Assessment of denture hygiene habits among complete denture wearers attending Sulaimani Dental School

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Abstract

Background: The purpose of the study was to record self-reported hygiene habits and examine the influence of denture hygiene level on the prevalence and intensity of denture stomatitis and traumatic ulcers in the edentulous maxilla of older patients wearing a complete maxillary denture.

Materials and Methods: The study population comprised 38 maxillary complete denture (UCD) wearers (20 males and 18 females) aged 50–80 attending prosthodontics department of Sulaimani School of Dentistry. Denture hygiene habits were assessed and recorded. Biofilm on the internal surface of UCD was quantified using digital photos. Any relationships between denture hygiene habits, denture plaque and the condition of oral tissue were assessed.

Results: Of the participants, 94.7% cleaned their dentures with a toothbrush and 50% of them used toothpaste as cleaning method. The majority of them did not remove their dentures overnight and knew nothing about chemical denture cleansers for denture immersion. Only 26.3% of participants received instruction about denture and oral care from their dentists. Stomatitis was observed in 68.4% and traumatic ulcers in 18.4% of participants. A positive relation was observed between overnight removal of the denture and the presence of denture-related stomatitis. Data was analyzed using Chi-square test ($P < 0.05$).

Conclusion: The degree of denture hygiene was significantly associated with sex, education, and overnight denture removal. No significant relation was found between denture plaque and denture stomatitis. Participants surveyed had limited awareness of denture hygiene care.

***Keywords:** denture hygiene, denture stomatitis, denture plaque, brushing, overnight removal*

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Introduction:

The proportion of aging population continues to grow worldwide, especially in developing countries (1). The number of elderly patients requiring dentures has increased over the past years with the increase in life expectancy (2). Complete dentures are the most common treatment for patients with total teeth loss to improve the quality of life and restore function. The success of rehabilitative treatment mainly depends on patients' motivation, precise prosthesis aftercare and hygiene level (3). The dentist should follow up their patients in initial adjustment and aftercare and should give them thorough instructions regarding denture cleansing and wearing habits.

Inadequate denture hygiene combined with aging physiological changes has substantial negative effect on supporting tissues of the oral mucosa and may further impair the function of removable prostheses. The biofilm accumulation and colonization of the intaglio surface of prostheses by microorganisms provoke the prevalence of denture-related stomatitis (4, 5).

Plaque control by regular oral and denture hygiene procedures play a major role in the maintenance of oral health and the long-term health of removable prosthesis(6). The variation in oral hygiene habits and attitudes among individuals may be related to a number of factors such as education, gender, social status or age (7).

Daily hygiene has been reported to be the main means of preventing mucosal inflammation (8). Complete denture biofilm can be removed by mechanical and chemical methods. The commonest method is brushing with conventional and specific dentifrices(9), while chemical cleansing was found by some researchers to be superior to brushing alone for denture plaque control(5,6) and treatment of prosthesis-related stomatitis(10). In contrast, other study suggested that brushing is better than the chemical method of removing denture plaque (11).

Other denture hygiene behavior, which could adversely affect the prosthesis hygiene level and associated with denture-related lesions, is keeping dentures at night (12). Studies by Barbosa et al. (13) and Peracini et al. (9) found that 64% and 58% respectively slept with their dentures. In contrary others found only 9.2% slept with their denture (14). The difference in the findings could be attributed to variance in oral hygiene instructions given by the dentists (15).

Denture-induced stomatitis is the most common oral fungal infection among elderly denture wearer (16). It has been found to develop in between 25% and 67% of denture wearers (3). The frequency of denture stomatitis

is greater amongst women than men, and it has also been found to increase with age (17). Many factors have been anticipated in the development of denture stomatitis, including neglecting of denture hygiene(18-20), the age of the prosthesis(4), wearing complete dentures at night(17,21), traumatic occlusion(5), tobacco and alcohol consumption(22), irradiation and oral dryness(4,5.21).

The role of stomatitis disease found to be related to the pathogenesis of Candida biofilm, which assists the survival of fungal cells and contributes to the disease process (23, 24). Different clinical presentations of denture stomatitis could also contribute to the host immune response (25, 26). Many classifications have been proposed to assess the clinical forms, with Newton's classification being the most generally accepted (27).

Other denture-related lesions, namely, traumatic ulcers, could present among elderly denture wearers (3.9 to 29%) (2,3,17,18,28,29). Traumatic ulcers develop within 1-2 days after the insertion of dentures, but may also be found in subjects with old, ill-fitting dentures, overextended or unbalanced occlusion(3).

The purpose of this study was to evaluate the denture hygiene level and to analyze the behaviors and hygiene habits of maxillary complete denture patients in the local population of Sulaimani city. Furthermore, the study explored any possible relationships between these habits and oral mucosa conditions.

Materials and methods:

A total of 38 maxillary complete denture (UCD) wearers (20 men and 18 women, aged 50 to 80 years) participated in this study. They were attending prosthodontics department at Sulaimani School of Dentistry, Kurdistan region of Iraq. All UCDs were made from heat cure acrylic, full palatal coverage, without fracture or repair. This study was approved by the Medical Ethics Committee, Faculty of Dentistry, University of Sulaimani.

A questionnaire sheet was applied for each participant and filled personally by the interviewer. The questionnaires were used to collect socio-demographic data (age, sex, level of education), self-reported general

health data (good, moderate or poor)(1), and behavioral data, such as smoking status (non-smoker/ex-smoker/smoker). Dental status was specified as UCD against lower complete denture (C/C), UCD against natural teeth (C/N) and UCD against lower partial denture (C/P). The Prostheses were classified by the time of wearing: Group 1: 0–5 years; Group 2: 6–10 years; Group 3: 11 years or longer. The questionnaire also noted whether there had been any instructions regarding denture hygiene from the dentist (received or not). Denture hygiene materials and methods (cleaning, immersion) and wearing habits (overnight removal) were also recorded. In addition to the condition of denture level: good: 0.01-25.49% biofilm area covering the intaglio surface of the maxillary denture, fair: 25.50-50.49%, poor: 50.50-75.49% and very poor (V. Poor): 75.50-100% (Table 1).

Oral hygiene habits were obtained through structured interviews conducted immediately before the clinical examination. The clinical examination for the prevalence of oral mucosal lesions and denture hygiene level was specified to the UCD. The prevalence of the Denture stomatitis (according to Newton's classification)(27): Type I (localized inflammation or hyperemia), Type II (medium/high-intensity inflammation), or Type III (papillary hyperplasia of the palate). The presence of local traumatic ulcers was also reported in this study.

To quantify the denture biofilm, the internal surfaces of UCD were dyed with methylene blue disclosing solution (FDC Blue #1, 0.25% in deionized water) for 2 minutes. The surfaces were then rinsed with water, allow to dry and photographed (digital camera: Sony DSC-HX1

Digital STILL, Tokyo, Japan) with standard film-object distance. Photographs were transferred to a computer, and the total surface area of the intaglio surface of the UCD and areas corresponding to the stained region were measured using image processing software (Image J, Image Processing and Analysis in Java; US National Institutes of Health)(30) (Figure 1). The Biofilm percentage was calculated using the relation between biofilm area and total surface area of the denture's internal base (total plaque/total denture surface)(31,32).

The data were analyzed by using SPSS 16.0. A Chi-squared test was performed to evaluate statistical significance between the variables. A level of $p < 0.05$ were considered to be statistically significant.

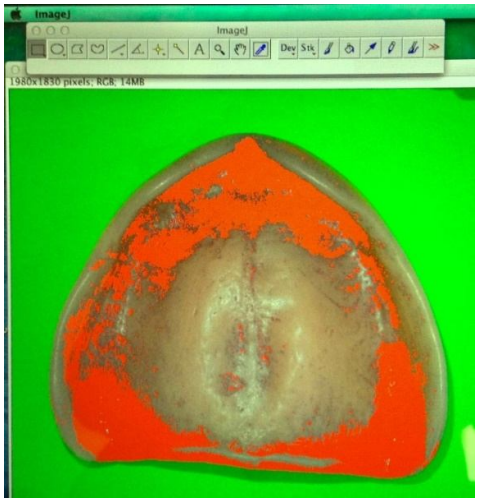

Figure 1: Stained regions were measured using image-processing software (Image Tool 2.02)

Results:

Socio-demographic characteristics and self-reported general health status of participants, as well as denture hygiene, are shown in Table 1. 52.6% of total participants were age 60-69 (55% males, 45% females). 29% were over 70 (54.5% males, 45.5% females). More than half of participants were illiterate; females were significantly more affected than males, with 71.4% receiving a lower level of education and therefore a higher rate of illiteracy. Only 4% of participants were secondary school graduates.

In term of overall self-reported general health, 63.2% considered themselves having moderate to poor general health. There was a significantly higher percentage of male smokers compared to females (66.7% current smokers and 77.3% of ex-smoker). The majority of participants had both upper and lower complete dentures

(73.7%). The remaining patients had upper complete denture against either partial denture or natural teeth. Patients were grouped by the age of denture prostheses, as follows: Group 1 (1– 5 years): 20 patients; Group 2 (6–10 years): 10 patients; Group 3 (11 years or older): 8 patients. Twenty-eight patients (73.7%) declared they had not been given instructions about denture cleansing and oral care, while the minority of interviewees (26.3%) stated that they had been given such instructions. About (94.7%) used a toothbrush and only two participants used a hard sponge to clean their dentures. Half of those who used a toothbrush reported brushing with toothpaste, other cleansing combinations were also reported, such as ordinary soap (28.9%), sodium hypochlorite (2.6%).

The majority of subjects cleaned their dentures twice a day (63.1%). Only 39.5% removed their dentures overnight, with female participants immersing their dentures in water significantly more than their male counterparts. The use of other products for immersion

like sodium hypochlorite was almost nil; with only one participant (2.6%) using such products. 18 of participants (47.4%) kept their dentures dry without any immersion.

Denture hygiene was rated as “good” for 9 participants (23.7%), “fair” for 18 (47.4%), “poor” for 9 (23.7%) and “very poor” for 2 (5.3%). Males had a significantly lower biofilm coverage area than female subjects.

Relationships between denture hygiene and age, sex, education, self-reported general health status, smoking status, denture wear and denture hygiene are shown in Table 2. Significant correlation was found between denture hygiene and sex of participant (females had significantly poorer denture hygiene), education status in addition to overnight removal ($p < 0.05$).

Stomatitis was observed in 26 participants (68.4%), and traumatic ulcers were observed in 7 participants (18.4%) (Table 3). There was no significant correlation found between different variables except denture stomatitis with wearing the denture at night and traumatic ulcer among current smokers ($p < 0.05$).

Discussion:

Many studies have been undertaken to highlight the needs for improving the oral health of older people particularly for those who wear removable prosthesis as the poor denture hygiene has been found to be an important factor in denture stomatitis (19).

Present results demonstrate that only two factors of socio-demographic parameters are significantly correlated with biofilm coverage area, namely, gender and education. Other parameters: age, self-reported general health, smoking, dental status and years of current UCD, showed no significant association. This was an unexpected finding, as long as age-related changes were apparently involved with denture hygiene status(31).

It was found that most of the subjects did not receive guidance regarding oral hygiene practices(15,20,33), did not usually remove their dentures at night(9,13) and almost none of the subjects knew about the use of chemical denture cleansers. Although they cleaned their dentures with reasonable frequency, most dentures were rated as a fair and poor condition. A significant \orrelation was found between denture plaque coverage area with overnight denture wearing(34).

A previous study suggested that brushing is better for the removal of denture biofilm than chemical methods(11). Accordingly, the most commonly

performed denture hygiene practice in this study was brushing (98%)(4).

Chemical denture cleaning products could be an important alternative to mechanical cleaning, especially for elderly patients and for those who lack manual dexterity(8). Moreover, they could be more effective than brushing indenture biofilm control(18). Nevertheless, the combination of mechanical and chemical methods may produce better results than using one method(31). However, the participants in this study did not use any chemicals for cleaning dentures, except one, who used sodium hypochlorite.

The immersion of dentures in chemical cleansing solutions was completely negligent, and the results were in contrast with the other study(13). The diminish in using chemical cleansing solutions could be attributed

to the lack of availability and advertising of products for denture care or due to the high cost of solutions.

Despite the more common brushing in elderly females compared to males, denture plaque ratio was considerably higher in females. The significantly higher educational status of males could be a possible reason to improve their knowledge and practices regarding denture hygiene(20).

Regarding the denture hygiene status, this study found a poor and very poor degree of denture hygiene (29%) among patients, a lower percentage findings of other studies conducted by Baran and Nalcaci (42.6%)(2), and Knabe C, Kram (55%)(28).

The prevalence of stomatitis in the current sample was apparently high, with no significant differences between males and females(23). Denture stomatitis was significantly associated with continuous wearing of dentures ($p < 0.05$) similar to other studies (13,17), but it contrasts with the other(25). A possible reason for the use of the dentures during the night could be the presence of a partner(25).Other studies have shown denture stomatitis to be associated with poor denture hygiene habits(2,20,21), low education, tobacco and alcohol use(22). Similarly, this study found denture-related lesions to be more frequent with fair denture hygiene, amongst patients with lower levels of education and amongst smokers. Stomatitis was also seen more in those who claimed not to have received denture hygiene instruction (73.7%) and this result was in accordance with other studies(15,20,33). The importance of these instructions cannot be overstated and if correctly given, would very likely contribute greatly to the reduction of clinical signs of denture stomatitis lesions(19).

Although with increased denture plaque ratio, denture stomatitis appeared more frequently, there was no significant relation between them, unlike other studies(2,20). This insignificant correlation could be due to several factors: the method in rating denture plaque which used in this study give area rather than thickness, there was no indication about the pathogenesis of the plaque which play an important role in denture stomatitis(23,24), in addition to the role of the body's immunity in reducing denture stomatitis(25,26).

Previous studies found the prevalence of denture related lesions, including traumatic ulcers rating from 3.9% to 29%(2,3,17,18,28,29). The prevalence of traumatic ulcer in current study was low (18.4%) and significantly frequent among smokers(35).

Table 1. Distribution of socio-demographic parameters, individual behavior and UCD hygiene level of participants, by sex, n (%)

Parameters		Males (n=20)	Females (n=18)	*P*	Total (n=38)
Age group (years)	50-59	3 (42.9%)	4 (57.1%)		7 (18.4%)
	60-69	11 (55%)	9 (45%)		20 (52.6%)
	70^{+}	6 (54.5%)	5 (45.5%)		11 (29%)
Education	Illiterate	6 (28.6%)	15 (71.4%)	<0.05	21 (55.3%)
	Primary school	11 (84.6%)	2 (15.4%)		13 (34.2%)
	High school	3 (75%)	1 (25%)		4 (10.5%)
Self-reported general health	Good	8 (57.1%)	6 (42.9%)		14 (36.8%)
	Moderate	9 (56.2%)	7 (43.8%)		16 (42.1%)
	Poor	3 (37.5%)	5 (62.5%)		8 (21.1%)
Smoking	Never smoke	1 (7.7%)	12 (92.3%)	<0.05	13 (34.2%)
	Ex-smoker	17 (77.3%)	5 (22.7%)		22 (57.9%)
	Current smoker	2 (66.7%)	1 (33.3%)		3 (7.9%)
Dental/Denture status	C/C	13 (46.4%)	15 (53.6%)		28 (73.7%)
	C/N	5 (71.4%)	2 (38.6%)		7 (18.4%)
	C/P	2 (66.7%)	1 (33.3%)		3 (7.9%)
Years of current UCD wearing	1-5 y	12 (60%)	8 (40%)		20 (52.6%)
	6-10 y	5 (50%)	5 (50%)		10 (26.3%)
	11^{+} y	3 (37.5%)	5 (62.5%)		8 (21.1%)
Receive instructions	Yes	5 (50%)	5 (50%)		10 (26.3%)
	No	15 (53.6%)	13 (46.4%)		28 (73.7%)
Brushing habits	Toothbrush + water	2 (40%)	3 (60%)		5 (13.2%)
	Toothbrush + paste	8 (42.1%)	11 (57.9%)		19 (50%)
	Toothbrush + soap	8 (72.7%)	3 (27.3%)		11 (28.9%)
	Toothbrush + others	1 (100%)	0		1 (2.6%)
	Other than brushing	1 (50%)	1 (50%)		2 (5.3%)
Brushing frequency	Very seldom	8 (88.9%)	1 (11.1%)		9 (23.7%)
	Once a day	2 (40%)	3 (60%)		5 (13.2%)
	Twice a day	10 (41.7%)	14 (58.3%)		24 (63.1%)
Overnight removal	Removed	8 (53.3%)	7 (46.7%)		15 (39.5%)
	Not removed	12 (52.2%)	11 (47.8%)		23 (60.5%)
Immersion materials	Water	6 (31.6%)	13 (68.4%)	<0.05	19 (50%)
	Chemicals	1 (100%)	0		1 (2.6%)
	No immersion	13 (72.2%)	5 (27.8%)		18 (47.4%)
Denture hygiene	V. Poor (75.50-100%)	1 (50%)	1 (50%)	<0.05	2 (5.3%)
	Poor (50.50-75.49%)	1 (11.1%)	8 (88.9%)		9 (23.7%)
	Fair (25.50-50.49%)	14 (77.8%)	4 (22.2%)		18 (47.4%)
	Good (0.01-25.49%)	4 (44.4%)	5 (55.6%)		9 (23.7%)

Table 2. Distribution of degree of denture hygiene, by age, sex, education, self-reported general health, smoking status, denture wear, receiving instructions and hygiene habits

Characteristics		Denture hygiene				Total
		V. Poor	Poor	Fair	Good	
Age	50-59	0	1	6	0	7
	60-69	0	4	9	7	20
	70+	2	4	3	2	11
Sex*	Male	1	1	14	4	20
	Female	1	8	4	5	18
Education*	Illiterate	2	9	7	3	21
	Primary school	0	0	9	4	13
	High school	0	0	2	2	4
Self-reported general health	Good	1	2	7	4	14
	Moderate	1	4	6	5	16
	Poor	0	3	5	0	8
Smoking	Never smoke	0	5	5	3	13
	Ex-smoker	2	4	12	4	22
	Current smoker	0	0	1	2	3
Dental/Denture status	C/C	2	9	12	5	28
	C/N	0	0	4	3	7
	C/P	0	0	2	1	3
Years of current UCD wearing	1-5 y	0	3	12	5	20
	6-10 y	1	2	5	2	10
	11+ y	1	4	1	2	8
Receive instructions	Yes	0	2	5	3	10
	No	2	7	13	6	28
Brushing habits	Toothbrush + water	0	2	2	1	5
	Toothbrush + paste	1	3	9	6	19
	Tooth brush + soap	1	3	5	2	11
	Tooth brush + others	0	1	0	0	1
	Other than brushing	0	0	2	0	2
Brushing frequency	Very seldom	0	2	6	1	9
	Once a day	0	1	1	3	5
	Twice a day	2	6	9	7	24
Overnight removal*	Removed	0	5	6	4	15
	Not removed	2	4	12	5	23
Immersion materials	Water	1	7	5	6	19
	Chemicals	0	1	0	0	1
	No immersion	1	1	13	3	18

* $P<0.05$.

Table 3. Differences between denture stomatits and traumatic uclers with socio-demo-graphic characteristic, denture wearing receiving instructions, oral and denturehygiene habits

Parameters	Denture stomatitis		Newton's Classification			Ulcer	
	No	Yes (%)	I	II	III	No	Yes
Age							
50-59	3	4 (57.1)	3	1		7	0
60-69	6	14 (70)	10	4			5
70^{+}	3	8 (72.7)	4	4		9	2
Sex							
Male	9	11 (55)	6	5			4
Female	3	15 (83.3)	10	4	1	15	3
Education							
Illiterate	5	16 (76.1)	11	4	1	19	2
Primary school	5	8 (61.5)	4	4		8	5
High school	2	2 (50)	2			4	0
Self-reported general health							
Good	6	8 (57.1)	5	2	1	13	1
Moderate	4	12 (75)	8	4		12	4
Poor	2	6 (75)	3	3		6	2
Smoking						*	
Never smoked	6	7 (53.8)	5	2		12	1
Ex-smoker	6	16 (72.7)	9	5		19	3
Current smoker	0	3 (100)	1	2		0	3
Dental/Denture status							
C/C	7	21 (75)	12	8	1	24	4
C/N	3	4 (57.1)	3	1		5	2
C/P	2	1 (33.3)	1	0		2	1
Years of current UCD wearing							
1-5 y	6	14 (82.3)	8	5	1	16	4
6-10 y	3	7 (70)	5	2		8	2
11^{+} y	3	5 (62.5)	3	2		7	1
Receive instructions							
Yes	4	6 (60)	4	2		9	1
No	8	20 (71.4)	13	6	1	22	6
Brushing habits							
Toothbrush + water	1	4 (80)	3	1		4	1
Toothbrush + paste	6	12 (66.6)	9	2	1	14	5
Toothbrush + soap	5	6 (54.5)	3	3		10	1
Others	0	1 (100)	0	1		1	0
No brushing	0	2 (100)	1	1		2	0

Brushing frequency							
Very seldom	7	2 (22.2)	1	1		6	3
Once a day	2	3 (60)	1	2		3	2
Twice a day	10	14 (58.3)	11	2	1	22	2
Overnight removal	*						
Removed	6	9 (60)	7	2		12	3
Not removed	6	17 (73.9)	9	7	1	19	4
Immersion							
Water	8	11 (57.8)	8	2	1	16	3
Chemicals	1	0 (0)	0	1		1	0
No immersion	3	15 (83.3)	8	6		14	4
Denture hygiene							
V.Poor (75.50-100%)	1	1 (50)	1			2	0
Poor (50.50-75.49%)	2	7 (77.7)	3	4		7	2
Fair (25.50-50.49%)	6	12 (66.6)	8	3	1	16	2
Good (0.01-25.49%)	3	6 (66.6)	4	2		6	3

*; P<0.05.

Conclusion:

Within the limitations of this study, the results show a lack of association between denture hygiene and studied socio-demographic factors, except for gender and education. Nor was there an association between other important oral health behaviors except with overnight removal.

Denture biofilm does not seem to influence stomatitis, but overnight denture wearing does influence it. On the other hand, smoking stimulates traumatic ulcer. Participants surveyed had limited awareness of denture hygiene care. Complete denture wearers need improved guidelines regarding denture use and hygiene care. Dentist participation is, of course, essential to control the local factors triggering stomatitis related to wearing dentures so that the treatment will be successful and the oral health of the elderly patient and their quality of life could be improved.

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