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### RESEARCH ARTICLE

#### INFLUENCE OF SUBJECTIVE FACTORS OVER HYGIENE HABITS OF COMPLETE DENTURE WEARERS

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#### Abstract

**Background:** Hygiene of the complete dentures is closely related to the oral and general health status of patients. Different factors can impact hygiene habits of complete denture wearers. There is not agreement of opinion about the most significant subjective factor.

The aim of this research was to study the hygiene habits of the complete denture wearers and the influence of some factors as age, sex and education over patient's behaviour.

**Material and Method:** Subjects of observation in the study were 110 (48 men and 62 women) complete dentures wearers, aged 52 to 84. Questionnaire and information leaflet were created. The questionnaire contained 16 questions concerning the manners for hygiene maintenance of dentures and oral cavity, the sources of the information about the hygiene care and the score of the leaflet by the patient.

**Results:** Washing dentures with water, soap and toothbrush was reported as preferred method for cleaning (32.73%). 42.73% of participants were not provided with information about hygiene care for dentures. Significant correlation was established between patients' education and: method for hygiene maintenance of the dentures ( $r = 0.5754$ ); hygiene care of the oral cavity ( $r = 0.6395$ ); use of additional means for disinfection of dentures ( $r = 0.6489$ ).

**Conclusion:** Within the range of this study we could conclude that the education is the more significant factor that impacts patient's hygiene habits. The age is not determinative factor, whereas the sex of patients can impact their choice of methods and the frequency of hygiene procedures.

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#### Introduction:-

The hygiene of the removable dentures is closely related to the oral and general health status of patients and it is significant factor that impacts their quality of life (Felton et al., 2011). Oftentimes, the biofilm beneath the complete dentures is the reason for the occurrence of stomatitis, as well as some systematic diseases such as bacterial endocarditis, aspiration pneumonia, general respiratory infections etc. (Abe et al., 2006; Campos et al., 2008; Li et al., 2000).

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The hygiene of removable dentures is essential in order to eliminate bacterial biofilm in its capacity of pathogenic factor (Kulak-Ozhan et al., 2002). It is proven that quality care after oral hygiene significantly reduces the quantity of oropharyngeal bacteria (Ishikawa et al., 2008).

Numerous researches are dedicated to the effectiveness of methods for denture cleaning (Barnabé et al., 2004; Nikawa et al., 1999; Panzeri et al., 2009). Dills et al. (1988) establish that washing dentures with toothpaste is not as effective as cleaning with effervescent tablets. Panzeri et al. (2009) prove that washing dentures with two types of toothpastes (one antibacterial and one with fluorosurfactant) reduce the bacterial biofilm much better compared to washing only with toothbrush and water. Barnabé et al. (2004) research the efficiency of sodium hypochlorite and coconut soap in their capacity of disinfecting agents for cleaning the dentures in order to reduce the denture stomatitis. De Souza et al. (2012) after comparing six clinical methods established that there is no proof that some methods for dentures cleaning are better than the rest. In the dental literature the recommended methods are different and there is no consensus on the most suitable method (Axe et al., 2016). Nevertheless, according to the prevailing opinion, the combined methods of mechanical washing with toothbrush and paste and chemical cleaning of dentures via soluble tablets are the optimal version for maintaining dentures' hygiene (Baba et al., 2018).

Factors that significantly predefine the quality of denture cleaning are patients' hygiene habits. Research works show that preferred methods for cleaning the dentures are washing with toothbrush and water or washing with toothbrush and toothpaste. Baran and Nalçaci (2009) concluded that the first manner is being practiced by around 45.2% of the persons researched by them and the second one of around 48.4%. According to other authors the percent is 34.1% for washing with water and 31.8% for using toothbrush and toothpaste, correspondingly (Aoun et al., 2017). According to Cinquanta et al. (2021) the recommended combined methods of mechanical cleaning and soaking the dentures in cleaning solutions is applied by around 1/5 (21.1%) of the patients.

Another factor that is of significance for the good oral hygiene is the frequency of washing the dentures. The highest numbers of patients say that they clean their dentures once daily (Aoun et al., 2017, Sharma et al., 2020). Significant interrelation is established between wearing the dentures at night-time, denture stomatitis and denture cleaning (Cankaya et al., 2020). According to some research, only around 1/3 (30.9%) of the inquired persons do not sleep with their dentures overnight (Bacali et al., 2021; Cinquanta et al., 2021). Around 28.8% of them use cleaning tablets that get dissolved in water (Ishikawa et al., 2008). It was observed mismatch between the self-assessment of patients concerning their hygiene status and the actual results of the clinical assessment. According to Sharma et al. (2020) almost 90% of the patients define the hygiene status of their dentures as good or satisfactory but the clinical examination shows that in little bit more than half of the dentures are of poor hygiene status.

In dental literature is reported different correlation between the degree of denture hygiene and age, sex, general health status and educational level of the patients (Baran and Nalçaci, 2009; Bergdahl and Bergdahl, 2002). There is not agreement of opinion about the most significant subjective factor.

Other factor that is essential to the accurate denture cleaning is patients' awareness of the available methods and means for the maintenance of the hygiene (De Castellucci et al., 2008). Marchini et al. (2004) prove the connection between the absence of guidelines on oral hygiene and the cases of denture stomatitis. Cankaya et al. (2020) found that 54.10% of the inquired persons, who report that they were not informed about taking care after the dentures, have poor hygiene status. Shankar et al. (2017) found that 10.2% of patients have never been briefed by their doctor of dental medicine how to clean their dentures. According to other authors this percent is higher – between 51.89% and 82.9% (Peracini et al., 2010; Dikbas et al., 2006). The inquiry that was held among the doctors of dental medicine and professional dental hygienists shows that more than 10% of them didn't provide their patients with initial recommendations on the manners of hygiene maintenance of the dentures (Axe et al., 2016).

The successful hygiene maintenance depends on patient's knowledge and the briefing manner – verbal or in writing could be more significant factor than other subjective factors (Cankaya et al., 2020). For example, after tuition via online research most patients start washing their dentures three or at least two times a day (Dwivedi et al., 2021).

## **Material And Methods:-**

The **aim** of this research was to study the hygiene habits of the complete denture wearers and the influence of some subjective factors as age, sex and education over patient's behavior. Subjects of observation in the study were 110 (48 men and 62 women), complete dentures wearers, aged 52 to 84.

**Including criteria:**

Patients who have been using conventional complete dentures made of polymethylmethacrylate (PMMA) at least 1 year, before showing up for the current treatment.

**Excluding criteria:**

Patients with complete dentures made of materials different from PMMA; patients who have been using complete dentures less than 1 year.

Inquiry card and information leaflet were created. The inquiry contains 16 issues grouped in 2 sections (Fig.1). The first one includes questions concerning the manners for hygiene maintenance of dentures and oral cavity. The second section includes questions concerning the sources of the information about hygiene care and the score of the leaflet by the patient.

Inquiry			
Patient: ID.....		.....	
/Name, Surname/		/sex/	/age /
		/education/	
<p>1. For how many years you have been using complete dentures?</p> <p>UD LD</p> <p><input type="checkbox"/> <input type="checkbox"/> 1 to 5 years</p> <p><input type="checkbox"/> <input type="checkbox"/> for more than 5 years</p> <p><input type="checkbox"/> <input type="checkbox"/> for more than 10 years</p> <p>2. Do you sleep with the dentures overnight?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>3. Do you use adhesives for retention of your dentures?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>4. How do you maintain the hygiene of your dentures?</p> <p><input type="checkbox"/> washing with water</p> <p><input type="checkbox"/> washing with water and soap</p> <p><input type="checkbox"/> washing with water, soap and toothbrush</p> <p><input type="checkbox"/> washing with toothbrush and toothpaste</p> <p>5. How many times in 24-hour period you wash your dentures?</p> <p><input type="checkbox"/> one time</p> <p><input type="checkbox"/> two times</p> <p><input type="checkbox"/> three times – in the morning, at noon and in the evening</p> <p><input type="checkbox"/> after every eating</p> <p>6. Do you use additional means for denture disinfection and cleaning?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>7. If "Yes", what are these?</p> <p><input type="checkbox"/> effervescent tablets</p> <p><input type="checkbox"/> gel</p> <p><input type="checkbox"/> soluble powders</p> <p><input type="checkbox"/> other.....</p> <p>8. How often do you disinfect your dentures?</p> <p><input type="checkbox"/> daily</p> <p><input type="checkbox"/> every other day</p> <p><input type="checkbox"/> twice weekly</p> <p><input type="checkbox"/> once weekly</p> <p><input type="checkbox"/> twice monthly</p> <p><input type="checkbox"/> once monthly</p> <p><input type="checkbox"/> when it seems necessary to me</p> <p><input type="checkbox"/> other.....</p> <p>9. Do you use means for maintenance of oral cavity hygiene?"</p> <p><input type="checkbox"/> mouthwash</p> <p><input type="checkbox"/> soluble powders</p> <p><input type="checkbox"/> other.....</p> <p>10. Do you get information from your doctor about hygiene maintenance of dentures?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>11. If "Yes", in what pattern?</p> <p><input type="checkbox"/> in writing – leaflet</p> <p><input type="checkbox"/> oral instructions</p> <p><input type="checkbox"/> in e-version</p>	<p>12. Do you believe that the provision of guidelines in writing on the hygiene maintenance of dentures is useful to you?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>13. Did you learn from the leaflet you were provided with information about hygiene maintenance of the dentures of which you were not aware until then?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>14. Does the information contain terms that are not clear to you?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>15. Would you like to receive the information in e-format, for example as file at your email?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>16. Would you like to review materials about the hygiene of oral cavity and dentures online for example: articles, videos, presentations, if the information contains links to them?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p>	

Figure 1:- Inquiry card.

**Statistical Methods:**

Data were subjected to statistical analysis that includes descriptive and correlative analysis. Student's t-Test was used in order to establish the presence of differences, which result from the data about men and women. The statistics was performed through Microsoft Office Excel 2016.

**Results:**

The answers about the time of the 24-hour period in which the patients use their dentures show that almost 70% of the patients take their dentures out during the night, 62.9% of women and 77.08% of men correspondingly, whereas there is no statistically significant difference between the answers provided by men and women –  $p > 0.05$ . Adhesives for retaining dentures are being used by 22.73% of the patients, 18.75% of men and 25.81% of women, correspondingly.

The data concerning the choice of patients about the manners of maintaining complete dentures' hygiene are presented in Table 1.

**Table 1:-** Answers concerning the manners of maintaining complete dentures' hygiene.

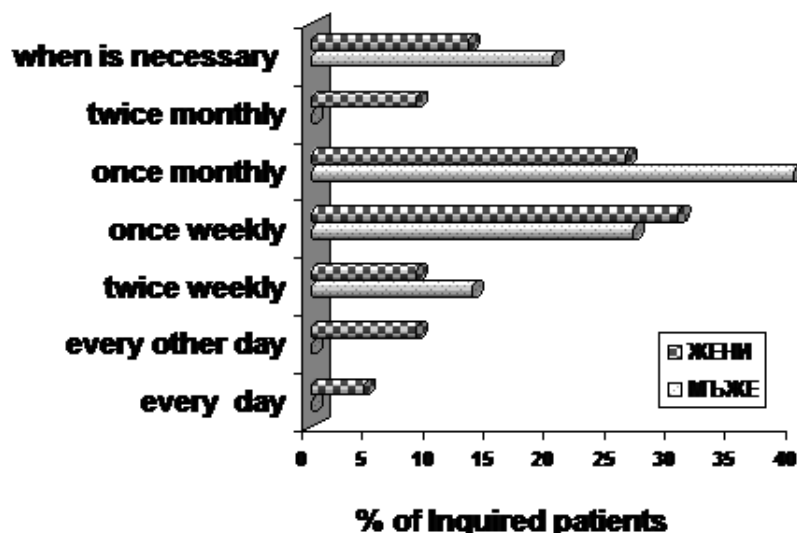
Question	How do you maintain the hygiene of your dentures?						
Participants	Men N = 48		Women N = 62		P	Total N = 110	
Answers	n	%	n	%		n	%
Washing only with water	14	29.17	9	14.52	0.0418	23	20.91
Washing with water and soap, without the help of toothbrush	15	31.25	17	27.42	0.6644	32	29.09
Washing with water and soap, with the help of toothbrush	12	25	24	38.71	0.1309	36	32.73
Washing with toothbrush and toothpaste	9	18.75	15	24.19	0.5159	24	21.82

Almost 1/5 (20.91%) of the inquired patients wash their dentures only with water whereas men prevail in this group - 29.17% compared to women - 14.52% and the difference between data is statistically significant ( $p = 0.0418 < 0.05$ ). There is no significant difference between the answers provided by male and female to other questions ( $p > 0.05$ ).

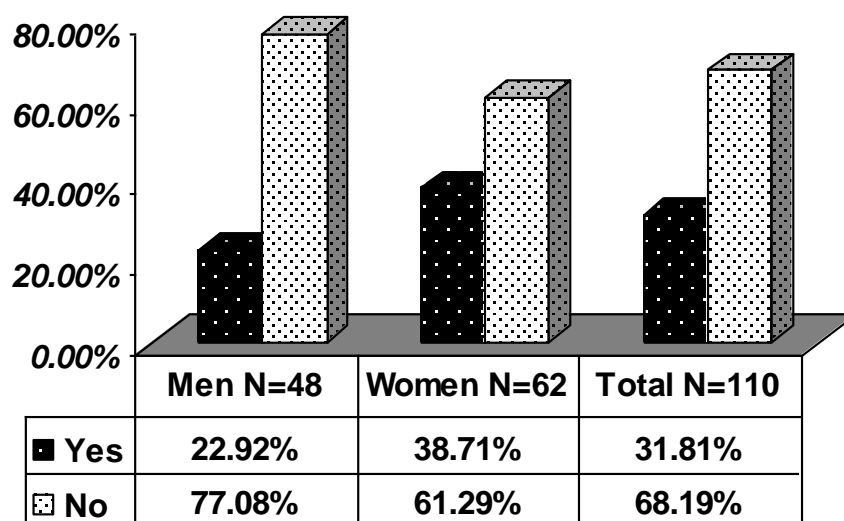
The data about the number of washings of the dentures in 24-hour period show that 38.18% wash their dentures twice daily – in the morning and in the evening. The most of inquired person wash their dentures just once in 24-hour period – 43.64%. Relatively low per cent of patients wash their dentures three times – 12.73%, and only 6 (5.45%) people do this after every meal. There is no statistically significant difference between the answers provided by male and female to this question ( $p > 0.05$ ).

More than half of the patients – 65.45% maintain the hygiene of their dentures as only washing them. 34.55% are aware of the need of regular disinfection of dentures and use special means to this end. Most of them (23.63%) use effervescent tablets. The other patients rely on gel or powder.

The frequency with which patients apply disinfecting procedures is presented on figure 2.

**Fig. 2. Frequency of disinfection of the complete dentures**

To the question "Do you use means for maintenance of oral cavity hygiene?" 31.81% of the patients provide positive answers, 38.71% of women and 22.92% of men, whereas the data about men and women are with statistically significant difference –  $p < 0.05$ , (Fig. 3).

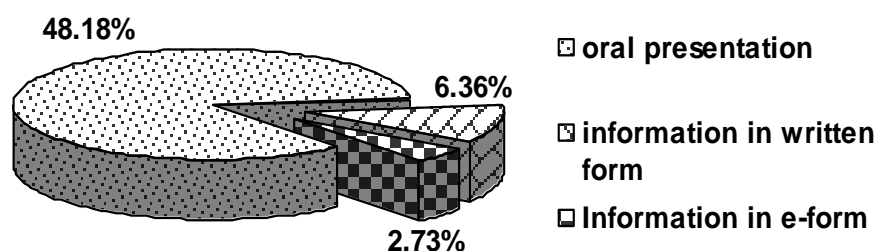
**Fig. 3. Answers of the question: "Do you use means for maintenance of oral cavity hygiene?"**

Mouthwash is being used by 16.36% of the patients and 6.36% use dissolvable powders, whereas 9.09% prefer other means. As an alternative to the ready means for maintenance of the oral hygiene, these patients define home-made herbal essences – most often, camomile or sumac and solution of baking soda in water.

The answers provided to the question about received guidelines concerning the hygiene maintenance of the removable dentures show the following: significant per cent of patients - 42.73% have not received guidelines from their doctor of dental medicine about the way in which they need to take care after their dentures (Fig.4); 48.18%

received guidelines orally, 6.36% received information in writing. Only 3 patients (2.73%) were provided with digital information – in case of two of them as a file with short description that is identical to the guidelines in writing and in the case of just one patient as a link to training video. There is no statistically significant difference between the answers provided by men and women ( $p > 0.05$ ).

**Fig. 4. Form of guidelines about hygiene maintenance of complete dentures and oral cavity given to the patients**



We presented to the attention of the inquired patients leaflet that contains information about the need to maintain the hygiene of the removable dentures and manners of cleaning and disinfecting them. The data related to this information show the following: 95.45% of the inquired persons believe that the issuance of guidelines in writing is useful and necessary; 90.91% learnt from the leaflet useful information about the maintenance of denture hygiene; 97.27% of the patients define the leaflet as understandable and without unclear terms.

To the question “Would you like to receive the information in digital pattern, for example as a file at your email?” 66.36% of the patients answered positively whereas the per cent of female is higher – 70.97%, compared to the one of men – 60.42%. Over half of all patients – 61.82% would like to review additional information on the topic concerning the maintenance of oral hygiene and denture hygiene, if the information contains links to similar contents online.

### Discussion:-

Most patients, around 70% are aware that it is preferable not to sleep with their dentures overnight. Almost 1/5 (20.91%) of the inquired patients wash their dentures only with water, whereas men prevail in this group – 29.17% compared to women – 14.52%, whereas the difference in data is statistically significant ( $p = 0.0418 < 0.05$ ). This is the only method about which we found statistically significant difference in the replies provided by men and women. Within the present research work we established that the preferred manner of maintaining the denture hygiene is washing with soap and water and toothbrush (32.73%), whereas data are similar to the ones reported by Aoun and Gerges, (2017) – 34.1%, and little bit lower than the ones of Baran and Nalçacı (2009) – 45.2%. Approximately equal is the share of those who use only water and soap and the ones that use water, soap and toothbrush, 29.09% and 32.73% correspondingly. Nevertheless, relatively low is the per cent of patients using toothbrush and toothpaste – 21.82%. Other authors report that this way is preferred by the patients and is being practiced by around 1/3 to 1/2 of the researched persons (Aoun et al., 2017; Cinquanta et al., 2021). We establish clearly outlined correlation between the choice of patients on the manner of hygiene maintenance of dentures and their education. Patients of higher education choose a method for washing the dentures with toothbrush and soap –  $r = 0.5754$  or with toothbrush and toothpaste:  $r = 0.4081$ .

The greatest share is the patients that clean their dentures once daily – 43.64%, thus confirming the results of similar research works reported by Aoun and Gerges (2017) and Sharma et al. (2020). Significant number of all patients – 38.18% implement standard for two-time denture washing – in the morning and in the evening. When it comes to analysing the data according to this indicator we also observe correlation – the patients of higher education choose at least two-time or more frequent denture washing –  $r = 0.5998$ .

Most patients (65.45%) are not aware of the need to disinfect their dentures and maintain their hygiene only with washing. Around 35% of the inquired persons use mainly effervescent tablets (23.63%), which they apply with varying frequency. Most of them are patients who use adhesives (22.73%) for denture retention. The use of

additional means for disinfection of complete dentures has the most clearly stated connection to patient's education:  $r = 0.6489$ .

Only 1/3 of the patients (31.81%) use means for maintenance of oral cavity hygiene whereas around 20% of them prefer mouthwash and around 10% of the patients choose homemade solutions. Probably the reason behind this choice is the lower price of the homemade means. It is worth mentioning that these means are being applied more often by women (38.71%) compared to men (22.92%), whereas the difference is statistically significant ( $p < 0.05$ ). This corresponds to the opinion of Baran and Nalçacı (2009) that hygiene maintenance of dentures could be influenced by person's sex.

It was established significant correlation between applying means for hygiene maintenance of oral cavity and patients' education –  $r = 0.6395$ . The established correlations confirm the opinion expressed by other authors (Bergdahl and Bergdahl, 2002) whereas education is the most significant factor that impacts patient's choice of the way of hygiene maintenance of complete dentures and oral cavity. In limitation of this research it wasn't established correlation between age of the patients and their choice regarding means for hygiene maintenance of dentures and oral cavity.

What impresses us is that many patients didn't receive guidelines about the hygiene maintenance of complete dentures. The per cent established by us - 42.73% are close to the data defined by Peracini et al. (2010) - 51.89% and by Marchini et al. (2004), yet these are significantly lower than the presented ones by Dikbas et al. (2006), according to whom 82.9% of patients have not been briefed. Most of the briefed persons received only guidelines orally. The provision of information in writing is rather an isolated phenomenon than a routine practice. Only 3 patients (2.73%) received information in e-pattern showing that the opportunities offered by modern digital technologies are not being taken advantage of in practice.

The results of correlative analysis of data show that there is moderate correlation between age of patients and their wish to receive guidelines about the maintenance of hygiene of mouth and dentures online –  $r = 0.4294$ . Similar degree of correlation –  $r = 0.4123$  is established between patients' age and their inclination to use internet resources for improving their awareness of the topics. Nevertheless, the high numbers of patients of the age above 60 are willing to receive additional information via online resources. Nowadays, irrespective of age, people use mobile devices and internet. Providing additional information via online resources could be a useful approach for instruction of the patients about oral hygiene.

### Conclusion:-

Within the range of this study we could conclude that significant numbers of patients are not aware of the optimal methods and means for maintenance of hygiene of the complete dentures and oral cavity. The age of patients is not determinative factor about the hygiene habits. The sex of patients can impact their choice of methods and frequency of hygiene procedures. The education is the more significant factor that impacts patient's hygiene habits than other subjective factors such as age and sex. Providing patients with information about hygiene care for dentures can be considered as additional influential factor. The opportunities digital technologies provide us with should be utilized in optimal manner when tutoring patients about the prevention of their oral health.

### Conflict of interest:

The author declares no potential conflicts of interest with respect to the research, authorship and publication of this article.

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