



Denture hygiene among inhabitants of the Lublin province

Higiena uzupełnień protetycznych wśród mieszkańców województwa lubelskiego

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Abstract

Objectives. Dentures, like the patient's own teeth, require the necessary hygienic procedures to keep them in good condition. The aim of the study was to analyze selected socio-demographic features, as well as awareness and hygiene behaviours in patients from the Lublin province who use fixed and removable dentures.

Materials and method. The cross-sectional study material consisted of 1,200 questionnaires distributed among people residing in the Lublin province using removable or fixed dentures. The study was conducted between June 2016 – June 2017 in randomly selected private dental offices providing private and National Health Fund dental services in the Lublin province to patients using dentures.

Results. The majority of respondents (51.6%) disinfected their dentures, with women more often than men providing a positive answer. Almost a half (45.6%) of respondents used dentures 24 hours a day, 36.7% stored their dentures overnight in a container with liquid, 16.3% stored them in a dry container, and others (1.4%) in a different way. A manual toothbrush was indicated by 68.3% of respondents as the method they used for daily oral hygiene. Men significantly more often used other types of brushes (electric or sonic) than women. Men also more often used dental floss.

Conclusions. The dentist issuing denture should provide the patient with detailed recommendations regarding its use and proper hygiene because patients' knowledge on this subject is insufficient.

Key words

oral hygiene, removable partial dentures (RPDs), fixed dentures

Streszczenie

Cel pracy. Uzupełnienia protetyczne tak jak zęby własne pacjenta wymagają niezbędnych zabiegów higienizacyjnych, pozwalających utrzymać uzębienie resztkowe i protezy w dobrym stanie. Celem badań była analiza wybranych cech socjodemograficznych oraz świadomości i zachowań higienizacyjnych pacjentów z województwa lubelskiego użytkujących protezy stałe i ruchome.

Materiał i metody. Materiał do badań stanowiło 1200 formularzy ankietowych, wypełnionych przez osoby zamieszkałe na terenie województwa lubelskiego korzystające z ruchomych i/lub stałych protez zębowych.

Badanie przeprowadzono w prywatnych gabinetach stomatologicznych na terenie województwa lubelskiego wśród pacjentów użytkujących protezy.

Wyniki. Większość ankietowanych (52,9%) dezynfekuje swoje protezy, przy czym na odpowiedź wpływa płeć – częściej odpowiedź twierdzącą wskazywały kobiety. Prawie połowa (47,1%) ankietowanych użytkuje protezy całodobowo, 37,2% przechowuje swoje protezy przez noc w pojemniku z płynem, 14,5% – w pojemniku na sucho, pozostali (1,2%) w inny sposób. Szczoteczkę manualną wskazało 74,8% ankietowanych jako tę, którą używają do codziennej higieny jamy ustnej. Mężczyźni istotnie częściej korzystali z innych szczoteczek (elektrycznej lub sonicznej) niż kobiety. Również mężczyźni częściej używają nici dentystycznych.

Wnioski. Lekarz dentysta oddający protezę powinien przekazywać pacjentowi szczegółowe zalecenia dotyczące jej użytkowania oraz prawidłowej higieny, ponieważ wiedza pacjentów na ten temat jest niewystarczająca.

Słowa kluczowe

higiena jamy ustnej, protezy ruchome, protezy stałe

INTRODUCTION

The increase in life expectancy in Poland and neglect in dental care from an early age [1] has resulted in an increase in the number of complete and partial edentulous patients. Denture rehabilitation of these patients should be based on

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fixed or removable dentures with bridges. Another effective solution is an implant-based prosthetic rehabilitation in the case of missing abutments teeth, or the inability to use residual teeth as abutments. In Poland, due to financial reasons, many people opt for denture treatment refunded by the National Health Fund which covers the costs of removable mucosa-supported dentures (complete and/or partial dentures).

Dentures, like the patient's own teeth, require necessary hygienic procedures to maintain the residual teeth and dentures in good condition [2]. Patients during the last visit for prosthetic treatment, in particular those receiving their first denture, should be instructed by the dentist about the proper use and care of the dentures. It is very important in the case of removable dentures to inform patients about the necessity to remove them for at least 6–8 hours a day and to store them in a dry environment [3]. Patients should be aware that acceptance of the finished dentures does not terminate the treatment process, but they should remain under the care of the dentist and report for designated visits, and not only in the event of an emergency, e.g., breaking/fracture of the denture [4, 5]. In the case of prosthetic bridges, however, patients should be informed about the need to use special dental floss without which it is impossible to keep the restoration clean.

Surveys conducted among patients using fixed and removable dentures indicate that there is a problem with maintaining the correct hygiene of prosthetic restorations [4, 6]. This may be due to the age of the majority of patients, and their physical limitations or insufficient information provided by dentists. It is very important that dentists are aware that even the best denture work if used improperly can lead to prosthetic stomatopathy and other complications [7].

OBJECTIVE

The aim of the study was to analyze selected socio-demographic features, as well as awareness and hygiene behaviours in patients from the Lublin province who use fixed or removable dentures.

MATERIALS AND METHOD

The study material consisted of 1,200 questionnaires distributed among people residing in the Lublin province, who used removable or fixed dentures. The inclusion criteria were the use of prosthetic dentures and place of residence in the Lublin province. The study was conducted between June 2016 – June 2017. 1,170 correctly filled forms were considered valid and served as a source of data. The study was conducted in randomly selected private dental offices which provided private and National Health Fund dental services to patients using dentures in the Lublin province. The participants completed the questionnaire independently in their own time, without the supervision of the office staff. The characteristics of the study group, taking into account gender, age, education, place of residence, income and type of dental care, are presented in Table 1. The study also analyzed the type of health care (National Health Fund or private), duration of denture usage, any repairs of dentures, use of preparations for cleaning and disinfection of dentures,

Table 1. Characteristics of the surveyed group of patients

Category	n	%	
Gender	Male	410	35.0
	Female	760	65.0
Age	18-35	112	10.0
	36-50	333	28.0
	51-65	479	41.0
	Over 66	246	21.0
Education	Primary school	98	8.0
	Vocational	227	19.0
	High school	524	45.0
	University	321	27.0
Residence	Village	279	24.0
	Town up to 50K	228	19.0
	City 50-200K	167	14.0
Monthly income (PLN) per person	City over 200K	496	42.0
	Up to 500 PLN	80	7.0
	500-900 PLN	268	23.0
	1,000-1,500 PLN	457	39.0
Type of dental care most often used by the patient	Over 1500 PLN	365	31.0
	Public	620	52.9
	Private	491	42.0
What kind of denture are you using?	Both	47	4.0
	None	13	1.1
	Fixed	478	40.9
	Removable	576	49.2
	Both	116	9.9

method of storing dentures at night, causes and frequency of follow-up visits, and the level of subjective evaluation of satisfaction with the dentures used. All procedures performed involving the participants were in accordance with the ethical standards of the Institutional and/or National Research Committee, and with the 1964 Helsinki Declaration and its later amendments, or comparable ethical standards. The authors obtained the informed consent of patients/caregivers of patients to participate in the study.

The data was prepared using the SPSS 20.0 PL statistical package [8]. The Kolmogorov-Smirnov test was used to analyze the normality of the distribution of the obtained data. Because a statistically significant data discrepancy was obtained from the normal distribution, further analyses were carried out using non-parametric tests (χ^2). Spearman non-parametric correlation coefficients were also estimated. The value of $p < 0.05$ was adopted as the threshold of statistical significance.

RESULTS

More than a half of the respondents (52.9%) used only public dental care as part of the benefits provided by the National Health Fund (NFZ), while 42.0% used only private dental care. The analysis did not reveal the relationship between gender and the choice of type of dental care. There was, however, a significant relevance between education and the choice of type of care – the lower the level of education of

respondents, the more often they indicated public dental care. In turn, with age, patients were less likely to use any dental care. A relationship between the place of residence and income was also shown – the larger the city and the higher income per one person, the more often the respondents chose private dental care (Tab. 2).

Patients using removable dentures were more likely to use public dental care, while users of fixed dentures more often opted for private care (Tab. 3). A more frequent selection of fixed dentures was shown in correlation with an increase in the level of education. Both prosthetic restorations (fixed and removable) were more often used by people who had had dentures made more than 10 years previously. In the question about the repair of dentures, the respondents were able to make multiple selections, and from the analysis of these data it followed that removable denture had to be repaired statistically more often; however, dentures were damaged more often among patients using both types of dentures (fixed and removable).

Among 457 respondents using removable dentures, 38.7% used partial acrylic dentures, 53.2% used complete dentures and only 8.1% skeletal dentures (Tab. 4). The majority of respondents (51.6%) disinfected their dentures, the answer was dependent on gender – women answered affirmatively more often. A statistically significant correlation was also found in the case of age and education level and the reverse-dependent in the case of income (Tab. 5). Almost half (45.6%) of respondents used dentures 24 hours a day, 36.7% stored their dentures overnight in a container with liquid, 16.3% stored them in a dry container, while others (1.4%) stored them in a different way. Removable dentures were most often ordered as part of public dental care, and a positive correlation was shown with gender, with men more often using this form of care, age, education, place of residence and income.

In the case of fixed dentures, most respondents used prosthetic crowns (55.0%), bridges (31.2%), and 13.8% of respondents had both fixed dentures? (Tab. 6). A manual toothbrush was indicated by 68.3% of respondents as the method they used for daily oral hygiene. Men significantly more often used other brushes (electric or sonic) than women (Tab. 7). Men also used dental floss more often. The use of dental floss decreased with the age of the respondents, and the use of floss was also noticeably reduced in patients with lower education levels, smaller cities and lower income.

DISCUSSION

The use of removable dentures is often associated with prosthetic stomatopathies for several reasons: improper preparation of prostheses and/or improper habits of patients related to the cleaning and storing of dentures.

An excessively prolonged period of use of the same dentures is not conducive to proper prosthetic rehabilitation. Almost 1/3 of respondents used their prostheses in the range of 5–10 years, and 23.25% of respondents used them for over 10 years. According to the results of a review carried out by Akinyamoju et al.[9], dentures should not be used for more than 5 years because after this period they may have a detrimental effect on oral tissues. Research conducted in Brazil by Coelho et al. [10] showed that, respectively, 24.53% and over 50% of respondents used their dentures for more than 20 years. Also, in studies by Cakan et al. [11], 65% of patients used their dentures for more than 6 years.

54.79% of respondents reported to the dentist only if a problem occurred, while only 25.98% of patients reported regularly for follow-up visits every 6 months. This is confirmed by the results of research conducted by Marchini et al. [12] in which only 23% of the patients reported back to the dentist

Table 2. Type of care used according to the analyzed categories of respondents

Category		Public		Private		Both		None		χ^2 (p-value)	Fisher (p-value)	V-Crammera
		n	%	n	%	n	%	n	%			
Gender	Male	218	35.2	169	34.4	18	38	5	58	0.910	0.8846	0.021
	Female	402	64.8	322	65.6	29	62	7	42			
Age	18-35	20	3.0	88	18.0	4	8.0	0	0	0.000	0.000	0.2313
	36-50	130	21.0	188	38.0	8	17.0	7	58			
	51-65	280	45.0	179	36.0	15	15.0	5	42			
	Over 66	190	31.0	36	7.0	20	43.0	0	0			
Education	Primary school	66	11.0	32	7.0	0	0.0	0	0.0	0.000	0.000	0.2254
	Vocational education	176	28.0	51	10.0	0	0.0	0	0.0			
	High school	291	47.0	202	41.0	16	36.4	12	100.0			
	University	87	14.0	206	42.0	28	63.6	0	0.0			
Residence	Village	204	33.0	71	14.0	4	9.0	0	0.00	0.000	0.000	0.2048
	Town up to 50K	141	23.0	56	11.0	24	51.0	7	58.0			
	City 50-200K	75	12.0	88	18.0	3	6.0	1	8.0			
	City over 200K	200	32.0	276	56.0	16	34.0	4	33.0			
Monthly income (PLN) per person	Up to 500 PLN	60	10.0	20	5.0	0	0.0	0	0.0	0.000	0.000	0.241
	500-900 PLN	260	42.0	55	11.0	4	9.0	0	0.0			
	1000-1500 PLN	260	42.0	173	35.0	19	40.0	5	42.0			
	Over 1500 PLN	91	16.0	243	49.0	24	51.0	7	58.0			

**Correlation significant at 0.01 (two-sided)

Table 3. What type of denture do you use?

Category		Fixed		Removable		Both		χ^2 (p-value)	Fisher (p-value)	V-Crammera
		n	%	n	%	n	%			
Please select the type of dental care you use most often	Public	135	28.24	416	72.22	69	59.48	0.000	0.000	0.335
	Private	319	67.86	144	25.00	28	24.14			
	Both	19	3.97	16	2.78	12	10.34			
	None	5	1.05	0	0.00	7	6.03			
Education	Primary school	12	2.51	82	14.24	4	3.45	0.000		0.301
	Vocational	56	11.72	163	28.30	8	6.90			
	High school	193	40.38	247	42.88	84	72.41			
	University	217	45.40	84	14.58	20	17.24			
How long have you been using dentures?	Less than 5 years	258	53.97	214	37.15	28	24.14	0.000		0.204
	5-10 years	164	34.31	169	29.34	61	52.59			
	More than 10 years	56	11.72	189	32.81	27	23.28			
Did the dentures require repair during this time? (what kind?)	Yes, after breaking	28	5.9	218	32.06	36	29.51	0.000		0.297
	Yes, adding removed tooth	48	10.00	174	25.59	20	16.39			
	Yes, relining the denture	8	1.7	40	5.88	8	6.56			
	Yes, other, e.g., recementing	52	10.88	20	2.94	4	3.28			
	Yes, adding removed tooth and after breaking	4	0.84	51	9.17	8	6.9			
No, denture did not require repair	338	70.71	220	39.57	56	48.28				
Which one of the dentures required repair?	None	346	72.38	198	4.38	68	58.62	0.000		0.273
	Upper denture	88	18.41	210	36.46	28	24.14			
	Lower denture	32	6.69	93	15.15	20	17.24			
Are you satisfied with the dentures?	Both	12	2.51	75	13.02	0	0.00	0.070	0.087	0.061
	Yes	374	78.90	438	76.04	84	72.41			
	No	31	6.54	45	7.81	4	3.45			
How often do you go to control visits at the dentist?	Partially yes	69	14.56	93	16.15	28	24.14	0.000		0.283
	When I see a problem	183	39.61	378	66.08	80	68.97			
	Every six months	214	46.32	69	12.06	21	18.10			
	I don't go to control visits	45	9.74	105	18.36	4	3.45			
	In another period	20	4.33	20	3.50	11	9.48			

**Correlation significant at 0.01 (two-sided)

within 10 years after receiving their denture. The problem indicated most by the respondents related to fracture of the denture (24.10%) and tooth addition after extraction of an own tooth (20.68%). Denture fracture can often be caused by anocclusal problems, which can be corrected during follow-up visits to prevent damage to the dentures, or oversteering own teeth in the case of partial dentures [13].

Many studies have confirmed the fact that dentists do not give advice about the proper hygiene of dentures [14–16]. Proper hygiene of removable dentures should be carried out daily with a few abrasive cleansers by the patient, and once a year a professional cleaning procedure should be carried out by a dentist or hygienist using ultrasonic devices [14]. The effect of cleaning dentures can be improved by using, in addition to brushing, effervescent cleaning tablets [4]. The majority of respondents (78.0%) used abrasive toothpaste to clean their dentures, which is also reflected in other studies [11, 17]. *In vitro* studies by Izumida et al. [18] confirm that the use of toothpastes causes the greatest surface roughness of the acrylic material, which encourages the adhesion of bacterial plaque to the surface of the denture.

2/3 of respondents indicated that they disinfect their dentures by mostly using cleaning and disinfecting tablets,

hot water or hydrogen peroxide. Boiling water should not be used because it does not lead to proper disinfection and can also cause deformation of the denture [14]. Preparations containing sodium hypochlorite are considered the most effective, as confirmed by *in vitro* studies [16].

45.6% of respondents did not remove their removable dentures at night, which may contribute to the formation of inflammation of the mucous membrane due to the accumulation of bacterial plaque [12]. In turn, as many as 36.7% of respondents stored their dentures at night in a container with liquid, thus allowing the growth of microorganisms on the surface of restorations. Only 16.3% of respondents stored dentures in a dry environment in accordance with the applicable rules. Incorrect use of dentures at night has been demonstrated in many surveys worldwide [2, 3, 5, 11].

Patients using fixed dentures are often convinced that they should take care of them in the same way as their natural teeth. 68.3% of respondents used manual brushes for daily oral hygiene, electric and sonic toothbrushes were used by 29.6% and 2.0%, respectively. This may be due to the fact that there is a myth about decementation of prosthetic works by using electric or sonic brushes. There is no evidence in support of this thesis in the literature, and there are papers

Table 4. Questions about removable dentures.

Survey questions	Category						
	full denture	acrylic partial denture	skeletal denture				
What kind of removable denture do you use?	n	243	177	37			
	%*	53.2	38.7	8.1			
What substances do you use to clean the denture?	toothpaste		soap	dishwasher liquid	other		
	n	446	70	8	36		
	%	78.	12.2	1.4	6.3		
Do you disinfect your dentures?	yes, once a week		yes, every two weeks	yes, less frequently	no		
	n	204	39	52	277		
	%	35.7	6.8	9.1	48.4		
What do you use to disinfect your dentures?	hot water		soda solution	Corega tabs	Octenisept	mouthwash	hydrogen peroxide
	n	24	12	112	12	8	31
	%	7.7	3.8	35.9	3.8	2.6	9.9
Do you use special preparations for dentures and mucous membranes?	creams/glues for dentures (e.g., Protefix)		denture cleaning tablets (e.g., Corega)	gel for irritated gums (e.g., Sachol, Dentosept)	cleaning brushes	other methods	I don't use any
	n	85	132	58	72	4	115
	%	18.2	28.3	12.4	15.5	0.9	24.7
How do you store your dentures at night?	I use it 24/7, I don't take it out at night		in a container with water/liquid	in a dry container	differently		
	n	261	210	93	8		
	%	45.6	36.7	16.3	1.4		
Did you have the dentures made based on the National Health Fund insurance?	yes, I have made dentures based only on NHF insurance		yes, I have dentures made based on NHF insurance with additional cost	yes, but if denture was not available from NHF insurance I have it made it privately	I do not have dentures made on NHF insurance		
	n	357	57	73	58		
	%	64.3	10.3	13.2	12.3		
Did dentures require adjustments?	no, denture didn't require adjustment		yes, denture required small adjustment	yes, denture required several adjustments	yes, but even after adjustments I'm not satisfied with dentures ordered		
	n	227	222	70	41		
	%	40.5	39.6	12.5	7.3		

* percentage of all responses given

clearly showing that the use of electric and sonic brushes does not affect the degradation of cement of fixed dentures [19]. Significantly more men used power brushes (electric / sonic), which may be due to the fact that men are more likely to choose novelty and gadgets than women. As shown by numerous studies collected in our own review of literature, it can be concluded that the use of electric and/or sonic brushes improves oral hygiene [20].

A half (53.3%) of the patients who had fixed dentures did not use dental floss, only 22.7% of respondents used dental floss; however, as many studies have emphasized, brushing and flossing should be a standard in everyday hygiene, with rinses used as an addition [21].

Incorrect hygiene and storage of dentures is most likely related to the lack of information provided by the dentist to patients [2]. This problem is important because the society's

knowledge about the hygiene of dentures is negligible. Older people are most often the patients who use removable dentures but are unable to find information about proper denture hygiene.

CONCLUSIONS

1. The dentist should provide the patient with detailed recommendations regarding the use and proper hygiene of dentures. The recommendations should be in written form clearly understandable by the patients.
2. The dentist should pay attention during check-up visits, especially because most patients skip them and report only when a problem occurs. Regular check-up can prevent damage to the dentures.

Table 5. Questions about removable dentures.

Category		Gender	Age	Education	Place of residence	Monthly income (PLN) per person
What kind of removable denture do you use?	χ^2 (p-value)	0.782	0.000	0.000	0.000	0.000
	V Cramera	0.033	0.320	0.209	0.247	0.256
What substances do you use to clean the denture?	χ^2 (p-value)	0.959	0.000	0.000	0.000	0.000
	V Cramera	0.033	0.180	0.207	0.213	0.158
Do you disinfect your dentures?	χ^2 (p-value)	0.517	0.000	0.003	0.000	0.000
	V Cramera	0.063	0.209	0.121	0.220	0.151
What do you use to disinfect your dentures?	χ^2 (p-value)	0.940	0.000	0.000	0.000	0.000
	V Cramera	0.075	0.340	0.279	0.393	0.384
Do you use special preparations for dentures and mucous membranes?	χ^2 (p-value)	0.978	0.000	0.000	0.000	0.000
	V Cramera	0.041	0.207	0.266	0.269	0.245
How do you store your dentures at night?	χ^2 (p-value)	0.856	0.05436	0.000	0.005	0.000
	V Cramera	0.037	0.099	0.219	0.117	0.225
Did you order the dentures based on National Health Fund insurance?	χ^2 (p-value)	0.829	0.000	0.000	0.000	0.000
	V Cramera	0.040	0.286	0.213	0.187	0.204
Did dentures require adjustments?	χ^2 (p-value)	0.425	0.000	0.000	0.006	0.10862
	V Cramera	0.071	0.207	0.211	0.117	0.092

Table 6. Questions about fixed dentures

Survey question		Category			
		crown	bridge	both	
What kind of denture do you use?	n	252	143	63	
	%*	55.0	31.2	13.8	
What kind of toothbrush do you use?		manual	electric	sonic	
	n	302	131	9	
	%	68.3	29.6	2.0	
Do you use dental floss?		yes, specially designed for the hygiene of bridges	waxed	non-waxed	I don't use it
	n	103	73	36	242
	%	22.7	16.1	7.9	53.3
What kind of mouthwash do you use?		alcohol-based	based on chlorhexidine	I don't know	I don't use it
	n	83	67	140	152
	%	18.8	15.2	31.7	34.4

* percentage of all responses given

Table 7. Questions about fixed dentures.

Category		Gender	Age	Education	Place of residence	Monthly income (PLN) per person
What kind of denture do you use?	χ^2 (p-value)	0.9466	0.000	0.000	0.000	0.027
	V Cramera	0.01548	0.21886	0.20378	0.19043	0.12454
What kind of toothbrush do you use?	χ^2 (p-value)	0.50765	0.000	0.001	0.001	0.001
	V Cramera	0.05539	0.23986	0.1635	0.16216	0.16059
Do you use dental floss?	χ^2 (p-value)	0.46939	0.000	0.000	0.000	0.000
	V Cramera	0.07469	0.23598	0.14923	0.20212	0.18711
What kind of mouthwash do you use?	χ^2 (p-value)	0.39106	0.000	0.000	0.000	0.000
	V Cramera	0.08244	0.20943	0.24603	0.25709	0.24923

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