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THE IMPACT OF SOCIO-ECONOMIC FACTORS ON THE QUALITY OF LIFE OF EDENTULOUS ELDERLY PATIENTS IN SERBIA

Anika Ćuković **Danimir Jevremović** **Maja Pavlović**
Michal Potran **Ana Jevremović**
University Business Academy in Novi Sad, Faculty of Dentistry Pančevo, Serbia

Tooth loss is a significant global issue, particularly among the elderly, as it impairs essential stomatognathic functions like chewing, swallowing, speech, and aesthetics. Edentulism can also affect nutrition, overall health, and quality of life, leading to functional, psychological, and social challenges. This research aimed to determine whether the type of prosthetic restoration affects patients' overall satisfaction and the extent to which socio-economic factors affect quality of life. The study included 120 patients of both genders and over 60 years of age, who were divided into two groups: patients with conventional complete dentures (Group 1) and patients with complete dentures with mini-implants (Group 2). The respondents completed the Oral Health-related Quality of Life (OHRQoL) questionnaire, which was divided into four parts: socio-demographic data, hygiene habits, changes in oral functioning, and changes in ways, 30 of life related to oral health. Patients with conventional complete dentures had significantly more frequent speech impairment (80.3%), swallowing (47.5%), and chewing (82.0%), compared to patients with mini-implants. The association of speech, swallowing, and chewing disorders with educational level and income was also demonstrated. They were also significantly more stressed, more nervous, more distracted by daily activities, and more uncomfortable than another group of subjects. Patients rehabilitated with mini-implant-supported complete dentures demonstrated higher overall satisfaction levels. The level of education and income have the highest impact on the quality of life of all socioeconomic factors.

Keywords: complete denture, quality of life, mini-implants, socio-economic factors

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Correspondence to:
Ana Jevremović
University Business Academy in Novi Sad
Faculty of Dentistry
Pančevo, Serbia
E-mail: dranalapcevic@gmail.com

INTRODUCTION

Tooth loss is an important problem on a global scale, and it is especially present in the older population. Edentulism is known to impair the basic functions of the stomatognathic system, such as loss or limitation of chewing movements, swallowing, speech, reduction of the lower third of the face, a decrease in vertical dimensions, poor aesthetics, and phonetic issues, mimicry, temperomandibular joint dysfunction, etc. (1,2). Typically, individuals with edentulism prefer foods that are easier to chew, which can compromise their nutritional intake, potentially affecting their overall health. These changes can negatively impact oral health-related quality of life (OHRQoL). As an irreversible condition, edentulism may lead to functional impairment as well as psychological or social disability (3).

The annual frequency of losing ≥ 1 tooth ranges from 1 to 14% in European countries. 30% of the global population between the ages of 65 and 74 is edentulous. Some authors have suggested that, by the year 2020, less than 15% of the population will be edentulous (4). Tooth loss is associated with socioeconomic factors, habits and general medical status of the organism (5).

Serbia is a country with a Human Development Index (HDI) of 0.787 and has an estimated 7 million inhabitants, of which about 60% reside in urban areas. The prevalence of individuals without natural teeth has shown slight variation over the years—10.2% in 2006, 12.4% in 2013, and 11.1% in 2019—as has the prevalence of denture use within this subgroup (79% in 2006, 82.3% in 2013, and 80.1% in 2019). Women who have lost all their natural teeth are more likely to use dental prostheses (83.8%) compared to men (73.4%). Among individuals over the age of 60, the percentage of edentulous persons ranges from 30% to 45%(6).

The objective of each prosthetic treatment is to establish normal functioning of the stomatognathic system. In cases where all teeth are missing, the preferred treatment would be implant placement and fixed restorations. However, this is not always possible. The limiting factors are often poor financial situation, inadequate anatomical conditions or poor general condition of the organism. Considering that there are usually at least two of these limiting factors present in the elderly population, it is clear why the choice of complete denture is the preferred therapy for them (7).

Resorptive changes after tooth loss cause a decrease in the height and width of the alveolar ridge and thus impair the retention and stabilization of the lower complete denture. In cases of unfavourable anatomical conditions, numerous oral-surgical pre-prosthetic surgical procedures are available, like vestibuloplasty, alveolar ridge augmentation, which facilitate the production of an adequate lower complete denture. On the other hand, such procedures are often avoided in the elderly due to the extent of the intervention and the potential systemic complications. Recently, the use of mini-implants (8-13) has proven to be one of the possible solutions for the edentulous patients. Implant-supported dentures offer many benefits such as better retention and denture stabilization, better chewing efficiency, even load distribution, better aesthetics and maintenance of vertical dimensions of occlusion compared to conventional complete dentures.In order to achieve adequate dental rehabilitation for the last 20 years, great attention has been paid to personal attitude and satisfaction of the patient. This has resulted in the development of research involving the measurement of oral health-related quality of life (OHRQOL), aimed at providing information on the impact of the oral cavity on the quality of human life (14).

This study aimed to determine:

1. Whether the type of prosthetic solution applied affects the overall satisfaction of the patient.
2. Whether there is a difference in quality of life depending on the type of prosthetic solution used.
3. To what extent socio-economic factors affect the quality of life of edentulous elderly patients.

METHODS

The research was conducted at the Faculty of Dentistry in Pančevo and included 120 patients of both genders, all over 60 years of age. The participants were divided into two groups: Group 1 consisted of patients with conventional complete dentures, while Group 2 included patients with complete dentures supported by mini-implants. In all participants, the current prosthetic solution had been applied within the last year.

Entry criteria for study participation were:

- Age 60 years or older.
- Complete edentulism in one or both jaws.
- Presence of prosthetic restorations no longer than 12 months.

Exclusion criteria included the following habits:

- Smoking,
- Frequent alcohol consumption.

The implementation of this study was approved by the Ethics Committee of the Faculty of Dentistry in Pančevo.

Only respondents who provided written informed consent for voluntary participation were included in the study.

Participants completed a structured questionnaire divided into four sections, each corresponding to a specific group of variables considered in the research.

The variables included in the study were grouped as follows:

- Applied prosthetic solution.
- Sociodemographic and socioeconomic characteristics (gender, age, place of residence, marital status, educational degree, income.
- Hygiene habits (washing dental prosthesis, removing dental prosthesis at night).
- Changes related to oral functioning (difficulties when eating, difficulties while speaking, feeling of discomfort, pain in the lower jaw, denture stability.
- Changes in the way of life related to oral health (nervousness, discomfort, stress interfering with daily activities).

Statistical analysis

Statistical data analysis was performed using the IBM SPSS Statistics software, version 30. Pearson's Chi-square test was applied as a goodness-of-fit test and for the analysis of contingency tables, to determine whether there were significant differences in the frequencies of non-parametric data for one or two variables.

For parametric data, the ANOVA F-test was used to compare mean values between groups. In addition, Spearman's rank-order correlation, a non-parametric test, was employed to assess the relationship between oral health-related quality of life (OHRQoL) and other examined variables, depending on data distribution.

The level of statistical significance was set at $p < 0.05$.

RESULTS

A total of 50.8% of participants were women (55.7% in Group 1 and 45.8% in Group 2), while 49.2% were men (44.3% in Group 1 and 54.2% in Group 2). The average age of the patients was approximately the same between the groups: Group 1 had a mean age of 67.54 ± 2.90, and Group 2 had a mean age of 67.54 ± 29.07 years. Regarding monthly income, the fewest participants in both groups had an income of up to 15,000 RSD (3.3% in Group 1 and 0% in Group 2), while the largest share had an income of up to 60,000 RSD in Group 2 (44.1%) and up to 30,000 RSD in Group 1 (39.3%) (Table 1).

Further testing related to the distribution of patients relative to the health-related quality of life (HRQOL) showed differences concerning the representation between groups (Table 2).

Table 1. *Demographic and socioeconomic characteristics of respondents*

Table 1.	Total		Group 1		Group 2		Chi2, §F test sign p
	n = 120	(%)	N = 61	%	N = 59	%	
Gender							
Male	59	49.2	27	44.3	32	54.2	0.275/ns
Female	61	50.8	34	55.7	27	45.8	
Average age	67.59 ± 2.94		67.54 ± 2.90		67.64 ± 2.99		§0.849/ns
Place of residence							
Countryside	24	20	10	16.4	14	23.7	0.468/ns
City	57	47.5	32	52.5	25	42.4	
Suburban area	39	32.5	19	31.1	20	33.9	
Degree of education							
Elementary school	9	7.5	4	6.6	5	85	0.189/ns
High school	77	64.2	44	72.1	33	55.9	
Faculty	32	26.7	13	21.3	19	32.2	
Scientific title	2	1.7	0	0	2	3.4	
Marital status							
Married	72	60	38	62.3	34	57.6	0.875/ns
Single	9	7.5	5	8.2	4	6.8	
Divorced	16	13.3	8	13.1	8	13.6	
Widowed	23	19.2	10	16.4	13	22	
Monthly income (RSD)							
up to 15,000	2	1.7	2	3.3	0	0	0.000***
up to 30,000	25	20.8	24	39.3	1	1.7	
up to 45,000	30	25	23	37.7	7	11.9	
up to 60,000	33	27.5	8	13.1	25	42.4	
over 60,000	30	25	4	6.6	26	44.1	

Speech difficulties were reported at a significantly higher rate in Group 1 (80.3%) compared to only 3.4% in Group 2. Swallowing difficulties were also notably more frequent in Group 1 (47.5%) compared to 3.4% in Group 2. A similar trend was observed with chewing difficulties, where 82% of participants in Group 1 reported issues, while only 1.7% did so in Group 2.

Responses to the question "Are you satisfied with the stability of your lower complete denture?" also varied significantly between groups. In Group 1, only 1.6% of respondents were completely satisfied, 68.90% were dissatisfied, and 29.5%were completely dissatisfied. In contrast, responses in Group 2 showed that 17.0% were completely satisfied, 55.90% were dissatisfied, and 27.10% were completely dissatisfied—indicating notably higher satisfaction compared to Group 1.

Table 2. *Distribution of patients relative to oral health-related quality of life (OHRQOL) among groups*

Table 2.	Total		Group 1		Group 2		Chi squere test, p sign
	n = 120	(%)	N = 61	%	N = 59	%	
Do you experience any difficulties while speaking?							
Yes	51	42.5	49	80.3	2	3.4	0.000***
No	57	47.5	11	18	46	78	
Occasionally	12	10	1	1.7	11	18.6	
Do you experience any difficulties while swallowing?							
Yes	31	25.8	29	47.5	2	3.4	0.000***
No	81	67.5	32	52.5	49	83	
Occasionally	8	6.7	0	0	8	13.6	
Do you experience any difficulties while chewing?							
Yes	51	42.5	50	82	1	1.7	0.000***
No	62	51.7	10	16.4	52	88.1	
Occasionally	7	5.8	1	1.6	6	10.2	
Are you satisfied with the stability of the complete lower denture?							
Yes, totally	11	9.2	1	1.6	10	17	0.014*
No	75	62.5	42	68.9	33	55.9	
No, not at all	34	28.3	18	29.5	16	27.1	
Do you remove complete lower denture at night?							
Yes, always	33	27.5	28	45.9	5	8.5	0.000***
Occasionally	45	37.5	27	44.3	18	30.5	
No	42	35	6	9.8	36	61	
Do you experience any difficulties while eating a certain type of food?							
Yes	27	22.5	27	44.3	0	0	0.000***
No	67	55.8	14	23	53	89.8	
Occasionally	26	21.7	20	32.7	6	10.2	
Do you feel pain in the lower jaw?							
Yes	13	10.8	10	16.4	3	5.1	0.034*
No	85	70.9	44	72.1	41	69.5	
Occasionally	22	18.3	7	11.5	15	25.4	
Are you frequently highly stressed in the process of communication?							
Yes	47	39.2	40	65.6	7	11.9	0,000***
No	73	60.8	21	34.4	52	88.1	
Do you frequently think about your denture?							
Yes	32	26.7	29	47.5	3	5.1	0.000***
No	43	35.8	10	16.4	33	55.9	
Occasionally	45	37.5	22	36.1	23	39	
Do you feel uncomfortable because of your denture?							
Yes	22	18.3	21	34.5	1	1.7	0.000***
No	58	48.4	16	26.2	42	71.2	
Occasionally	40	33.3	24	39.3	16	27.1	
Are you nervous because of your complete lower denture?							
Yes	36	30	29	47.5	7	11.9	0.000***
No	62	51.7	11	18	51	86.4	
Occasionally	22	18.3	21	34.5	1	1.7	
Does the wearing of a denture interfere in any way with your daily activities?							
Yes	34	28.4	31	50.8	3	5.1	0.000***
No	67	55.8	17	27.9	50	84.7	
Occasionally	19	15.8	13	21.3	6	10.2	

How often do you wash your denture?							
In the morning and in the evening	46	38.3	25	41	21	35.6	0.848/ns
Only in the morning	2	1.7	1	1.6	1	1.7	
Only in the evening	19	15.8	8	13.1	11	18.6	
After every meal	53	44.2	27	44.3	26	44.1	
When did you get your first complete lower denture?							
Last year	22	18.3	12	19.7	10	17	0.756
3 years ago	65	54.2	34	55.7	31	52.5	
5 years ago	33	27.5	15	24.6	18	30.5	
Are you satisfied with your health?							
Very dissatisfied	2	1.7	2	3.3	0	0	0.000***
Disatisfied	31	25.8	24	39.3	7	11.9	
Neither satisfied nor dissatisfied	29	24.2	19	31.2	10	16.9	
Satisfied	52	43.3	11	18	41	69.5	
Very satisfied	6	5	5	8.2	1	1.7	

Table 3. *Correlation of OHRQOL relative to the socioeconomic health factors in the overall sample*

Table 3.		Group	Age	Gender	Residence	Education	Marital	Income	Income <45000rsd≥
Difficulties while speaking	R	.758**	0.042	0.004	-0.074	.218*	0.091	.610**	.609**
	Sig.	0	0.652	0.965	0.423	0.017	0.324	0	0
	N	120	120	120	120	120	120	120	120
Difficulties while swallowing	R	.540**	0.083	0.01	-0.12	.297**	0.052	.391**	.469**
	Sig.	0	0.366	0.917	0.193	0.001	0.57	0	0
	N	120	120	120	120	120	120	120	120
Difficulties while chewing	R	.787**	-.181*	-0.055	-0.124	.207*	0.169	.580**	.590**
	Sig.	0	0.048	0.548	0.178	0.024	0.065	0	0
	N	120	120	120	120	120	120	120	120
Stability satisfaction	R	0.085	-0.129	-0.073	-0.148	0.023	0.165	-0.085	-0.062
	Sig.	0.358	0.161	0.426	0.108	0.805	0.072	0.358	0.5
	N	120	120	120	120	120	120	120	120
Do you remove complete lower denture at night?	R	.566**	0.005	-0.055	-.242**	-0.039	.209*	.458**	.437**
	Sig.	0	0.956	0.554	0.008	0.671	0.022	0	0
	N	120	120	120	120	120	120	120	120
Difficulties while eating certain types of food	R	0.166	0.044	-0.138	-0.019	0.036	0.045	.303**	.216*
	Sig.	0.071	0.636	0.134	0.835	0.694	0.623	0.001	0.018
	N	120	120	120	120	120	120	120	120
Frequently thinking about denture	R	.264**	-0.076	0.015	-.218*	0.122	.259**	.388**	.348**
	Sig.	0.004	0.41	0.874	0.017	0.186	0.004	0	0
	N	120	120	120	120	120	120	120	120
Uncomfortable feeling	R	0.112	0.052	-.263**	-0.118	0.019	0.066	0.078	0.039
	Sig.	0.225	0.575	0.004	0.198	0.835	0.474	0.396	0.67
	N	120	120	120	120	120	120	120	120
Pain in the lower jaw	R	.235**	-0.051	-0.146	-0.173	-0.022	.182*	.306**	.292**
	Sig.	0.01	0.582	0.11	0.059	0.814	0.047	0.001	0.001
	N	120	120	120	120	120	120	120	120
Nervous	R	0.059	-0.049	-0.152	-0.008	-0.127	-0.031	0.086	0.059
	Sig.	0.521	0.594	0.098	0.928	0.166	0.74	0.352	0.52
	N	120	120	120	120	120	120	120	120

Denture wearing vs. daily activities	R	.295**	-0.049	-0.062	-0.134	.207*	-0.04	.361**	.447**
	Sig.	0.001	0.592	0.502	0.143	0.023	0.665	0	0
	N	120	120	120	120	120	120	120	120
Denture washing frequency	R	0.028	-0.012	0.107	-0.125	0.003	0.02	-0.167	0.005
	Sig.	0.763	0.897	0.247	0.173	0.975	0.826	0.068	0.953
	N	120	120	120	120	120	120	120	120
Health satisfaction	R	.400**	-0.1	-0.142	-0.159	0.024	-0.02	.369**	.352**
	sig	0	0.275	0.121	0.083	0.797	0.829	0	0
	N	120	120	120	120	120	120	120	120

Frequent stress during communication was reported by 65.6% of participants in Group 1, whereas only 11.9% in Group 2 experienced the same issue (Table 2).

The analysis of the relationship between speech, swallowing, and chewing difficulties and socio-demographic characteristics showed no statistically significant correlation with age, gender, place of residence, or marital status.

A significant correlation was found between speech difficulties ($R = 0.758$, $p < 0.0001$), swallowing difficulties ($R = 0.540$, $p < 0.0001$), and chewing difficulties ($R = 0.787$, $p < 0.0001$) in Group 1 compared to Group 2 (Table 3).

A significant correlation was also observed between speech difficulties ($R = 0.218$, $p < 0.017$), swallowing difficulties ($R = 0.297$, $p < 0.001$), and chewing difficulties ($R = 0.207$, $p < 0.024$) in the group with lower education compared to the group with higher education (university degree or scientific titles) (Table 3).

Furthermore, a significant correlation was found between speech difficulties ($R = 0.609$, $p < 0.0001$), swallowing difficulties ($R = 0.469$, $p < 0.0001$), and chewing difficulties ($R = 0.590$, $p < 0.0001$) in the group with an income below 45,000 RSD compared to the group with an income above 45,000 RSD (Table 3).

A significantly higher percentage of participants in Group 1 (47.5%) consider their dentures compared to Group 2 (5.1%), with place of residence showing strong correlation—most commonly among suburban residents (43.6%), then urban (21.1%), and least among rural (12.5%). This is also notable among married and single individuals (33.3%), and those earning below 45,000 RSD (47.4%). Discomfort is significantly associated with female gender.

Wearing dentures interferes with daily activities more in Group 1 (50.8%) than in Group 2 (5.1%), with the strongest correlation among those with elementary or secondary education (33.7%) and low income (52.6%). Lower jaw pain is more frequent in Group 1 (16.4%) than Group 2 (5.1%), especially among divorced individuals and those earning under 45,000 RSD (15.8%).

No significant link was found between denture-related nervousness or hygiene habits and sociodemographics. Self-rated health does not significantly differ by age, gender, residence, education, or marital status; however, higher satisfaction is seen in Group 2 (3.61 ± 0.72) and among those earning over 45,000 RSD (3.56 ± 0.83 vs. 2.89 ± 0.95).

DISCUSSION

The status of oral health has a significant impact on both physical and mental health, which ultimately influences the overall quality of life. This includes a person's appearance, speech, chewing, food perception, social life, and self-esteem (15, 16). According to estimates, 20% of the population in Serbia was over 65 years old in the year 2017 (17).

Our study aligns with previous research by Celebić et al., which reported that more than a third of edentulous patients are not fully satisfied with their complete dentures, primarily due to issues with insufficient stability, retention, and discomfort during mastication. Similarly, in our study, patients with conventional complete dentures expressed significant dissatisfaction with the stability of their prostheses, leading to complaints of difficulties in speaking, chewing, and overall discomfort, which aligns with the findings of Celebić et al. (18). On the other hand, our results showed that patients with mini-implant-supported complete dentures were significantly more satisfied. Patients with conventional dentures were more often stressed, nervous, and unable to perform daily activities, frequently thinking about their dentures compared to patients in Group 2. These findings are consistent with several previous studies. For example, Burns and colleagues found that patients with implant-retained overdentures have greater preference and satisfaction compared to conventional dentures, particularly in terms of comfort and functionality (19). Similarly, long-term studies show that mini implants provide good stability,

minimal bone loss, and high patient satisfaction over extended periods [20,21]. Elsyad et al. demonstrated that the design of overdentures with mini implants significantly reduces supportive tissue loss and enhances stability, which directly affects functional efficiency and satisfaction (20, 22). Additionally, histological and clinical results from a one-year study by Passos and colleagues support the effectiveness of mini implants in lower dentures, with patients showing a high degree of adaptation and satisfaction (23).

This situation can likely be attributed to the better stabilization provided by mini-implants compared to conventional complete dentures (24-26). More stable dentures enable a satisfactory chewing capacity, thereby having a positive impact on patients' quality of life (QoL) (27-30). On the other hand, an unstable denture negatively affects the patient's ability to eat, speak, and smile. Patients with conventional dentures often encounter difficulties while doing housework, socializing, and engaging in leisure activities (31,32).

Our study did not reveal any significant differences in terms of gender, except for the fact that women experienced certain discomfort (33). Silverman et al. (32) suggest that men adapt better to their dentures. These results can be explained by the fact that addressing or alleviating oral problems and improving oral health does not significantly reduce women's concerns. Women generally view complete dentures as a form of handicap, which can hinder socialization and cause discomfort (24).

Married patients tend to express higher overall satisfaction with conventional dentures compared to single patients, although no significant differences were observed (25). Our research showed that married respondents removed their dentures more often at night, while divorced patients experienced more pain, and both married and single patients thought more often about their dentures.

Respondents with higher education experienced fewer difficulties with speaking, swallowing, and chewing compared to those with lower education levels. Dentures interfered more with the daily activities of respondents with elementary and secondary education, which is consistent with the findings of Caglayan (34). This could be attributed to the fact that higher-educated respondents were more likely to have complete dentures with mini-implants, which are more stable and therefore cause fewer problems. Patients with an income lower than 45,000 RSD more frequently reported discomfort while eating, interference with daily activities, pain, and more frequent thoughts about their dentures. This may be explained by the fact that people with lower income are generally more dissatisfied with their dentures (33).

The use of mini-implants has recently become the method of choice for the prosthetic rehabilitation of patients who are unable to receive standard dental implants. The growing body of evidence on the efficacy of implant treatments aimed at increasing the stability of complete dentures and improving patients' quality of life (QoL) is promising (35-37). Mini-implants are highly acceptable, with a success rate of 92.32%, similar to the success rate of therapy using standard implants (8,38). These results indicate that complete dentures retained by mini-implants are an acceptable option, especially for patients with financial limitations or inadequate anatomical structures for standard implant insertion (39,40).

According to Kostić et al., improving oral health and regular dental check-ups would improve the functions of the orofacial system, physical appearance, and self-confidence of the subjects, as well as their social life (41). It is crucial to consider dental implants, particularly for patients who cannot mentally accept being edentulous and for elderly patients receiving their first complete denture, as they may have decreased neuromuscular adaptation.

Within the limitations of this study, the following conclusions have been drawn:

1. Patients with conventional complete dentures report overall lower satisfaction compared to those with complete dentures supported by mini-implants.
2. The selected prosthetic solution significantly affects the stability of the denture, influencing chewing, speaking, daily activities, discomfort, and communication difficulties.
3. Level of education and income have the greatest impact on the quality of life among all socio-economic factors. Patients with higher education levels more easily understand the advantages of using mini-implants for the retention and stabilization of complete denture.

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Author Contributions

Conceptualization, J.A. and J.D.; Methodology, investigation, and data curation, J.A., Ć.A., and P.M.; Formal analysis, P.M., Ć.A., and P.A.; Writing – original draft preparation, J.A., P.M., and J.D.; Writing – review and editing, J.A.; Supervision, J.D. All authors have read and approved the published version of the manuscript.

Statement of Ethics

This study was approved by the Ethics Committee of the Faculty of Dentistry in Pančevo and conducted in accordance with the Declaration of Helsinki.

Statement of Competing Interest

The authors declare no relevant conflicts of interest.

Statement of Data Availability

All data analyzed during this study are included in the published article.

Statement of Generative AI Technologies Use

No generative AI was used.

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