, through improvement of the surface strength without changing SMA bulk properties, such as super-elasticity and toughness. One of these processes is electro-polishing, electrochemical process which enables reduction of the surface irregularities (in contrast to electroplating where electric current is used to deposit metallic ions onto one electrode).

During electro-polishing an instrument is placed in a temperature-controlled electrolytic bath and connected to the positive terminal. When direct current passes through the anode, the metal on the surface is oxidized and dissolved in the electrolyte. This is usually performed with specific ionic solutions and under rigorous manufacturing control. This process is supposed to improve material properties, like its dynamic fatigue and corrosion resistance; however, these evidences are controversial [12, 13].

Some authors found an extension of fatigue life for electro-polished instruments while most did not. Moreover, Boessler et al. suggested change in cutting behavior with an increase of torsional load after electro-polishing, while cyclic fatigue was reduced [14].

Another approach to polishing consists of treating the surface with a Deox treatment, which represents some kind of chemical polishing. As for electropolishing, there is little indication that chemical polishing would cause any effect on mechanical properties of the underlying metal, since changes are limited from few nanometers to few micrometers from the top of the surface.

Physical vapor deposition is significantly more efficient process in which surface of SMA instruments with a layer of titanium nitride is covered, showing the presence of golden color on its surface. These instruments show significant improvement in their cutting efficiency and corrosion resistance without affecting super-elastic properties. Another process is plasma immersion or ionic ion implantation, which is based on the bombardment of corresponding accelerated ions using plasma or ion gun, that induce the change of the subsurface layers of SMA and increase their cutting efficiency, without affecting the bulk characteristics of treated instruments.

Tripi et al. observed that nitrogen deposition would force elemental nickel from the surface inward, toward the core of instruments. Finally, one study considered boron implantation and reported that implanting boron into SMA had the potential of drastically improving cutting efficiency without hindering their super-elastic properties [12–15]. Boron-implanted SMA had their surface hardness doubled when compared with pure SMA at 0.05 μm depth. The surface hardness of this modified SMA exceeded that of stainless steel.

Finally, surface hardening can be achieved through cryogenic treatment. The manufactured samples by this method, showed increased microhardness but no detectable change in crystalline phase composition or elemental composition. This was also confirmed by another study that showed deep dry cryogenic treatment increased cutting efficiency significantly but not the wear resistance.

CONCLUSION

Memory shape alloys on the base equiatomic TiNi composition have a great importance in the development of various endodontic instruments, and wire and brackets used for orthodontic teeth movements. All positive effects of these alloys were analyzed and particularly, the most important properties like shape memory effect and super-elasticity. Also, new approaches related to the surface modification of SMA, by using diverse plasma methods were given.

REFERENCES

1. Lee JH, Park JB, Andreasen GF, Lakes RS. Thermomechanical study of Ni-Ti alloys. *J Biomed Mater Res*. 1988; 22(6):573–88. [DOI: 10.1002/jbm.820220611]
2. Uehara T, Tamai T. An atomistic study on shape memory effect by shear deformation and phase transformation. *Mechanics Advan Mater Struct*. 2006; 13(2):197–204. [DOI: 10.1080/15376490500451825]
3. Cui J, Chu YS, Famodu OO, Furuya Y, Hatrick-Simpers J, James RD, et al. Combinatorial search of thermoelastic shape-memory alloys with extremely small hysteresis width. *Nat Mater*. 2006; 5(4):286–90. [DOI: 10.1038/nmat1593] [PMID: 16518396]
4. Pattabi MK, Ramakrishna K, Mahesh KK. Corrigendum to “Effect of thermal cycling on the shape memory transformation behavior of NiTi alloy: powder X-ray diffraction study,” *Mater Sci Engineer A*. 2009; 505(1–2):191–7. [DOI: 10.1016/j.msea.2009.01.001]
5. Thompson SA. An overview of nickel-titanium alloys used in dentistry. *Int Endod J*. 2000; 33(4):297–310. [DOI: 10.1046/j.1365-2591.2000.00339.x] [PMID: 11307203]
6. Ye J, Gao Y. Metallurgical characterization of M-Wire nickel-titanium shape memory alloy used for endodontic rotary instruments during low-cycle fatigue. *J Endod*. 2012; 38(1):105–7. [DOI: 10.1016/j.joen.2011.09.028] [PMID: 22152631]
7. Hou X, Yahata Y, Hayashi Y, Ebihara A, Hanawa T, Suda H. Phase transformation behavior and bending property of twisted nickel-titanium endodontic instruments. *Int Endod J*. 2011; 44(3):253–8. [DOI: 10.1111/j.1365-2591.2010.01818.x] [PMID: 21219356]
8. Ounsi HF, Salameh Z, Al-Shalan T, Ferrari M, Grandini S, Pashley DH, et al. Effect of clinical use on the cyclic fatigue resistance of ProTaper nickel-titanium rotary instruments. *J Endod*. 33(6):737–41. [DOI: 10.1016/j.joen.2007.03.006] [PMID: 17509417]
9. Shen Y, Zhou HM, Zheng YF, Peng B, Haapasalo M. Current challenges and concepts of the thermomechanical treatment of nickel-titanium instruments. *J Endod*. 2013; 39(2):163–72. [DOI: 10.1016/j.joen.2012.11.005] [PMID: 23321225]
10. Zhou HM, Shen Y, Zheng YF, Li L, Zheng YF, Haapasalo M. Mechanical properties of controlled memory and superelastic nickel-titanium wires used in the manufacture of rotary endodontic instruments. *J Endod*. 2012; 38(11):1535–40. [DOI: 10.1016/j.joen.2012.07.006] [PMID: 23063231]
11. Shen Y, Zhou HM, Zheng YF, Campbell L, Peng B, Haapasalo M. Metallurgical characterization of controlled memory wire nickel-titanium rotary instruments. *J Endod*. 2001; 37(11):1566–71. [DOI: 10.1016/j.joen.2011.08.005] [PMID: 22000465]
12. Lopes HP, Elias CN, Vieira MV, Vieira VT, de Souza LC, Dos Santos AL. Influence of surface roughness on the fatigue life of nickel-titanium rotary endodontic instruments. *J Endod*. 2016; 42(6):965–8. [DOI: 10.1016/j.joen.2016.03.001] [PMID: 27080117]
13. Wolle CF, Vasconcellos MA, Hinrichs R, Becker AN, Barletta FB. The effect of argon and nitrogen ion implantation on nickel-titanium rotary instruments. *J Endod*. 2009; 35(11):558–62. [DOI: 10.1016/j.joen.2009.07.023] [PMID: 19840647]
14. Boessler C, Paque F, Peters OA. The effect of electropolishing on torque and force during simulated root canal preparation with ProTaper shaping files. *J Endod*. 2009; 35(1):102–6. [DOI: 10.1016/j.joen.2008.09.008] [PMID: 19084135]
15. Lee DH, Park B, Saxena A, Serene TP. Enhanced surface hardness by boron implantation in Nitinol alloy. *J Endod*. 1996; 22(10):543–6. [DOI: 10.1016/S0099-2399(96)80015-X] [PMID: 9198443]

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Osnovne karakteristike i primena legura sa efektom pamćenja oblika u ortodonciji i endodonciji

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KRATAK SADRŽAJ

Glavne karakteristike legura sa efektom pamćenja oblika (shape memory alloys – SMA) zasnovane na ekvatomskom sastavu nikla i titana (TiNi) i njihova primena u endodonciji su analizirani u ovom radu. Posebno je istraživana fazni prelaz između prostornocentrirane kubne austenitne faze i ortorombične ili monoklinične martenzitne faze. Pored toga, dati su i glavni nedostaci konvencionalne tehnologije proizvodnje SMA, kao i novi tehnološki pristupi u poboljšanju svojstava SMA, bez promene njihove superelastičnosti.

Ključne reči: NiTi legura; kristalna transformacija; endodoncija; ortodoncija

UVOD

Legure na bazi nikla i titana sa efektom pamćenja oblika (TiNi SMA) široko se koriste u ortodonciji zbog svojih dobrih mehaničkih svojstava, biokompatibilnosti, duktilnosti, otpornosti na koroziju, niskog modula elastičnosti i posebnih karakteristika kao što su superelastičnost i efekat memorije oblika. Superelastičnost omogućava SMA žici da se vrati u svoj prvobitni oblik posle rasterećenja. SMA žica se može deformisati do 7-8% deformacije ili skoro četrdeset puta više od žice od nerđajućeg čelika iste geometrije. Drugim rečima, SMA su materijali koji mogu zapamtiti svoj prvobitni oblik, nakon što su elastično ili pseudoplastično deformisani, zahvaljujući svojoj termoelastičnoj martenzitoj transformaciji, gde se prostorno centrirana kubna matična faza (austenitna faza) transformiše silom smicanja u ortorombičnu ili monokliničnu martenzitu fazu, koja prolazi ili ne prolazi kroz srednju tetragonalnu fazu (R fazu).

Glavna prednost upotrebe SMA u instrumentima za oblikovanje korenskih kanala je visoka fleksibilnost legure. Martenzitna transformacija može biti indukovana naponom iz austenitne faze u uskom rasponu temperatura. Superelastičnost se javlja kada dođe do značajne reverzibilne deformacije, dok za to vreme napon ostaje konstantan. Ako se deformacija (napon) povećava, pojavljuje se superelastična deformacija, dok naprezanje ostaje konstantno.

KRISTALNA STRUKTURA SMA I NJENE FAZNE TRANSFORMACIJE

U strukturnim rešetkama svih SMA dešavaju se jednostavne promene koje posledično indukuju fazne promene dok primaju ili oslobađaju toplotnu energiju. Tokom ovog procesa, kritična deformacija i vraćanje prvobitnog oblika su uzrokovani promenom parametara rešetke kroz faznu transformaciju između austenitne i martenzitne faze. Imajući u vidu da su parametri SMA rešetke stabilni na visokim temperaturama i da odgovaraju kubnoj strukturi austenita kao matičnoj fazi, izgleda da SMA, kada se hlade kroz temperaturni opseg kritične transformacije, pokazuju specifične promene modula elastičnosti (krutosti), granica tečenja i električnog otpora [1–4]. Ove promene su rezultat promena u njihovoj kristalnoj strukturi kroz marten-

zitsku transformaciju (Slika 1). Količina ove transformacije je funkcija početne (M_p) i završne (M_z) temperature.

EFEKAT PAMĆENJA OBLIKA I SUPERELASTIČNOST SMA

Martenzita transformacija je trenutni proces kristalisanja bez difuzije, u kome se neki atomi često pomeraju iz početnog položaja pomoću mehanizma sličnog smicanju, pri čemu se prostorno centrirana kubna matična faza austenita transformiše u dvostruku martenzitu fazu sa strukturom gusto pakovane heksagonalne rešetke. Ova promena izaziva samo jedan (jednosmerni) ili dvostruki (dvosmerni) efekat pamćenja oblika, koji omogućava vraćanje SMA u svoj prethodni oblik, oporavljajući se od velikog naprezanja kroz zagrevanje i superelastičnost. Promene njihovih strukturnih rešetki izazivaju faznu transformaciju iz visokotemperaturne kubne (austenitne forme) u niskotemperaturnu ortorombičnu ili monokliničnu površinski centriranu kubnu formu.

Srednja trigonalna faza između austenitne i martenzitne, tzv. R faza, može se pojaviti kao rezultat romboedarnog izobličenja kubne matične faze. Zbog toga, tanke ploče R faze mogu da se nukleiraju iz dislokacija, koje rastu i spajaju se omogućavajući formacije mnogih drugih ploča, tokom potpune transformacije SMA u R fazu. Kada se te ploče skupe i nestanu, SMA se vraća u austenit. Inverzni proces se može indukovati zagrevanjem SMA iznad temperature transformacije, kada se SMA struktura vrati u svoju originalnu austenitnu kubnu matičnu fazu, koja je stabilnija u uslovima visokih temperatura [5, 6, 7].

Dobro je poznato da promena sastava legure od samo 0,1% izaziva promenu temperature transformacije legure od oko 10°C, a zatim se menjaju njene mehaničke karakteristike. Skoro jednak atomski udeo Ti i Ni kod SMA, pokazuje široke granice u sastavu u oblasti eutektičke faze iznad 630°C, ali generalno, austenitna početna (A_s) i austenitna završna (A_f) temperatura su oko 20°C iznad martenzitne dorade (M_s) i martenzitne početne (M_f) temperature, pokazujući jasno izražen histerezis iznad opsega temperaturne transformacije (Slika 2) [5, 6, 7].

Osim termičke obrade, transformacija iz austenitne u martenzitu fazu može biti indukovana i mehaničkim stresom. Naime, kada se na austenitnu leguru primeni dovoljan napon smicanja, počinje martenzitska transformacija, zbog tendencije SMA da

olakša prekomerni stres. Dodatno, kada se održava mehaničko naprezanje, SMA je u martenzitnoj fazi i ostaje deformisana, dok se ne ukloni napon smicanja, dok tokom sveg vremena trajanja naprezanja SMA ostaje u nestabilnoj martenzitnoj fazi, koja će se transformisati u austenit, odmah posle rasterećenja SMA. Ogromni deformacioni kapacitet SMA (do 7-8% deformacije) i sposobnost obrnute deformacije pri nižim naprezanjima nazivaju se superelastičnost ili pseudoelastičnost [8, 9].

Superelastičnost je povezana sa termoelastičnom i stresom indukovanom martenzitnom fazom i njenom reverznom faznom transformacijom u austenitnu fazu. Stoga, SMA može skladištiti energiju deformacije formiranjem mehaničkih blizanaca, ili twinninga, zbog sile smicanja koja utiče na pomake atoma na granici blizanaca i odgovarajuće promene zapremine indukovane prelazom između martenzitnih i austenitnih faza. Dok je superelastičnost indukovana stresom, efekat pamćenja oblika se inicira zagrevanjem legure u martenzitnoj fazi i njenom transformacijom u termodinamički stabilnu austenitnu fazu [8, 9].

Prilikom procesa hlađenja jednostepena transformacija je zamenjena procesom u dva koraka koji uključuje transformaciju iz austenita u R fazu, a zatim iz R faze u martenzitnu fazu. Transformacija R faze je odgovorna za promene u histerezi, koji je manji tokom transformacije u dva koraka.

Smanjenje veličine zrna SMA poboljšava pseudoelastičnost, jer olakšava poželjnu orijentaciju susednih zrna i njihovu povećanu stabilnost zbog većeg broja proizvedenih martenzitnih ploča. S druge strane, sastav SMA utiče na opseg temperature prelaza. Dodatno, veoma mali višak nikla u strukturi SMA može smanjiti temperaturu prelaza u SMA i povećati trajnu granicu tečenja austenitne faze. U međuvremenu, SMA obogaćena titanom često sadrži drugu fazu Ti_2Ni , koja ima mnogo veću temperaturu transformacije SMA bogate niklom ili ekvatomske SMA, utičući na veoma širok opseg njihove fluktuacije između -50 i +100°C. Redukcija temperature prelaza može biti postignuta kroz promene odnosa nikla i titana ili termičkom obradom [7, 8, 9].

Znajući da proizvodni metod, kao što su valjanje i odgrevanje, koji se primenjuje na SMA žice tokom procesa proizvodnje dovodi do loma malih kristala, sledi da je njegova rekristalizacija neophodna za razvoj predvidljive srednje veličine i orijentacije zrna. Pored toga, pokazalo se da se sa povećanjem sadržaja Cu početna temperatura transformacije od austenitne u ortorombičnu martenzitnu fazu ne menja. Tokom drugog koraka transformacije od ortorombične u monokliničnu fazu, ona se smanjuje i javlja se samo u legurama sa sadržajem bakra ispod 15%. Promene u sastavu legura na bazi Cu dobijene dodavanjem Cu imaju pozitivan efekat na mehanička svojstva SMA, kao što je redukcija histereze odgovarajuće transformacije, smanjenje krhkosti, lakše oblikovanje itd., jer je preraspodela u martenzitnoj strukturi i njena transformacija u austenitnu strukturu lakša u Cu-NiTi legurama [10, 11, 12].

Posle toga je prisutna konvencionalna martenzitna deformacija – klasična linearna veza naprezanja/deformacija. Prema tome, ako se opterećenje uklanja pre dostizanja granice plastične deformacije, deformacija će biti reverzibilna, kako uobičajena austenitna elastičnost tako i pseudoelastična deformacija usled promene faze. Termička modifikacija pokazuje da je prisutan fenomen histereze i da se krive opterećenja i rasterećenja ne podudaraju, jer krive naprezanje–deformacija mogu značajno varirati u zavisnosti od prečnika žice, temperature i osobina žarenja. Testiranje instrumenata nekoliko proizvođača pokazalo

je da su prethodne generacije instrumenata proizvedene od jedinstvene kompozicije SMA (55% Ni – 45% Ti). Neki istraživači smatraju da su temperature transformacije takvih legura veoma osetljive na sastav i čak 1% odstupanja u ovim procentima bi dovelo do pomeranja praga temperature od skoro 100°C. Kao direktna posledica, postrojenja za topljenje moraju ispunjavati stroge zahteve u kontroli odnosa nikla i titana da bi se dobile potrebne konačne temperature transformacije [10, 11, 12].

Za dobijanje potrebnog proizvoda potrebna su višestruka smanjenja i česta međupropusna žarenja u temperaturnom opsegu između 600 i 800°C. Male šupljine koje su redovno raspoređene po masi legure generišu se kao posledica proizvodnog procesa, jer kada se istope šipke nikl i titana, postoji razlika u brzini difuzije između dva elementa, npr. brzina difuzije atoma nikla u titan se razlikuje od brzine titanijumskih atoma u niklu, što stvara praznine poznate kao Kirkendalova poroznost, koje pokazuju jak uticaj na mehaničko ponašanje SMA.

Pored toga, neki istraživači imaju hipotezu da se može uneti vodonik u leguru iz oralnih tečnosti kroz intersticijska mesta, dislokacije i granice zrna stvarajući hidridne faze koje su odgovorne za vodoničnu krhkost. Pored toga, ove hidridne faze se formiraju primarno blizu površine legure. Osim toga, budući da je debljina sledećeg krhkog sloja promenljiva, mikropukotine koje se formiraju na površini usled dejstva spoljašnjih sila izazivaju deformaciju ili abraziju. Shodno tome, adsorpcija vodonika može biti veoma važan faktor u određivanju životnog veka SMA kada je izložen biološkim medijima. Stoga, redovna klinička procedura može biti relevantna tokom dezinfekcije ili protokola sterilizacije kada je SMA u kontaktu sa jonizovanim tečnostima tokom dužeg perioda [10, 11, 12].

POVRŠINSKA OBRADA SMA

Pošto se SMA nisu mogle promeniti, alternativne strategije poboljšanja ponašanja ortodontskih instrumenata zasnivaju se na modifikaciji površine, kako bi se sprečilo formiranje mikropukotina i drugi slični nedostaci, kroz poboljšanje čvrstoće površine bez promene osobina SMA, kao što su superelastičnost i žilavost. Jedan od tih procesa je elektropoliranje, elektrohemijski proces koji omogućava smanjenje površinskih nepravilnosti (za razliku od galvanizacije gde se koristi električna struja za deponovanje metalnih jona na jednu od elektroda).

Prilikom elektropoliranja instrument se postavlja u elektrolitičku kupku sa kontrolisanom temperaturom i povezuje se sa pozitivnim terminalom. Kada struja prolazi kroz anodu, metal na površini se oksidira i rastvara u elektrolitu. Ovo se obično izvodi sa specifičnim jonskim rastvorima i pod strogom kontrolom proizvodnje. Ovaj proces treba da poboljša svojstva materijala, kao što je dinamički zamor i otpornost na koroziju; međutim, ovi dokazi su kontroverzni [12, 13].

Neki autori su pronašli produžetak trajanja zamora za elektropolirane instrumente, dok većina nije. Štaviše, Boessler et al. sugerisali su promenu ponašanja sečenja sa povećanjem torzionog opterećenja posle elektropoliranja, dok je ciklički zamor smanjen [14].

Drugi pristup poliranju sastoji se u tretiranju površine instrumenta tretmanom Deox, koji predstavlja neku vrstu hemijskog poliranja. Što se tiče elektropoliranja, malo je naznaka da bi hemijsko poliranje izazvalo bilo kakav efekat na mehaničke

osobine metala, jer su promene ograničene na nekoliko nanometara do nekoliko mikrometara od vrha površine.

Fizičko taloženje para je znatno efikasniji proces u kome je prekrivena površina SMA instrumenata slojem titanijum-nitrida, pokazujući prisustvo zlatne boje na njenoj površini. Ovi instrumenti pokazuju značajno poboljšanje u efikasnosti rezanja i otpornosti na koroziju bez uticaja na superelastična svojstva. Drugi proces je imerzija plazmom ili jonska implantacija, koja se zasniva na bombardovanju odgovarajućih ubrzanih jona pomoću plazma ili jonskog pištolja, koji indukuju promenu dubljih slojeva SMA i povećavaju njegovu efikasnost sečenja, bez uticaja na karakteristike obrađenih instrumenata.

Tripi i dr. primetili su da će taloženje azota pogurati elementarni nikl od površine prema unutra, prema jezgri instrumenata. Konačno, jedna studija je razmatrala implantaciju bora i došla do zaključka da implantacija bora u SMA ima mogućnost da drastično poboljša efikasnost sečenja bez ometanja njihovih superelastičnih svojstava [12–15].

SMA sa implantiranim borom je imala udvostručenu površinsku tvrdoću u poređenju sa čistim SMA na dubini od 0,05

µm. Površinska tvrdoća ove modifikovane SMA premašila je tvrdoću nerđajućeg čelika.

Konačno, površinsko očvršćavanje se može postići kriogenim tretmanom. Proizvedeni uzorci ovom metodom pokazali su povećanu mikrotvrdoću, ali ne i detektabilnu promenu u sastavu kristalne faze ili elementarnom sastavu. Ovo je potvrđeno i drugom studijom koja je zaključila da duboko suvo kriogeno tretiranje značajno povećava efikasnost sečenja, ali ne i otpornost na habanje.

ZAKLJUČAK

Legure sa efektom pamćenja oblika na bazi ekvatomskog sastava Ti i Ni imaju veliki značaj u razvoju različitih endodontskih instrumenata, kao i žica i konzola koje se koriste za podešavanje položaja zuba. Analizirane su sve pozitivne strane ovih legura, a posebno najvažnije osobine kao što je efekat pamćenja oblika i superelastičnost. Takođe, dati su novi pristupi vezani za modifikaciju površine SMA, korišćenjem različitih plazma metoda.

Quality indicators of dental health care in Serbia

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SUMMARY

Health care has witnessed considerable progresses toward quality improvement over the past two decades. More precisely, there have been global efforts aimed to improve this aspect of health care along with experts and decision-makers reaching the consensus that quality is one of the most significant dimensions and features of health system. Quality health care implies highly efficient resource use in order to meet patient's needs in terms of prevention and treatment. Quality health care is provided in a safe way while meeting patients' expectations and avoiding unnecessary losses. The mission of continuous improvement in quality of care is to achieve safe and reliable health care through mutual efforts of all the key supporters of health system to protect patients' interests. A systematic approach to measuring the process of care through quality indicators (QIs) poses the greatest challenge to continuous quality improvement in health care. Quality indicators are quantitative indicators used for monitoring and evaluating quality of patient care and treatment, continuous professional development (CPD), maintaining waiting lists, patients and staff satisfaction, and patient safety.

Keywords: health care; quality of health care; quality indicator; patient satisfaction; patient safety

INTRODUCTION

Quality health care is of paramount importance for a health system. Continuous improvement in the quality of patient care and safety is an integral part of everyday activities of medical professionals, medical associates and anyone employed in the health system [1]. Striving for quality patient treatment and care with the aim of delivering the best possible outcome for the patient is as old as medical profession. Nonetheless, organized efforts to evaluate and improve quality of health care started to appear in the 20th century. It was Avedis Donabedian who made a major contribution to this field at the time. Namely, in the late 1970s Avedis Donabedian introduced evaluation of medical care and patient expectations based on clearly defined standards.

Quality health care implies highly efficient resource use in order to meet patient's needs of prevention and treatment in a safe way while meeting patients' expectations and avoiding unnecessary losses [1]. The Health Insurance Act, which represents one of the basic sets of principles of health care in Serbia, states: "The principle of continuous quality improvement is exercised by the measures and activities that in accordance with the latest advances in medical science and practice, enhance the possibilities for positive outcome while reducing risks and other unintended consequences for health and well-being of individuals and the whole community" [2]. The fundamental components of continuous quality improvement (CQI) in health care are: patient-centeredness, process analysis, forming quality improvement teams, applying simple methods to analyze quality-related issues in sys-

tematical way, implementing previously established plans and changes, data gathering, monitoring and evaluation.

A quality indicator is a quantitative indicator used to monitor and evaluate quality of patient care and treatment. It is also perceived as a support system for health care activities. Quality indicators include performance indicators of health care providers based on their type and range of services they offer. Furthermore, these include different indicators used to assess the performance of the Commission for Health Care Quality Improvement, but also those related to continuing professional development (CPD), maintaining waiting lists, patient safety, patient and staff satisfaction [3].

Each health institution in Serbia is obliged to collect data used for calculating quality indicators and then submit them annually to "Dr Milan Jovanovic Batut" Institute of Public Health of Serbia. This procedure is completed through the competent district institute.

The aim of this study was to introduce the basic quality indicators of health care in Serbia.

QUALITY INDICATORS IN DENTAL HEALTH CARE

Quality indicators in dental health care are monitored in health care institutions providing dental services, i.e. prevention and treatment. Accordingly, quality indicators are monitored in the following health care institutions: health centers, institutes for dentistry, institutes for student health care (within the Dental Care Department) and institutes for health care of workers.

There are ten defined quality indicators that are monitored in dental health care [3]:

- 1) Percentage of children who received topical application of concentrated fluoride at the age of 7;
- 2) Percentage of children who received topical application of concentrated fluoride at the age of 12;
- 3) Percentage of 7-year-old children with no tooth decay;
- 4) Percentage of 12-year-old children with no tooth decay;
- 5) DMFT in 12-year-old children;
- 6) Percentage of children in grade 7 of elementary school with diagnosed untreated orthodontic irregularities;
- 7) Percentage of children in grade 3 of secondary school with diagnosed untreated orthodontic irregularities;
- 8) Percentage of women who had a preventive check-up during pregnancy;
- 9) Percentage of patients aged 18 or above who have received conservative periodontal treatment;
- 10) Percentage of repeated interventions.

Dental health care quality indicators are in compliance with general and specific goals of the National Program for Preventive Dental Health Care [4].

According to the 2016 report on quality improvement in health care institutions, 38.3% of 7-year-old children and 37.6% of 12-year-old children had all healthy teeth, whereas the mean DMFT of 12-year-old children was 2.15. Approximately 90% of 7-year-old and 12-year-old children had received topical application of concentrated fluoride. Around one third (35.3%) of pregnant women had visited a dentist for preventive check-ups. However, there was high percentage of children with orthodontic irregularities – 53.9% of grade 7 children (elementary school) and 49.9% of grade 3 children (secondary school). The proportion of patients 18 years old or above that had received conservative periodontal treatment was 15.9%. Finally, approximately one in twenty patients (4.18%) required repeated intervention [5].

PATIENT SATISFACTION WITH DENTAL HEALTH CARE SERVICE

Patient/user satisfaction is perceived as a general attitude of individuals towards their own experience with a health care system. Taking patient satisfaction into consideration is a measure that reflects the system's responsiveness to people's non-medical expectations. Thus, the patient's perception is critical for the quality of care [5].

National surveys of patient satisfaction conducted by means of questionnaires represent the most convenient way of collecting data from a large number of people. These are carried out in institutions providing primary, secondary and tertiary care. Such analyses enable us to assess patient satisfaction among different patient populations based on their gender, age and type/department of health institution. The replicability of such research facilitates the process of monitoring any changes that occur within health care system over time. As for Serbia,

this measure was first introduced in 2010 and has been used ever since.

To assess dental health care, these surveys are conducted in institutions providing primary care within departments of pediatric dentistry. The questionnaire consists of 19 questions divided into several sections. The person who brings a child for a dental check-up is asked to fill in the questionnaire. The first four questions refer to parents'/guardians' socio-demographic characteristics (gender, age, education, and financial status). The remaining questions relate to dental care provided to the child (chosen dentist, criteria for choosing/replacing the chosen dentist, the number of visits to public/private dentists within the past year and waiting times). A set of questions covers health education, i.e. the importance of regular check-ups, application of fluoride, maintaining proper oral hygiene, balanced diet and orthodontic irregularities). Certain questions refer to working times, getting check-up on weekends, accessibility of care for children with special needs, accessibility of care in emergencies, the time between check-ups, helpfulness of receptionists and keeping a book of complaints. Finally, the last section evaluates the characteristics of chosen pediatric dentists such as providing clear explanations of procedures, allocating sufficient amount of time to discuss the patient's issues, being well-aware of the child's problems and conditions. This section also gathers information on cooperation among medical staff and dental charges (exempt from charges, participation fee, full price) [6].

The proportion of patients who were satisfied (satisfied and very satisfied) with pediatric dental health care in 2016 was 83.2% with the average mark of 4.08 (range: 1–5) [5, 7].

PATIENT SATISFACTION WITH HEALTH CARE

These indicators refer to the number of complaints and are given in the Report on the Number of Complaints for the reporting year [5]. The Law on Patients' Rights terminated the Patient Ombudsman in December 2013. As a result, each health care institution has appointed an advisor whose duty is to protect patients' rights. That person is not employee of health care institution to avoid conflict of interest.

The patient who believes that he/she has been denied medical care or that their social right to health care has been denied by a health professional/associate is entitled to make a complaint [8]. A complaint can be made about the quality of health care, conduct of health professionals/associates, fee processing, organization of medical institution, waiting times, reimbursement of medical costs, patient rights, etc.

JOB SATISFACTION AMONG EMPLOYEES IN PUBLIC HEALTH INSTITUTIONS

Job satisfaction among employees in public health care institutions in Serbia has been measured since 2006. Job

satisfaction is defined as subjective perception of an employee regarding their personal fulfilment derived from work and the impact of their contribution on the institution.

Work motivation is one of the essential prerequisites for efficient work performance and is tightly connected to achieving positive results both at individual and institutional level. From a manager's point of view, motivation translates into employees being completely involved, committed and dedicated to themselves, their skills and capacities, and the job they perform while feeling fulfilled and content [9]. Salaries and remuneration packages can often enhance employees' feelings of accomplishment in the workplace. Reward schemes can include either individual or group compensation. However, apart from financial incentives, reward schemes should comprise nonfinancial incentives, as well. These are numerous and refer to appreciating one's need to further develop by acknowledging their professional competencies, including them in goal-setting and decision-making, allowing them to define and perform tasks and duties independently, enabling them to cooperate with other institutions, offering flexible working hours and providing them with continuing professional development, etc.

Work-related stress is one of the major causes of occupational diseases and sick leave not only in Europe, but also across the world. According to the 2010 Report published by the European Commission (EC) and the International Labour Organization (ILO), stress is second most frequent health problem among employees in the European Union [10]. Owing to the fact that patients trust medical practitioners with their lives and health, medical profession is among the most stressful professions. This inevitably results in medical practitioners being exposed to highly specific stressors. There are a variety of occupational stressors in health care. Many recent studies on morbidity from psychosomatic and mental disorders have shown that stressors such as contact with patients and their families, decision-making, working shifts, including night shifts and long working hours, contribute to emotional exhaustion among medical practitioners [11, 12]. Managers in health care institutions and departments should be responsible for identifying stress hotspots, as well as the employees who might be experiencing high levels of stress. Even though it is the management's duty to ensure that stress is addressed at the organizational level, each person should take any necessary measures to prevent stress at the individual level.

A universal questionnaire is used to investigate job satisfaction among health professionals in Serbia, regardless of their positions. The questionnaire consists of 23 questions designed to assess employees' attitudes towards equipment, interpersonal relations, time management, professional development, remuneration, their superiors, cooperation with colleagues, patients, stress exposure, work pressure and plans to change jobs. The final part of the questionnaire is concerned with employees' suggestions, complaints and proposals for improving quality of care and increasing job satisfaction [13].

COMMISSION FOR HEALTH CARE QUALITY IMPROVEMENT REPORT

Comprehensive report on the work of the Commission for Health Care Quality Improvement is an indicator of quality of the Commission's performance which offers a comprehensive overview of all activities and measures implemented in the reporting year with the aim of improving quality of care and functioning of the health care institution [5].

Initial part of report focuses on different domains of quality of the Commission's performance (annual evaluation of professional performance and an integrated plan for continuous quality improvement within the health care institution, number of assessments without prior notice, number of patient complaints, etc.). The second part of the report is concerned with indicators of patient satisfaction associated with quality of care. The report also contains statistics of patient satisfaction and staff satisfaction, along with the analysis of collected data. The final part of the report summarizes the overall performance with regard to the Integrated Plan for Continuous Quality Improvement in Health Care.

PATIENT SAFETY

Patient safety is universally defined as "identification, analysis and correction of risky events in order to increase the levels of safety in health care and minimize patient-related risks." [1]. Thus, patient-related incidents are considered to be cumulative consequences of the cause rather than individual mistakes. The principle of safety requires health care system that prioritizes patient safety and minimizes any risks during the provision of diagnostics or therapeutic treatment.

Due to the fact that one in ten patients experiences iatrogenic harm, the World Health Organization (WHO) has published an advocacy material in order to reduce the number of such incidents in the world. The WHO guidelines refer to drug nomenclature, patient identification, hand-over communication and the importance of hand hygiene.

Agency for Accreditation of Health Care Institutions in Serbia (AZUS) plays a prominent role in establishing the patient-safety system in Serbia. Ever since the AZUS Patient Safety Strategy was first introduced in 2010, health care institutions and facilities in Serbia have been obliged to adhere to its principles. The strategy sets out five key goals related to patient safety. These include safe surgical procedures, infection prevention and control, medication safety, personalized care and treatment, and eliminating/minimalizing adverse events [14, 15, 16].

CONTINUING PROFESSIONAL DEVELOPMENT (CPD)

Continuing Professional Development of health professionals and associates, which is one of the obligatory require-

ments for obtaining a license to practice, directly correlates with enhanced quality and efficiency in health care.

Quality indicators of CPD at institutional level are [5]:

- 1) Formulating plans for CPD of all employees;
- 2) The number of workshops, courses and seminars organized by the institution;
- 3) Percentage of employees for whom the institution covered the costs of attending course, seminar, congress or symposium relevant to their field at least once;
- 4) The number of CPD courses accredited by the Serbian Health Council that are organized/held by medical professionals employed in the institution.

CONCLUSION

“Quality is the responsibility of everyone.” This is commonly quoted slogan in health care which purpose is to reiterate that quality improvement is not what only individuals; specialized commissions, health care institutions and facilities are accountable for. Instead, it should lay the foundation for the provision of health care in its broadest sense. The process of quality improvement is gradual. Besides, it is equivalent to the process that we encounter in medical practice. The cause of poor quality is first identified by means of health care quality indicators. The next step is to carry out trials on the interventions that could help enhance it. Quality in dental health care should provide the patient with a proper treatment while minimizing risks as much as possible. Dental health care professionals and patients alike are obliged to cooperate with the aim of assuring high quality dental health care.

REFERENCES

1. Strategija za stalno unapređenje kvaliteta zdravstvene zaštite i bezbednosti pacijenata. Službeni glasnik RS, Beograd, br. 15/2009.
2. Zakon o zdravstvenoj zaštiti. Službeni glasnik RS, Beograd, br. 107/200572/2009, 88/2010, 99/2010, 7/2011, 119/2012 i 45/2013.
3. Pravilnik o pokazateljima kvaliteta zdravstvene zaštite. Službeni glasnik RS, Beograd, br. 49/2010.
4. Uredba o Nacionalnom programu preventivne stomatološke zdravstvene zaštite. Službeni glasnik RS, Beograd, br. 22/2009.
5. Izveštaj o unapređenju kvaliteta rada u zdravstvenim ustanovama Republike Srbije u 2016. godini. Institut za javno zdravlje Srbije „Dr Milan Jovanović Batut“, Beograd, 2017.
6. Metodološko uputstvo za postupak izveštavanja zdravstvenih ustanova o pokazateljima kvaliteta rada, listama čekanja, zadovoljstvu pacijenata i obuci zaposlenih. Institut za javno zdravlje Srbije „Dr Milan Jovanović Batut“, Beograd, 2014.
7. Analiza zadovoljstva korisnika zdravstvenom zaštitom u državnim zdravstvenim ustanovama Republike Srbije 2016. godine. Institut za javno zdravlje Srbije „Dr Milan Jovanović Batut“, Beograd, 2017.
8. Zakon o pravima pacijenata. Službeni glasnik RS, Beograd, br. 45/2013.
9. Gray JAM. Evidence-based Healthcare and Public Health: how to make decisions about health services and public health. Elsevier Health Sciences, 3rd ed, 2009.
10. Mićović P. Zdravstveni menadžment. Komora zdravstvenih ustanova Srbije, Beograd, 2008.
11. Andolhe R, Barbosa RL, Oliveira EM, Costa AL, Padilha KG. Stress, coping and burnout among Intensive Care Unit nursing staff: associated factors. *Rev Esc Enferm USP*. 2015; 49:58–64. [DOI: 10.1590/S0080-623420150000700009] [PMID: 26761693]
12. Knežević B. Stres na radu i radna sposobnost zdravstvenih djelatnika u bolnicama. Doktorska disertacija. Zagreb: Medicinski fakultet; 2010.
13. Adriaenssens J, De Gucht V, Maes S. Causes and consequences of occupational stress in emergency nurses, a longitudinal study. *J Nurs Manag*. 2013; 12(3):222–40. [DOI: 10.1111/jonm.12138] [PMID: 24330154]
14. Analiza ispitivanja zadovoljstva zaposlenih u državnim zdravstvenim ustanovama Republike Srbije 2016. godine. Institut za javno zdravlje Srbije „Dr Milan Jovanović Batut“, Beograd, 2017.
15. Pravilnik o akreditaciji zdravstvenih ustanova, Službeni glasnik RS, Beograd, br. 112/2009.
16. Priručnik za sprovođenje mera za bezbednost pacijenata prema zahtevima AZUS-a. Agencija za akreditaciju zdravstvenih ustanova Srbije, 2010.

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Pokazatelji kvaliteta stomatološke zdravstvene zaštite u Srbiji

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KRATAK SADRŽAJ

U poslednje dve decenije u oblasti kvaliteta zdravstvene zaštite učinjeno je mnogo u svim zemljama sveta i postignut je konsenzus i među stručnjacima i među donosiocima odluka da je kvalitet među najznačajnijim dimenzijama i svojstvima zdravstvenog sistema. Kvalitetna zdravstvena zaštita je ona koja omogućava organizaciju resursa na najdelotvorniji način, kako bi se zadovoljile zdravstvene potrebe pacijenta za prevencijom i lečenjem, na bezbedan način, bez nepotrebnih gubitaka i na visokom nivou njihovih zahteva. Vizija stalnog unapređenja kvaliteta je dostizanje bezbedne i sigurne zdravstvene zaštite koju zajedničkim naporima razvijaju svi ključni akteri u zdravstvenom sistemu u interesu pacijenta. Najveći izazov za stalno unapređenje kvaliteta zdravstvene zaštite je sistematski pristup njegovom merenju, putem pokazatelja kvaliteta. Pod pokazateljima kvaliteta podrazumevamo kvantitativne pokazatelje koji se koriste za praćenje i evaluaciju kvaliteta nege i lečenja pacijenata, sticanje i obnovu znanja i veština zaposlenih, vođenje lista čekanja, zadovoljstvo korisnika uslugama zdravstvene službe, zadovoljstvo zaposlenih, kao i bezbednost pacijenata.

Ključne reči: zdravstvena zaštita; kvalitet zdravstvene zaštite; indikatori kvaliteta; zadovoljstvo pacijenata; bezbednost pacijenata

UVOD

Kvalitet zdravstvene zaštite je jedna od najvažnijih karakteristika sistema zdravstvene zaštite. Stalno unapređenje kvaliteta i bezbednosti pacijenata je sastavni deo svakodnevnih aktivnosti zdravstvenih radnika, zdravstvenih saradnika i svih drugih zaposlenih u zdravstvenom sistemu [1]. Težnja da se obezbedi kvalitetno lečenje i briga o pacijentu, kao i da se postigne najpovoljniji ishod po zdravlje pacijenta stara je koliko i lekarska profesija. Međutim, organizovani naponi na proceni i unapređenju kvaliteta rada u sistemu zdravstvene zaštite novijeg su datuma. U oblasti kvaliteta zdravstvene zaštite najveći doprinos krajem sedamdesetih godina prošlog veka dao je Avedis Donabedian, koji je prvi uveo poređenje između pružene i očekivane zdravstvene zaštite na osnovu definisanih standarda kao merila.

Kvalitetna zdravstvena zaštita je ona koja omogućava organizaciju resursa na najdelotvorniji način, kako bi se zadovoljile zdravstvene potrebe korisnika za prevencijom i lečenjem, na bezbedan način, bez nepotrebnih gubitaka i na visokom nivou njihovih zahteva [1]. Zakon o zdravstvenoj zaštiti, kao jedno od osnovnih načela na kojima je zasnovana zdravstvena zaštita u našoj zemlji, definiše: „Načelo stalnog unapređenja kvaliteta zdravstvene zaštite ostvaruje se merama i aktivnostima kojima se u skladu sa savremenim dostignućima medicinske nauke i prakse povećavaju mogućnosti povoljnog ishoda i smanjivanja rizika i drugih neželjenih posledica po zdravlje i zdravstveno stanje pojedinca i zajednice u celini“ [2]. Osnovne komponente stalnog unapređenja kvaliteta u zdravstvenoj zaštiti su: usmerenost na korisnika, analiza procesa, razvoj tima za unapređenje kvaliteta, jednostavne metode koje se koriste na sistematski način da bi se analizirali problemi sa kvalitetom, primena plana, implementacija promena, prikupljanje podataka, monitoring i evaluacija.

Pod pokazateljem kvaliteta podrazumeva se kvantitativan pokazatelj koji se koristi za praćenje i evaluaciju kvaliteta nege i lečenja pacijenata, kao i podrška aktivnostima zdravstvene zaštite. Oni obuhvataju i pokazatelje kvaliteta rada zdravstvenih ustanova u zavisnosti od vrste zdravstvene ustanove i delatnosti koju obavljaju. Takođe, prate se i pokazatelji kvaliteta koji se odnose na rad komisije za unapređenje kvaliteta rada, sticanje i obnovu znanja i veština zaposlenih, vođenje lista čekanja, bezbednost

pacijenata, zadovoljstvo korisnika uslugama zdravstvene službe i zadovoljstvo zaposlenih [3].

Zdravstvena ustanova prikuplja podatke za izračunavanje pokazatelja kvaliteta, koje jedanput godišnje preko nadležnog zavoda za javno zdravlje dostavlja Institutu za javno zdravlje Srbije „Dr Milan Jovanović Batut“.

Cilj rada je bio da se predstavie osnovni pokazatelji kvaliteta zdravstvene zaštite u Srbiji.

POKAZATELJI KVALITETA U STOMATOLOŠKOJ ZDRAVSTVENOJ ZAŠTITI

Ovi pokazatelji kvaliteta prate se u zdravstvenim ustanovama u kojima se obavlja zdravstvena delatnost i u kojima se obezbeđuju i prevencija i lečenje u oblasti stomatološke zdravstvene zaštite, u okviru službe za stomatološku zdravstvenu zaštitu. Ustanove zdravstvene zaštite u kojima se prate pokazatelji kvaliteta su dom zdravlja, zavod za stomatologiju, zavod za zdravstvenu zaštitu studenata i zavod za zdravstvenu zaštitu radnika.

U stomatološkoj zdravstvenoj zaštiti definisano je deset pokazatelja kvaliteta koji se prate u ovoj oblasti [3]:

1. procenat dece u sedmoj godini života obuhvaćene lokalnom aplikacijom koncentrovanih fluorida
2. procenat dece u dvanaestoj godini života obuhvaćenih lokalnom aplikacijom koncentrovanih fluorida
3. procenat dece u sedmoj godini života sa svim zdravim zubima
4. procenat dece u dvanaestoj godini života sa svim zdravim zubima
5. KEP kod dece u dvanaestoj godini života
6. procenat dece kod kojih je na obaveznom sistematskom pregledu u sedmom razredu osnovne škole utvrđeno prisustvo nelečenih ortodontskih anomalija
7. procenat dece kod kojih je na obaveznom sistematskom pregledu u trećem razredu srednje škole utvrđeno prisustvo nelečenih ortodontskih anomalija
8. procenat trudnica obuhvaćenih preventivnim pregledom
9. procenat pacijenata starijih od 18 godina života kod kojih je konzervativno tretirana parodontopatija
10. procenat ponovljenih intervencija.

Pokazatelji kvaliteta stomatološke zdravstvene zaštite su u skladu sa opštim i specifičnim ciljevima Nacionalnog programa preventivne stomatološke zdravstvene zaštite [4].

Prema izveštaju o unapređenju kvaliteta rada u zdravstvenim ustanovama iz 2016. godine, sve zdrave zube u sedmoj godini života ima 38,8% dece, a u dvanaestoj godini 37,6%. KEP kod dece u dvanaestoj godini života iznosi 2,15. Procenat dece u sedmoj i dvanaestoj godini života obuhvaćenih lokalnom aplikacijom koncentrovanih fluorida je oko 90%. Trećina trudnica (35,3%) obuhvaćena je preventivnim pregledom. Prisustvo ortodontskih anomalija kod dece u sedmom razredu osnovne škole (53,9%) i trećem razredu srednje škole (49,9%) izuzetno je visoko. Procenat pacijenata starijih od 18 godina života kod kojih je konzervativno tretirana parodontopatija je 15,9%. Skoro svaki dvadeseti pacijent (4,18%) ima potrebu za ponovljenom intervencijom [5].

ZADOVOLJSTVO KORISNIKA RADOM SLUŽBE STOMATOLOŠKE ZDRAVSTVENE ZAŠTITE

Zadovoljstvo korisnika/pacijenta je opšte opredeljenje pojedinca prema svom ukupnom iskustvu o zdravstvu. Mera okrenutosti prema zadovoljstvu pacijenata ogleda se u načinu na koji se sistem odnosi prema njihovim nemedicinskim očekivanjima. Mišljenje pacijenata je od velikog značaja za kvalitet [5].

Nacionalna ispitivanja zadovoljstva pacijenata putem upitnika su najbolji način za prikupljanje povratnih informacija o iskustvu velikog broja ljudi. Sprovodi se u ustanovama primarne, sekundarne i tercijarne zdravstvene zaštite. Ove analize omogućavaju procenu zadovoljstva za određene populacione grupe pacijenata u odnosu na pol, starost i vrstu/službu zdravstvene ustanove. Ponavljanjem istraživanja omogućava se praćenje promena tokom vremena u odnosu na karakteristike zdravstvenog sistema i sprovede se kod nas od 2010. godine.

U stomatološkoj zdravstvenoj zaštiti ispitivanje se sprovodi u ustanovama primarne zdravstvene zaštite u službi stomatološke zdravstvene zaštite dece. Upitnik se sastoji od 19 pitanja podeljenih u nekoliko setova i popunjava ga osoba koja je dovela dete na pregled. Prva četiri pitanja odnose se na socijalnodemografske karakteristike pratilaca (pol, starost, nivo obrazovanja i materijalno stanje). Ostala pitanja odnose se na stomatološku zdravstvenu zaštitu pruženu detetu (izbor stomatologa, način i razlog promene izabranog stomatologa, broj poseta državnom i privatnom stomatologu u poslednjih godinu dana i dužinu čekanja na pregled). Set pitanja se odnosi na sprovođenje zdravstvenovaspitnog rada (značaj redovnih pregleda, redovna upotreba fluora, pravilno održavanje oralne higijene, pravilna ishrana i ortodonske nepravilnosti). Određene karakteristike stomatološke službe su definisane pitanjima o radnom vremenu, pregledu vikendom, dostupnosti usluga deci sa posebnim potrebama, dostupnosti kod hitnog stanja, dužini čekanja pre posete ordinaciji, ljubaznosti osoblja na šalteru i postojanjem kutija/knjiga za žalbe i primedbe. Poslednji set pitanja se odnosi na određene karakteristike izabranih dečjih stomatologa (stomatolog daje jasna objašnjenja o intervencijama, odvaja dovoljno vremena za razgovor i upoznat je sa problemima i bolestima koje ima dete), informacije o saradnji među zdravstvenim radnicima i plaćanje usluga (besplatno, participacija, puna cena) [6].

Zadovoljnih pacijenata (zadovoljan i veoma zadovoljan) u službi stomatološke zdravstvene zaštite dece je u 2016. godini

bilo 83,2%, a srednja ocena opšteg zadovoljstva je 4,08 (raspon: 1–5) [5, 7].

ZADOVOLJSTVO KORISNIKA USLUGAMA ZDRAVSTVENE SLUŽBE

Ovi pokazatelji odnose se na broj podnetih prigovora i prikazuju se u Izveštaju o broju podnetih prigovora za izveštajni period od jedne godine [5].

Zaštitnika prava pacijenata u zdravstvenim ustanovama je ukinuo Zakon o pravima pacijenata. Poslove savetnika za zaštitu prava pacijenata od decembra 2013. godine obavlja diplomirani pravnik koji nije radnik zdravstvene ustanove [8]. Ovim je eliminisan sukob interesa poslodavca, davaoca zdravstvenih usluga, samog zaštitnika prava i pacijenata.

Pacijent koji smatra da mu je uskraćeno pravo na zdravstvenu zaštitu, ili da mu je postupkom zdravstvenog radnika, odnosno zdravstvenog saradnika, uskraćeno neko od prava iz oblasti zdravstvene zaštite, ima pravo da podnese prigovor [8]. Prigovori po vrsti se odnose na kvalitet zdravstvenih usluga, postupak zdravstvenih radnika i zdravstvenih saradnika, način naplaćivanja zdravstvenih usluga, organizaciju zdravstvene službe, vreme čekanja na zdravstvene usluge, refundacije novčanih sredstava, prava pacijenata i drugo.

ZADOVOLJSTVO ZAPOSLENIH U DRŽAVNIM ZDRAVSTVENIM USTANOVAMA

Istraživanje zadovoljstva zaposlenih u zdravstvenim ustanovama sprovodi se od 2006. godine. Zadovoljstvo poslom je subjektivna kategorija i predstavlja ličnu percepciju zaposlenog u kojoj meri su zadovoljena njegova očekivanja od posla kojim se bavi i ima značajan uticaj na čitavu ustanovu.

Radna motivacija predstavlja jednu od bitnih pretpostavki uspešnog rada i postizanja dobrih rezultata kako pojedinca, tako i cele ustanove u kojoj radi. Sa aspekta rukovodioca/menadžera motivisanost znači da će zaposleni biti uključeni, obavezni i posvećeni celim bićem sebi samima, znanju, veštinama i sposobnostima, poslu koji obavljaju sa osećanjem unutrašnjeg zadovoljstva [9]. Zarada i druge beneficije koje zaposleni dobijaju kao kompenzaciju za svoj rad povećavaju osećaj korisnosti na poslu. Sistemi nagrađivanja mogu biti individualni i grupni. Sistem stimulacije i motivacije zaposlenih, pored materijalnih, treba da obuhvati i nematerijalne podsticaje. Oni su brojni i uključuju potrebe rasta i razvoja pojedinca, profesionalno priznavanje sposobnosti, statusa, učestvovanje u postavljanju ciljeva i odlučivanju, samostalnost u obavljanju zadataka i odgovornosti, definisanju poslova, saradnju sa drugim institucijama, fleksibilno radno vreme, mogućnost kontinuirane edukacije i druge.

Stres na radnom mestu jedan je od najvećih uzroka profesionalnih bolesti i bolovanja u Evropi i u svetu. Prema zajedničkom izveštaju Evropske komisije i Međunarodne organizacije rada iz 2010. godine, stres je na drugom mestu lestvice zdravstvenih tegoba zaposlenih u Evropskoj uniji [10]. Zdravstvena struka svrstana je u struku koja je vrlo podložna stresu jer sa sobom nosi visoku odgovornost prema ljudskom životu i zdravlju i izloženosti specifičnim stresorima. Stresori u zdravstvenoj službi su brojni i prema raznim istraživanjima povećanom

morbiditetu od psihosomatskih bolesti i psihičkih smetnji pridonose emocionalno iscrpljivanje zdravstvenih radnika, kontakt s obolelima i njihovim porodicama, odgovornost pri donošenju odluka, smenski i noćni rad i produženo radno vreme [11, 12]. Rukovodioci u službama i odeljenjima treba da identifikuju mesta na kojima se stres naročito javlja u većem intenzitetu po zaposlene i prepoznaju osobe koje osećaju visok nivo stresa. Odgovor na povećan nivo stresa na radnom mestu treba da bude i na organizacionom nivou, što je posao menadžmenta, ali i preventivno delovanje na individualnom nivou pojedinca.

U istraživanju zadovoljstva zaposlenih koristi se jedinstven upitnik za sve zdravstvene ustanove koji obuhvata zaposlene radnike svih profila. Upitnik se sastoji od 23 pitanja koja se odnose na stavove ispitanika o opremi, međuljudskim odnosima, vremenu, mogućnosti profesionalnog razvoja, finansijskoj nadoknadi, saradnji sa kolegama, pretpostavljenima, pacijentima, izloženosti stresu i pritisku na poslu i o planovima za promenu posla. Poslednji deo upitnika se odnosi na sugestije, primedbe i predloge zaposlenih radi unapređenja kvaliteta rada i zadovoljstva zaposlenih [13].

IZVEŠTAJ O RADU KOMISIJE ZA UNAPREĐENJE KVALITETA RADA

Sumarni izveštaj o radu Komisije za unapređenje kvaliteta rada predstavlja pokazatelj kvaliteta rada Komisije za unapređenje kvaliteta rada zdravstvene ustanove koji zbirno i sveobuhvatno prikazuje ostvarene rezultate preduzetih aktivnosti na unapređenju kvaliteta zdravstvene zaštite i rada zdravstvene ustanove u periodu od jedne godine [5].

Prvi deo izveštaja se odnosi na domene kvaliteta rada Komisije za unapređenje kvaliteta rada (godišnji program provere kvaliteta stručnog rada i integrisani plan stalnog unapređenja kvaliteta u zdravstvenoj ustanovi, broj sprovedenih vanrednih provera kvaliteta stručnog rada, broj podnetih prigovora pacijenata itd.). Drugi deo se odnosi na domene kvaliteta rada koji pripadaju pokazateljima zadovoljstva pacijenata. Izveštaj sadrži i podatke o obavljenim istraživanjima o zadovoljstvu korisnika uslugama zdravstvene službe i zadovoljstvu zaposlenih u zdravstvenoj ustanovi, kao i urađene analize rezultata ovih istraživanja. Poslednji deo izveštaja se odnosi na ostvarene rezultate u odnosu na Integrisani plan stalnog unapređenja kvaliteta rada zdravstvenih ustanova.

BEZBEDNOST PACIJENATA

Oko definisanja bezbednosti pacijenta postoji saglasnost da je to „identifikacija, analiza i korekcija rizičnih događaja, sa ciljem da se zdravstvena zaštita učini bezbednijom i da se rizici po zdravlje pacijenta svedu na minimum“ [1]. Pri tome se prepoznaje da su neželjeni događaji kumulativni rezultat uzroka, a retko su posledica individualnih propusta. Bezbednost podrazumeva da se radi o stvaranju takvog sistema zdravstvene zaštite u kome je bezbednost pacijenta primarna, a moguća opasnost da se naudi pacijentu tokom dijagnostičkih ili terapijskih procedura svedena na najmanju meru.

S obzirom na to da greške počinjene tokom lečenja pogađaju svakog desetog pacijenta, Svetska zdravstvena organizacija

ustanovila je smernice za smanjenje tih grešaka, s ciljem da se smanje štete vezane za lečenje pacijenata širom sveta. Smernice se između ostalog odnose i na usaglašavanje imena lekova, identifikaciju pacijenata, komunikaciju tokom transfera pacijenata i bolju higijenu ruku.

Agencija za akreditaciju zdravstvenih ustanova Srbije (AZUS) ima značajnu ulogu u uspostavljanju sistema bezbednosti pacijenata u okviru našeg zdravstvenog sistema. Strategija za bezbednost pacijenata AZUS se primenjuje od 2010. godine i sprovodi se u ustanovama na svim nivoima zdravstvene zaštite. Strategija predlaže inicijalni pristup vezan za bezbednost pacijenata u okviru koga je definisano pet ključnih ciljeva za bezbednost pacijenata. Inicijalni ciljevi za bezbednost pacijenata su: procedure u hirurgiji vezane za bezbednost, svođenje na minimum mogućnosti nastanka infekcija u ustanovama, bezbedno rukovanje lekovima, nega i lečenje „pravog“ pacijenta i eliminisanje/svođenje na minimum neželjenih događaja [14, 15, 16].

STICANJE I OBNOVA ZNANJA I VEŠTINA

Od uspešne obnove znanja zdravstvenih radnika i zdravstvenih saradnika u svim vrstama zdravstvenih ustanova putem kontinuirane medicinske edukacije, koja predstavlja i uslov za licenciranje, u velikoj meri zavisi uspešna i pravovremena zdravstvena usluga.

Pokazatelji kvaliteta koji se odnose na sticanje i obnovu znanja i veština zaposlenih su [5]:

1. postojanje plana edukacije za sve zaposlene u zdravstvenoj ustanovi
2. broj radionica, edukativnih skupova i seminara održanih u zdravstvenoj ustanovi
3. procenat osoba koje su bar jednom o trošku ustanove pohađale kurs, seminar ili učestvovala na kongresu ili stručnom sastanku iz oblasti koja je relevantna za njihov stručni rad
4. broj akreditovanih programa kontinuirane medicinske edukacije od strane Zdravstvenog saveta Srbije, a čiji su nosioci (predavači) zaposleni u zdravstvenoj ustanovi.

ZAKLJUČAK

„Kvalitet je posao svih“ slogan je koji se u zdravstvenom sistemu često koristi i kojim se naglašava da obaveza stalnog unapređenja kvaliteta nije samo obaveza pojedinaca, posebnih komisija, zdravstvenih ustanova i institucija već treba da bude osnova sveukupnog pružanja zdravstvene zaštite pacijentima. Proces unapređenja kvaliteta odvija se u više etapa i identičan je procesu koji postoji u kliničkoj praksi – dijagnostikuje se uzrok lošeg kvaliteta uz pomoć pokazatelja kvaliteta zdravstvene zaštite, a zatim se testiraju intervencije koje mogu dovesti do njegovog poboljšanja. Kvalitet u stomatološkoj zdravstvenoj zaštiti treba da obezbedi da pacijent bude blagovremeno primljen i delotvorno lečen korišćenjem savremenih stomatoloških materijala od strane kompetentnog stomatologa, pri čemu su neprijatnosti za pacijenta svedene na najmanju moguću meru. Obaveza je i stomatoloških službi i pacijenata da zajednički rade na dostizanju što kvalitetnije stomatološke zdravstvene zaštite.

Da li ste pažljivo čitali radove?

1. Uticaj oralnog zdravlja je proveravan na:
 - a) nutritivni status
 - b) maligna oboljenja
 - c) sistemska oboljenja
2. Oralno zdravlje starih osoba:
 - a) ima značajan uticaj na nutritivni status
 - b) nema značajan uticaj na nutritivni status
 - c) samo ponekad ima uticaj na nutritivni status
3. Indeks značajnog karijesa kod dece na području opštine Podgorica je iznosio:
 - a) 5,4
 - b) 8,3
 - c) 9,1
4. Oralnohigijenske navike trudnica su proveravane kod:
 - a) 150 porodilja
 - b) 180 porodilja
 - c) 198 porodilja
5. Legure NiTi sa osobinom pamćenja oblika se najčešće koriste:
 - a) u ortodonciji i endodonciji
 - b) u protetici i hirurgiji
 - c) u dečjoj stomatologiji
6. Superelastičnost je važna osobina NiTi legure?
 - a) Da
 - b) Ne
 - c) Samo u izuzetnim slučajevima
7. Poređenjem pružene i očekivane zdravstvene zaštite na osnovu definisanih standarda je:
 - a) ostvaren veliki doprinos u kvalitetu zdravstvene zaštite
 - b) ostvaren neznatan doprinos u kvalitetu zdravstvene zaštite
 - c) ostvaren mali doprinos u kvalitetu zdravstvene zaštite
8. Povezanost oralnog zdravlja i nutritivnog statusa je utvrđivana kod:
 - a) dece
 - b) adolescenata
 - c) starijih osoba
9. Istraživanje povezanosti oralnog zdravlja i nutritivnog statusa je realizovano:
 - a) 2015. godine
 - b) 2017. godine
 - c) 2018. godine
10. Na području opštine Podgorica najmanje jedan zub sa zalivenim fisurama je imalo:
 - a) 12,3% dece
 - b) 15,3% dece
 - c) 18,3% dece
11. Stavovi i ponašanja trudnica u odnosu na stručnu spremu analizirani su na osnovu:
 - a) anonimne ankete
 - b) organizovanih stručnih radionica
 - c) organizovanih kurseva
12. Da je karijes zuba oboljenje koje se ne može sprečiti smatra:
 - a) 15% trudnica
 - b) 20% trudnica
 - c) 29,6% trudnica
13. Srednja R faza između mortenzitne i austenitne faze se može pojaviti kao rezultat romboedarnog izobličenja:
 - a) kubne faze
 - b) ortorombične faze
 - c) monokliničke faze
14. Izveštaj iz 2016. godine ukazuje da u sedmoj godini sve zdrave zube ima:
 - a) 20% dece
 - b) 25% dece
 - c) 38,8% dece
15. Nutritivni status je evaluiran:
 - a) upitnikom
 - b) testom
 - c) kliničkom proverom
16. Lošiji oralni status su imali ispitanici:
 - a) sa malnutricijom
 - b) bez malnutricije
 - c) zdrave osobe

17. Procenat dece sa obolelim zubima na području opštine Podgorica je iznosio:
 - a) 70%
 - b) 80,3%
 - c) 85,3%
18. Krvarenje desni kod trudnica je uočeno:
 - a) kod 40,1% trudnica
 - b) kod 60,1% trudnica
 - c) kod 67,1% trudnica
19. Nivo zdravstvene prosvetlosti trudnica na području Republike Srpske (BiH) je:
 - a) nizak
 - b) visok
 - c) relativno visok
20. Martenzitna transformacija NiTi legure je:
 - a) trenutni proces kristalisanja bez difuzije
 - b) proces koji traje nekoliko sati
 - c) proces koji traje nekoliko minuta
21. Kvalitet zdravstvene zaštite je značajno unapređen:
 - a) šezdesetih godina prošlog veka
 - b) sedamdesetih godina prošlog veka
 - c) osamdesetih godina prošlog veka
22. Ispitivanje povezanosti oralnog zdravlja sa malnutricijom je obuhvatilo:
 - a) 120 ispitanika gerontološkog centra
 - b) 146 ispitanika gerontološkog centra
 - c) 166 ispitanika gerontološkog centra
23. Broj zuba koji je nedostajao uticao je na samoprocenu zdravlja?
 - a) Da
 - b) Ne
 - c) Ponekad
24. U strukturi KEP-a kod dece na području opštine Podgorica dominirala je:
 - a) velika prevencija karijesa kod dece
 - b) mala prevencija karijesa kod dece
 - c) neznatna prevencija karijesa kod dece
25. U toku trudnoće stomatologa je posetilo:
 - a) 34,3% trudnica
 - b) 54,1% trudnica
 - c) 60,2% trudnica
26. Osobina pamćenja oblika NiTi legure bazira se na ekvatomskom odnosu:
 - a) NiTi Ti
 - b) NiTi u Fe
 - c) NiTi u Ag
27. Glavna prednost NiTi SMA legure u endodonciji je:
 - a) visoka fleksibilnost
 - b) visoka krutost
 - c) visoka otpornost na lom
28. Pokazatelji kvaliteta stomatološke zdravstvene zaštite su:
 - a) u skladu sa ciljevima Nacionalnog programa preventivne zaštite
 - b) posebno definisani
 - c) samo ponekad usaglašeni sa Nacionalnim programom
29. Povezanost oralnog zdravlja i nutritivnog statusa je proveravana kod:
 - a) 300 osoba koje žive sa porodicom
 - b) 400 osoba koje žive sa porodicom
 - c) 500 osoba koje žive sa porodicom
30. Procena stanja mlečnih zuba je proveravana:
 - a) na području opštine Podgorica
 - b) na području opštine Budva
 - c) na području opštine Bar
31. Na području opštine Podgorica uočena je:
 - a) velika prevencija karijesa kod dece
 - b) mala prevencija karijesa kod dece
 - c) neznatna prevencija karijesa kod dece
32. Samo četkicu i pastu u održavanju oralne higijene koristilo je:
 - a) 25,3% trudnica
 - b) 30,1% trudnica
 - c) 39,8% trudnica
33. Tokom trudnoće je neophodno obaviti redovan stomatološki pregled?
 - a) Da
 - b) Ne
 - c) Samo izuzetno
34. NiTi žica se može deformisati:
 - a) dvadeset puta više od žice nerđajućeg čelika
 - b) trideset puta više od žice nerđajućeg čelika
 - c) četrdeset puta više od žice nerđajućeg čelika
35. Pokazatelje kvaliteta zdravstvene zaštite čini:
 - a) osam osnovnih principa
 - b) devet osnovnih principa
 - c) deset osnovnih principa
36. Dentalni status kod osoba sa analizom nutritivnog statusa je procenjivan:
 - a) kliničkim pregledom
 - b) samo anamnezom
 - c) rendgenološki
37. Stanje mlečnih zuba je analizirano kod dece uzrasta:
 - a) tri godine
 - b) pet godina
 - c) šest godina
38. Prosečan broj obolelih mlečnih zuba po ispitaniku je iznosio:
 - a) 3,1 zub
 - b) 4,0 zuba
 - c) 4,9 zuba

39. Pojačana zdravstvena zaštita kod trudnica je:
- a) neophodna
 - b) bez velikog značaja
 - c) bez efekta na oralna oboljenja
40. Tokom trudnoće ginekolog nije savetovao trudnice da posete stomatologa u:
- a) 50,3% slučajeva
 - b) 60,1% slučajeva
 - c) 69,7% slučajeva
41. Martenzitna faza NiTi legure je:
- a) kubna
 - b) ortorombična
 - c) monoklinička
42. Sticanje novih znanja je važan:
- a) kvalitativan pokazatelj
 - b) kvantitativan pokazatelj
 - c) vrednosni pokazatelj
43. Dentalni status kod osoba sa analizom nutritivnog statusa je podrazumevao utvrđivanje:
- a) samo bezubosti
 - b) samo krezubosti
 - c) i bezubosti i krezubosti
44. Ispitivanje stanja zdravlja mlečnih zuba je obuhvatilo:
- a) 150 dece
 - b) 203 dece
 - c) 305 dece
45. Pregled zuba dece sa mlečnim zubima je realizovao:
- a) jedan stomatolog
 - b) dva stomatologa
 - c) tri stomatologa
46. Step en oralnozdravstvene prosv ećenosti trudnica je proveravan:
- a) na području Republike Srpske
 - b) na području opštine Foča
 - c) na području opštine Banja Luka
47. Da su zubi trudnica podložniji karijesu smatra:
- a) 60% trudnica
 - b) 70% trudnica
 - c) 80,8% trudnica
48. Austenitna faza NiTi legure je:
- a) kubna
 - b) ortorombična
 - c) monoklinička
49. Kvalitet je jedna od najznačajnijih dimenzija zdravstvenog sistema?
- a) Da
 - b) Ne
 - c) Samo u izuzetnim slučajevima
50. Najveći izazov za stalno unapređenje kvaliteta zdravstvene zaštite je:
- a) sistemski pristup
 - b) odgovoran pristup
 - c) pristup svakoj situaciji na identičan način

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