

ASSESSMENT OF PREVALENCE OF TOOTH LOSS AMONG PROSTHETICALLY TREATED PATIENTS IN THREE HEALTH CENTERS OF SOUTHERN SERBIA IN THE PERIOD 2002–2011

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Tooth loss leads to a variety of disorders of the orofacial system function, it changes the appearance of the patient and also disrupts patient's social life. The aim of this study was to analyze the prevalence of partial and complete tooth loss among prosthodontically managed patients in the reference institutions in the three towns of southern Serbia, during the period from 2002 to 2011. According to medical records, statistical analysis of the prevalence of both complete and partial edentulism was done based on mobile and fixed prosthetic dentures made in three different dental institutions approved by the Ministry of Health of Serbia (Niš, Vranje, Leskovac). The study sample consisted of patients' dental records. Taking into account the limitations of this study, a decrease in loss of teeth in the age structure of 20 to 40 years among prosthodontically managed patients could be observed. Edentulism was significantly higher in patients over the age of 60 years and more prevalent in female patients. In the Healthcare Center Vranje, there was a significant increase in teeth loss among prosthodontically managed patients, with a rate of 2.4% per year. The number of edentulous patients older than 60 years of age is not in keeping with the trend in Europe, and can be explained by low economic standard, wars waged in the Balkans in the 90's in the past century, migration from rural to urban areas and the newly introduced legal provisions. *Acta Medica Medianae* 2013;52(4):27-34.

Key words: edentulism, partial edentulism, prevalence

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Introduction

Both in partial and complete tooth loss, prosthetic rehabilitation of patients is not only therapeutic but also a prophylactic mean which restores the function of the masticatory system and the appearance of a patient, but also prevents further progressive deterioration of tooth structures (1-3).

The aging of the organism is associated with the accumulation of health problems, as well as a higher incidence of dental caries and periodontal diseases which consecutively lead to tooth loss (4,5). Studies by other authors have shown an uneven distribution of tooth loss between the genders and greater representation among women (6, 7).

Monitoring the occurrence of edentulism is important because it is an incontrovertible indicator of functioning and adequacy of country's oral health care system. Retrospective studies do not compromise the rights of patients and provide a base level from which they can make some conclusions and propose preventive measures.

The number of these studies is significant, but unfortunately, the studies related to frequency of edentulism and partial edentulism have not been realized up to now.

The aim of this study was to analyze the prevalence of partial and complete tooth loss among prosthodontically treated patients in the referential institutions in three cities of southern Serbia, during the period from 2002 to 2011. Based on the results, the frequency and trends of total or partial tooth loss among members of different genders and age groups could be assessed.

Materials and methods

The research included dental records of patients who were treated at the Department of Prosthodontics of the Clinic of Dentistry in Niš and Health Centers in Vranje and Leskovac, during the period from 2002 to 2011. The reference institutions were funded by the Ministry of Health of the Republic of Serbia. A retrospective study was supported by the Ethics Committee of the Faculty of Medicine in Niš (01-2113-4).

Based on data from the dental records, the following was analyzed:

- changes in the number of edentulous and partially edentulous patients in the examined period;
- method of prosthetic rehabilitation: complete denture (CD), partial denture (PRD) or bridge (B).;

- distribution of type of tooth loss in relation to age of patients. Patients were divided into three age groups, from 20 to 40 years, 40 to 60 years, and over 60 years.

- distribution of type of tooth loss in relation to gender of managed patients.

Total number of edentulous and partially edentulous prosthetically managed patients in reference institutions in southern Serbia, in the period 2002-2011, is shown in Table 1.

The number of edentulous and partially edentulous patients during the study period, method of prosthodontic rehabilitation (CD, PRD or B), and representation of gender and age groups among the treated patients is presented by frequency (number) and percentage. Comparison of representation was determined by Pearson's χ^2 test. Representation trend of gender and age groups and ways of prosthodontic rehabilitation during the study period were determined based on the linear regression equation. Data analysis was performed by SPSS 16.0.

Results

From the total number of prosthetically managed patients in the Clinic of Dentistry Niš during the study period, 35.37% of patients were edentulous. The number of partially edentulous patients was statistically significantly larger than the number of partially edentulous patients ($p < 0.001$).

Shifts of percentage representation of edentulous, partially edentulous as well as patients with PRD and B in the total number of patients are given in Figure 1. In the observed period, based on the trend of linear equations percentage representation of partially edentulous patients a positive trend with a tendency to increase by about 2.1% per year was established. Also, the representation of patients in whom the problem is solved with PRD shows a slight but negative trend - about 1% per year, while the trend of representation of patients with B is extremely positive in the observed period and is about 3% per year.

Table 1. Tendencies in the number of edentulous and partially edentulous patients in departments of prosthodontics of three dental centers of southern Serbia, in the period 2002-2011

Health center Treatment Year	Niš		Leskovac		Vranje	
	CD	PRD/B	CD	PRD/B	CD	PRD/B
2002	533	693	549	684	196	291
2003	606	838	528	801	217	287
2004	548	892	537	676	214	316
2005	431	739	575	574	170	408
2006	493	845	275	473	160	247
2007	232	563	270	329	232	191
2008	190	458	249	454	207	195
2009	205	519	288	387	237	196
2010	167	534	285	335	246	167
2011	193	494	285	472	188	159
Total	3598	6575	3841	5185	2067	2457

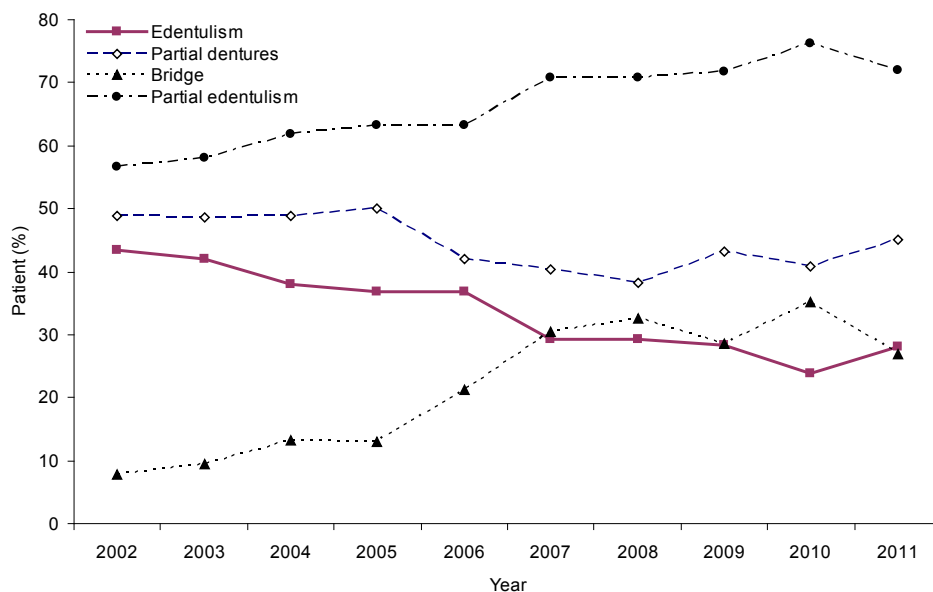


Figure 1. Representation of edentulous, partially edentulous patients with PRD and B in the period 2002-2011 in the Clinic of Dentistry Niš

Table 2. Gender structure of the total number of prosthodontic patients in the Clinic of Dentistry Niš, in the period 2002-2011

Treatment	Male		Female	
	n	%	n	%
CD	1672	46,47	1926	53,53
PE	2820	42,89	3755	C***57,11
PRD	2003	43,29	2624	56,71
B	817	41,94	1131	58,06

C - vs CD, *** - $p < 0,001$, n - number

Table 3. Age structure of prosthodontic patients in the Clinic of Dentistry Niš, in the period 2002-2011

Treatment	20-40 years		40-60 years		>60 years	
	(n)	%	(n)	%	(n)	%
CD	65	1,81	1326	36,85	2207	61,34
PE	825	12,55	2997	45,58	2753	41,87
PRD	301	6,51	2142	46,29	2184	47,20
B	524	26,90	855	43,89	569	29,21

n - number

The representation of female patients was generally higher in all sub-categories of patients (Table 2). Still, the representation of partially edentulous patients (57.11%) was significantly greater than of edentulous ones (53.53%) ($p < 0.001$). The representation of female patients with B was slightly higher than the representation with PRD, but without statistically significant difference. The redistribution of patients by age is shown in Table 3.

There was a statistically significant difference in the age structure of edentulous and partially edentulous patients ($p < 0.001$). This is due to significantly higher incidence of patients older than 60 years in the edentulous group (61.34%), while the incidence of patients of younger age group was higher in the partially edentulous group in relation to edentulous patients. There was a statistically significant difference in the age structure of patients with PRD and B at the maximum level of statistical significance ($p < 0.001$). This is due to significantly higher incidence of number of patients older than 60 in the group of patients with PRD (47.20%) compared with patients with B (29.21%),

while the incidence of patients of the youngest age group was several times (26.90% 6,51%) higher with the application of B compared to PRD. Representation in the age group of 40 to 60 patients was slightly higher in the group of patients with PRD.

The obtained results indicated the increase of the percentage of partially edentulous patients of the youngest, and the decline of the percentage of the oldest age group by about 1.5% per year (Figure 2).

Leskovac

At the Department of Prosthodontics of Health Center Leskovac out of the total number of patients 42.55% were edentulous. The number of partially edentulous patients was statistically significantly larger than the number of edentulous ones ($p < 0.001$).

Slightly positive trends of edentulous patients and patients with B were observed (Figure 3).

The representation of female patients was slightly lower in all subcategories of patients except for patients with B, but there were no statistically significant differences in gender representation between edentulous and partially edentulous patients (Table 4).

The redistribution of patients by age is shown in Table 5. There was a statistically significant difference in the age structure of edentulous and partially edentulous patients ($p < 0.001$). This is due to significantly higher incidence of patients older than 60 years in the edentulous group (62.51%), while the incidence of patients of younger age groups is higher in the partially edentulous group.

There was a statistically significant difference in the age structure of patients with PRD and B ($p < 0.001$). This is due to significantly higher incidence of the number of patients older than 60 in the group of patients with PRD (52.02%) compared with patients with B (17.27%), while the incidence of patients of the youngest age group was several times (35.16%: 4,46%) higher with the application of B compared to the PRD. Representation in the age group of 40 to 60 patients is similar, but slightly higher in the group of patients with B.

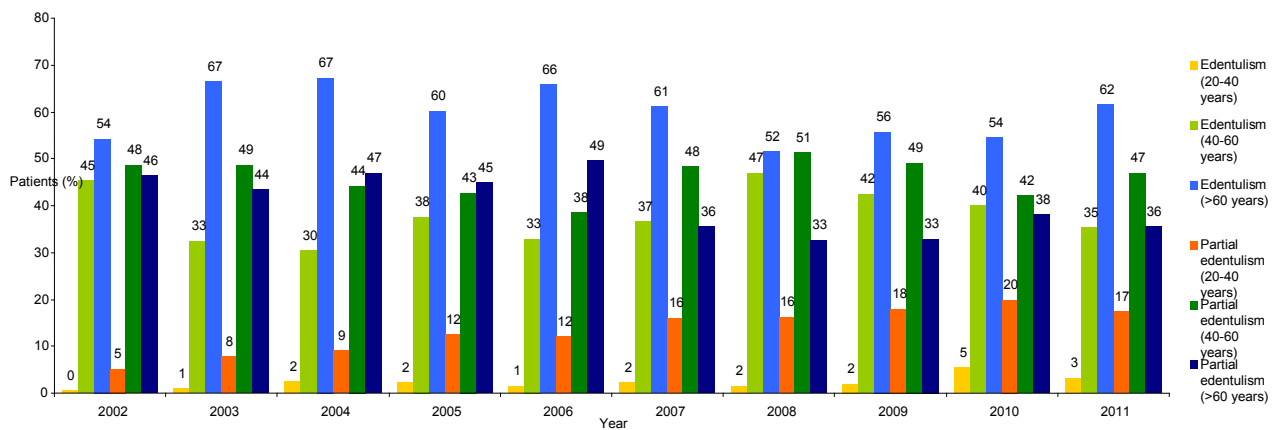


Figure 2. Percentage shares of age groups in prosthetically treated edentulous and partially edentulous patients in the Clinic of Dentistry Niš in the period 2002-2011

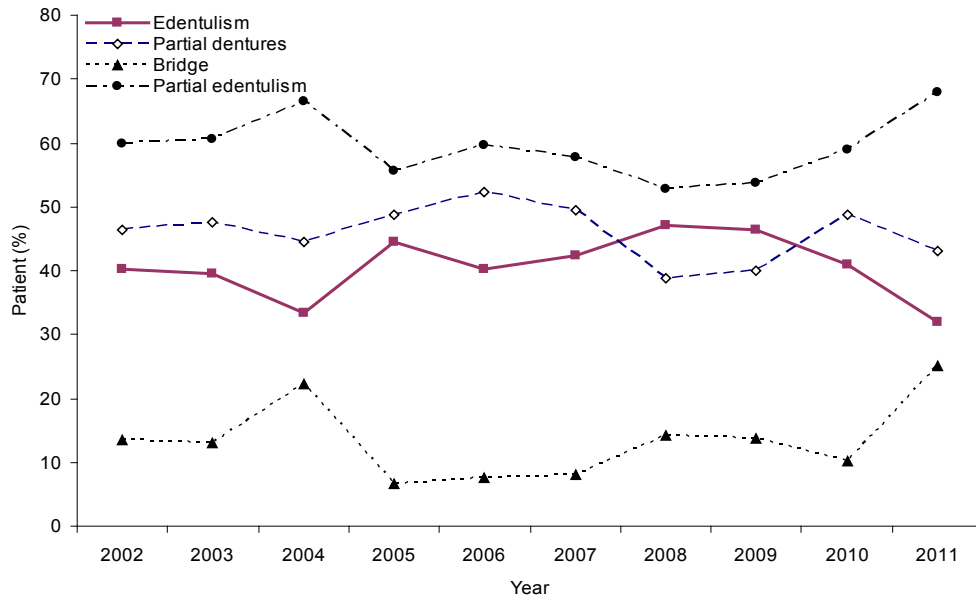


Figure 3. Analysis of percentage representation of edentulous and partially edentulous patients with PRD and B in the period 2002-2011 in the Health Center Leskovac

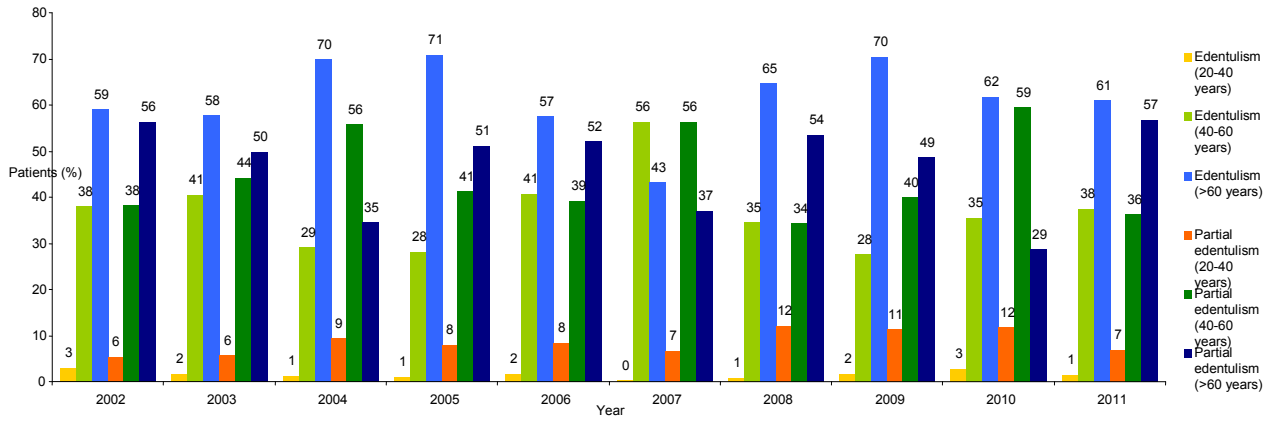


Figure 4. Percentage shares of age groups in edentulous and partially edentulous patients in the Health Center Leskovac in the period 2002-2011

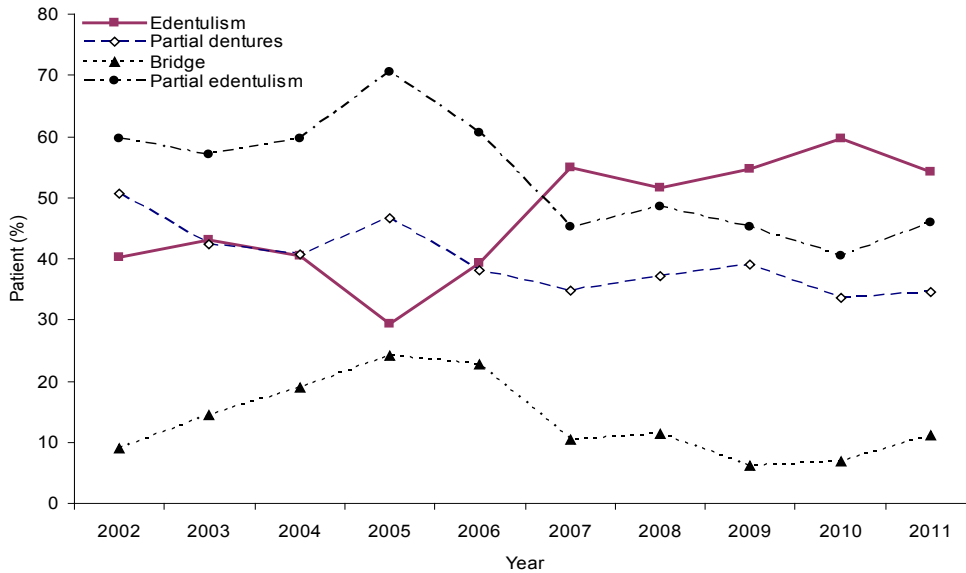


Figure 5. Analysis of percentage representation of edentulous and partially edentulous patients with PRD and B in the period 2002-2011 in the Health Center Vranje

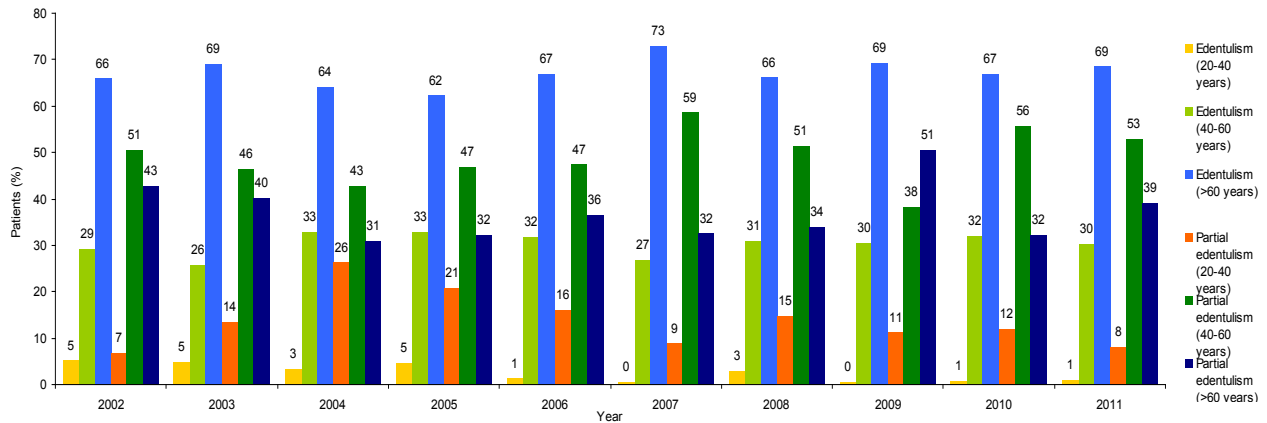


Figure 6. Percentage shares of age groups in edentulous and partially edentulous patients in the Health Center Vranje in the period 2002-2011

Table 4. Gender structure of prosthodontic patients in the period 2002-2011 in the Health Center Leskovac

Treatment	Gender	Male		Female	
		n	%	n	%
CD		1931	50,27	1910	49,73
PE		2596	50,07	2589	49,93
PRD		2300	50,57	2248	49,43
B		296	46,47	341	53,53

n – number

Table 5. Age structure of prosthodontic patients in the period 2002-2011 in the Health Center Leskovac

Treatment	Age	20-40 years		40-60 years		>60 years	
		(n)	%	(n)	%	(n)	%
CD		61	1,59	1379	35,90	2401	62,51
PE		427	8,24	2282	44,01	2476	47,75
PRD		203	4,46	1979	43,51	2366	52,02
B		224	35,16	303	47,57	110	17,27

n – number

Table 6. Gender structure of the total number of prosthodontic patients in the period 2002-2011 in the Health Center Vranje

Treatment	Gender	Male		Female	
		n	%	n	%
CD		808	39,09	1259	60,91
PE		1102	44,85	1355	55,15
PRD		778	42,63	1047	57,37
B		324	51,27	308	48,73

P - vs PE, B - vs B, *** - p<0,001, n - number

Table 7. Age structure of prosthodontic patients in the period 2002-2011 in the Health Center Vranje

Treatment	Age	20-40 years		40-60 years		>60 years	
		(n)	%	(n)	%	(n)	%
CD		50	2,42	624	30,19	1393	67,39
PE		368	14,98	1187	48,31	902	36,71
PRD		147	8,05	919	50,36	759	41,59
B		221	34,97	268	42,41	143	22,63

n - number

On the basis of linear equations trend stands out a slightly positive trend of partially edentulous patients in the age group 20 to 40 years and a negative trend of these patients in the oldest age group over 60 years (0.5% per year) (Figure 4).

Vranje

From the total number of prosthetically managed patients in the Health Center Vranje, 45.69% of patients were edentulous. The number of partially edentulous patients was statistically significantly higher than of edentulous ones (p<0.001).

Unlike Niš and Leskovac, there was a positive trend of the percentage representation of edentulous patients by about 2.4% per year in Vranje (Figure 5).

The representation of female patients was higher in all subcategories of patients except in the patients with B. The representation of female patients was statistically significantly higher in edentulous than partially edentulous patients, as well as in patients with PRD, compared with patients with B (p<0.001) (Table 6).

Difference in the number of patients by age groups is shown in Table 7.

There was a statistically significant difference in the age structure of edentulous and partially edentulous patients (p<0.001). This is due to significantly higher incidence of patients older than 60 years in the edentulous group (67.39%) compared with the partially edentulous group of patients (36.71%), while the incidence of younger patients was higher in the partially edentulous group in relation to edentulous patient group.

There was a statistically significant difference in the age structure of patients with PRD and B at the maximum level of statistical significance (p<0.001). This is due to significantly higher incidence of patients older than 60 in the group of patients with PRD (41.59%) compared with patients with B (22.63%), and patients aged 40 to 60 years (50.36% vs. 42.41%), while the

incidence of patients of the youngest age group (34.97%:8.05%) was several times higher with the application of B compared to PRD.

Figure 6 shows that percentage share of age groups in edentulous and partially edentulous patients was relatively constant in Vranje. Based on the linear trend equation, a slightly negative trend of edentulous patients of 20 to 40 years of age is observed (0.5% per year). In a group of partially edentulous group patients aged 40 to 60 years, there was a positive trend of edentulism about 0.6% per year.

Discussion

Representation of edentulism is not uniform in different parts of the world and Europe, which depends primarily on the social and economic differences in geographical location (8, 9). The research by Muller et al. indicates that the number of edentulous patients in Europe is progressively reduced (9). It is still generally more common in women, which is associated with changes in menopause and multiple births (5,7). Different representation of tooth loss among the population of one country is the result of different age, presence of systemic diseases, socio-economic differences and level of education (10-13). Numerous studies cite frequent tooth loss in rural areas, as well as in older and poorer population (14-16).

Probably, there is heterogeneity in the prevalence of edentulism and tooth loss in different parts of Serbia. This difference may be due to the diversity in social, cultural and geographical conditions of areas. Serbia is an underdeveloped country with a high rate of unemployment and low socio-economic standard.

Investigation into the prevalence of tooth loss at the territory of Serbia has not been done. The sample on which we investigated the prevalence of tooth loss and partial edentulism in the present study refers to the prosthetic treatment of patients in the three reference dental institutions, which is insufficient for making relevant conclusions. However, bearing in mind all the limitations of this study, the obtained results can be used as a general indicator of dental condition of patients in southern Serbia treated in the public healthcare institutions.

The positive trend of tooth loss in the category of the population older than 60 years in all three studied institutions supports the belated

restoration of tooth loss in these patients. The results were positively correlated with the study by Poljak-Guberina et al. who report that the increase of patients wearing dentures in Croatia is attributable to consequences of the war of the nineties, migration from rural to urban areas, reduction of the economic standard and the newly introduced legal regulations (17). Having in mind great economic crisis and the consequences of the war in 1999 in the territory of southern Serbia, as well as the newly introduced legal regulations which do not consider prosthodontic services as basic health insurance, a general reduction in the number of dental patients could be explained.

Edentulism among patients aged 20 to 40 years in the examined sample progressively decreased. Partial loss of teeth can be repaired by mobile and fixed prosthetic appliances. In the category of patients aged 20 to 40 years, tooth loss was compensated by fixed appliances, which indicates a less severe cases of partial edentulism and is correlated to the results of other authors (8,18). On the other hand, the PRD are more common among the elderly patients, probably due to a greater loss of teeth, and the higher cost of fixed prosthetics. In any case, whenever there is an indication, including here elderly population, fixed appliances should be used because PRD leads to faster loss of teeth (19). Change in oral health policies or changes in income affecting the individual's ability to afford dental care, as well as the advancements in technology, may lead to wide availability of effective preventive agents and treatments.

Conclusion

Although the analysis of the data cannot draw conclusions regarding the entire population in southern Serbia, they may form the basis for further studies which will include patients rehabilitated in the private dental sector. Among the patients treated in these institutions edentulism was significantly higher in the age group of patients over 60 years and more often observed in females patients.

There was a proven increase in the number of edentulous patients older than 60 years in all the investigated healthcare centers with a growth rate of 2.4% per annum in Health Center Vranje. Edentulism has been progressively reduced among the younger population of each examined center.

References

1. Polzer I, Schimmel M, Müller F, Biffar R. Edentulism as part of the general health problems of elderly adults. *Int Dent J.* 2010; 60(3):143-55. [[PubMed](#)]
2. Rodrigues SM, Oliveira AC, Vargas AM, Moreira AN, E Ferreira EF. Implications of edentulism on quality of life among elderly. *Int J Environ Res Public Health.* 2012; 9(1):100-9. [[CrossRef](#)] [[PubMed](#)] [[PubMedCentr](#)]
3. Felton DA. Edentulism and comorbid factors. *J Prosthodont.* 2009;18(2):88-96. [[CrossRef](#)] [[PubMed](#)]
4. Li KY, Wong MCM, Lam KF, Schwarz E. Age, period, and cohort analysis of regular dental care behavior and edentulism: A marginal approach. *BMC Oral Health* 2011; 11:9-22. [[CrossRef](#)] [[PubMed](#)] [[PubMedCentr](#)]
5. Thomson WM. Monitoring Edentulism in Older New Zealand Adults over Two Decades: A Review and Commentary. *Int J Dent.* 2012; [[CrossRef](#)]
6. Mitchell J, Bennett K, Brock-Martin A. Edentulism in high poverty rural counties. *J Rural Health.* 2013 29(1):30-8. [[CrossRef](#)] [[PubMed](#)]
7. Musacchio E, Perissinotto E, Binotto P, Sartori L, Silva-Netto F, Zambon S, et al. Tooth loss in the elderly and its association with nutritional status, socio-economic and lifestyle factors. *Acta Odontol Scand.* 2007;65(2):78-86. [[CrossRef](#)] [[PubMed](#)]
8. Zitzmann NU, Hagmann E, Weiger R. What is the prevalence of various types of prosthetic dental restorations in Europe? *Clin. Oral Impl. Res.* 2007; 18 (Suppl. 3): 20-33. [[CrossRef](#)] [[PubMed](#)]
9. Muller F, Naharro M, Carlsson GE. What are the prevalence and incidence of tooth loss in the adult and elderly population in Europe? *Clin Oral Implants Res.* 2007;18(Suppl 3):2-14. [[CrossRef](#)] [[PubMed](#)]
10. Hugoson A, Koch G, Göthberg C, Helkimo AN, Lundin SA, Norderyd O, Sjödin B, Sondell K. Oral health of individuals aged 3-80 years in Jönköping, Sweden during 30 years (1973-2003). II. Review of clinical and radiographic findings. *Swed Dent J.* 2005;29(4):139-55. [[PubMed](#)]
11. Hiidenkari T, Parvinen T, Helenius H. Missing teeth and lost teeth of adults aged 30 years and over in south-western Finland. *Community Dent Health.* 1996;13(4): 215-22. [[PubMed](#)]
12. Lin HC, Corbetl EF, LoIECM, Zhang HG. Tooth Loss, Occluding Pairs, and Prosthetic Status of Chinese Adults. *J Dent Res* 2001; 80(5):1491 -5. [[CrossRef](#)] [[PubMed](#)]
13. Kim JK, Baker LA, Seirawan H, Crimmins EM. Prevalence of oral health problems in U.S. adults, NHANES 1999-2004: exploring differences by age, education, and race/ethnicity. *Spec Care Dentist.* 2012;32(6):234-41. [[CrossRef](#)] [[PubMed](#)] [[PubMedCentr](#)]
14. Khazaei S, Firouzei MS, Sadeghpour S, Jahangiri P, Savabi O, Keshteli AH, Adibi P. Edentulism and Tooth Loss in Iran: SEPAHAN Systematic Review No. 6. *Int J Prev Med.* 2012; 3(Suppl1): S42-7. [[PubMed](#)] [[PubMedCentr](#)]
15. Zhang Q, Witter DJ, Bronkhorst EM, Nico Creugers NHJ. Dental and prosthodontic status of an over 40 year-old population in Shandong Province, China. *BMC Public Health* 2011; 11: 420. [[CrossRef](#)] [[PubMed](#)] [[PubMedCentr](#)]
16. Mojon P, Thomason JM, Walls AW. The impact of falling rates of edentulism. *Int J Prosthodont.* 2004;17(4):434-40. [[PubMed](#)]
17. Poljak-Guberina R, Celebić A, Catović A, Zivković O. Epidemiological study on removable denture deliveries in different districts of Croatia, 1996-2001 and 2002. *Coll Antropol.* 2005; 29(1):127-32. [[PubMed](#)]
18. Gasparić LB, Catović A, Komar D, Bergman V, Catić A. Epidemiological study on prosthodontic appliance deliveries within elderly cohorts in the Republic of Croatia, 2002-2006. *Coll Antropol.* 2009;33(2): 461-5. [[PubMed](#)]
19. Nevalainen M.J, Narhi TO, Ainamo A. A 5-year follow-up study on the prosthetic rehabilitation of the elderly in Helsinki, Finland. *Journal of Oral Rehabilitation* 2004 31; 647-52. [[CrossRef](#)] [[PubMed](#)]

PROCENA PREVALENCIJE GUBITKA ZUBA KOD PROTETIČKI TRETIRANIH PACIJENATA U TRI ZDRAVSTVENE USTANOVE JUŽNE SRBIJE, U PERIODU 2002–2011. GODINE

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Gubitak zuba dovodi do niza poremećaja funkcija orofacijalnog sistema, menja izgled pacijenta i remeti njegov društveni život. Cilj istraživanja bio je analiza prevalencije delimičnog i potpunog gubitka zuba kod protetički tretiranih pacijenata u referentnim ustanovama Ministarstva zdravlja tri grada južne Srbije, u vremenskom intervalu od 2002. do 2011. godine. Urađena je statistička analiza prevalencije bezubosti i krezubosti pregledom medicinske dokumentacije, a na osnovu mobilnih i fiksnih protetičkih nadoknada izrađenih od strane tri zdravstvene ustanove na jugu Srbije (Niš, Vranje i Leskovac). Uzorak ispitanika činili su stomatološki kartoni protetički saniranih pacijenata u ovim ustanovama. Uzimajući u obzir ograničenja ove studije, možemo primetiti smanjenje bezubosti u starosnoj strukturi od 20 do 40 godina kod protetički saniranih pacijenata. Bezubost je bila statistički značajno veća u starosnoj kategoriji pacijenata iznad 60 godina i zastupljenija kod žena. U zdravstvenoj ustanovi Vranje bio je prisutan značajan porast bezubosti, sa stopom od 2,4% godišnje. Porast bezubih pacijenata starijih od 60 godina ne prati trend u Evropi, a može se objasniti ratovima na teritoriji Balkana devedesetih godina dvadesetog veka, lošim ekonomskim standardom, migracijom iz ruralne u gradsku sredinu i novim zakonskim odredbama. *Acta Medica Medianae 2013;52(4):27-34.*

Ključne reči: bezubost, krezubost, prevalencija