DENTURE-RELATED ORAL LESIONS AMONG COMPLETE DENTURE WEARERS IN A MOROCCAN DENTAL DEPARTMENT: A DESCRIPTIVE STUDY

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ABSTRACT

Objective: Denture-related oral lesions (DROL) are particularly common among completely edentulous patients. These oral lesions can be a source of complaints for denture wearers. Aim: The objective of this descriptive study was to determine the prevalence of oral lesions related to wearing of complete removable dentures among complete edentulous patients, and to assess risk factors associated with the occurrence of these oral lesions.

Research Method: A questionnaire was drawn up. Statistical analysis was performed using Jamovi software for Windows version 13.0. The charts were made using Microsoft Office Excel. The univariate logistic regression analysis explores each risk factor separately, and then the multivariate analysis was made to analyze all the qualitative variables. The α risk was set at 5%, so any value of $p<0.05$ was considered statistically significant.

Findings: The prevalence of DROL was 60,61% among complete denture wearers(40/66), with denture stomatitis being the most frequent (50%), followed by hyperplasia, epulis and ulcers (17.5%), flabby ridge (12.5%), and angular cheilitis (5%). Logistic regression identified continuous denture wearing (adjusted OR = 88.24; 95% CI: 4.40–1768.96; $p = 0.003$) and tobacco use (adjusted OR = 176.09; 95% CI: 9.07–3416.08; $p < 0.001$) as the most significant risk factors. Poor prosthetic hygiene, sex and salivary flow were not significantly associated with DROL ($p > 0.05$).

Originality: Denture stomatitis was the most common oral lesion among complete denture wearers. Major risk factors included poor denture hygiene, tobacco use, and overnight denture wear. Enhancing hygiene practices and reducing both tobacco use and continuous denture wearing could significantly improve oral health in denture wearers.

Keywords: Moroccan Dental Department, Oral Lesions, Denture Wearers

1. INTRODUCTION

Oral health is an important aspect of quality of life in completely edentulous patients, as it affects not only their nutrition but also their psychological well-being, social interactions, and general health (Budtz-Jorgensen, 1983). The use of ill-fitting dentures is a major risk factor for compromised oral health and is frequently associated with denture-related oral lesions (DROL) (Jainkittivong et al. 2002; Peltola et al. 2004). These mucosal lesions are associated with several etiological factors, including poor oral and denture hygiene, continuous denture wearing, decreased vertical dimension, unstable occlusion, and ill-fitting dentures associated with traumatic injuries. Other factors include the patient's age, denture quality and fit, and the quantity and consistency of saliva. Moreover, systemic conditions such as tobacco

use, chronic diseases and medication use, hormonal or neurological disorders, and nutritional deficiencies may further exacerbate the development of these oral lesions (Bukhari et al. 2020; Martori et al. 2014). A cross-sectional study conducted in Spain identified general and local risk factors related to denture wearing in elderly individuals. Denture stomatitis was associated with low salivary pH and regular sugar consumption, while angular cheilitis correlated with age, complete edentulism, oral Candida presence, lack of denture stability, and reduced occlusal vertical dimension. The presence of traumatic ulcers was linked to a resorbed residual alveolar ridge (Martori et al. 2014). Similarly, a Brazilian cross-sectional study examining the prevalence of maxillary denture-related lesions highlighted key risk factors, including night-time denture use, inadequate cleaning, and biofilm accumulation, all of which showed statistically significant associations with oral lesions. Additionally, systemic factors such as male gender were associated to a higher prevalence of these lesions among complete denture wearers (Brantes et al. 2019).

The use of ill-fitting complete removable dentures in elderly patients is recognized as a potential risk factor for various oral lesions, including denture stomatitis, epulis fissuratum, angular cheilitis, papillary hyperplasia, and traumatic ulcers. In some cases, wearing ill-fitting dentures has even been associated with the development of oral squamous cell carcinoma (OSCC). These lesions can contribute to denture instability and patient discomfort, significantly impacting oral function and prosthetic adaptation.

Prevalence of a disease is one of the most important data on the determinants of this disease. Previous studies have highlighted the high prevalence of denture-related oral lesions among denture wearers and their associated risk factors (Martori et al. 2014; Brantes et al. 2019; Baran et al. 2009). However, limited research has been conducted in Morocco to assess the prevalence of these lesions among complete denture wearers, making our study particularly relevant. By investigating the prevalence and risk factors associated with these lesions, our study aims to contribute to improved early diagnosis, prevention strategies, and targeted treatment approaches. Therefore, the objective of this study is to determine the prevalence of oral lesions related to the use of removable complete dentures and to identify the key risk factors contributing to their development.

2. MATERIALS AND METHODS

This study was conducted among removable complete denture wearers at the Removable Prosthodontics Service of the Ibn Sina University Hospital Center, in Dental Consultation and Treatment Center in Rabat-Morocco, over a period of five months. The study included patients who sought consultation or treatment during this timeframe.

This study was taken as a part of a standard clinical examination and was conducted in accordance with the Helsinki agreement for research on humans. All participants provided written informed consent before enrollment. Participants who did not wish to undergo or were unable to undergo an oral and clinical examination were excluded from this study. Both general medical and dental histories of the participants were recorded, and each participant completed a self-administered questionnaire. Subsequently, all participants underwent clinical and oral examinations. Prior to the examination, the investigator explained the study's objectives and the significance of oral diseases associated with complete dentures to each participant. Written instructions on oral and denture hygiene practices were also provided.

The collected data included socio-demographic information such as age, sex, level of education, general health status, and medical history. Behavioral data, including the number of prescribed medications, smoking habits, and alcohol consumption, were also recorded. The evaluation of existing prostheses included an assessment of denture quality, peripheral border limits, occlusion, retention, stability, frequency of denture use, and hygiene practices. Intraoral examinations were performed to assess

the quality of the residual alveolar ridge based on Atwood's classification, as well as the condition of the soft tissue covering the alveolar bone.

Eligible participants were individuals aged 18 years or older, of both sexes, who had been wearing a complete removable denture in both arches for more than one year.

Exclusion criteria included patients wearing partial removable dentures or a single-arch complete removable denture, as well as those with systemic conditions affecting oral health, such as diabetes, corticosteroid inhaler use, or immunocompromised status. Additionally, individuals who had recently started using new dentures or were undergoing antifungal or long-term antibiotic therapy were also excluded.

All participants underwent a detailed clinical examination of oral lesions, assessing their number, location, size, morphology, and type. Diagnosis was based on patient history, clinical observation of lesion morphology, and lesion characteristics and behavior. Developmental anomalies and malignant conditions were excluded from the study. Initial diagnoses of oral lesions were made through clinical observation, and in cases of uncertainty, a biopsy was performed for confirmation.

The sample size calculation was initially estimated at 385 using the standard sample size estimation formula:

$$N = \frac{z^2 \times p \times (1-p)}{e^2}$$

where:

N = Sample size.

Z = 1.96, corresponding to a 95% confidence level.

p = 0.5, as the standard deviation.

e = 5%, representing the margin of error.

However, due to the limited number of edentulous patients wearing old complete removable dentures and limited duration of the study, only 157 edentulous patients were examined. Among them, just 66(43 women and 23 men) denture wearers met the eligibility criteria and were ultimately included in the final sample.

The small sample size and limited study duration constrained the assessment of oral lesions that may develop over time. Moreover, additional variables, such as denture wear frequency, hygiene practices, denture material composition, and underlying medical conditions may have influenced the outcomes. To address these limitations, further cross-sectional studies are recommended to provide a more comprehensive understanding and accurate outcomes.

3. STATISTICAL ANALYSIS

Statistical analyses were conducted using Jamovi Statistical Software, version 13.0. Binomial logistic regression was employed to explore the association between independent variables and the presence of denture-related oral lesions.

The Chi-square test (x^2) was used to compare qualitative variables such as sex, tobacco use, and prosthetic hygiene, while the Student's t-test was applied to quantitative variables, including salivary flow and denture wearing frequency. A univariate logistic regression was first performed to assess each risk factor individually, and then the multivariate logistic regression was employed to identify independent predictors while adjusting for confounding variables. Results were expressed as odds ratios (OR) with 95% confidence intervals (CI). A p-value < 0.05 was considered statistically significant.

4. RESULTS

Among the 157 participants invited to take part in this study, 91 were excluded. Of these, 57 were not denture wearers, while 34 were using either a single-arch complete removable denture or a removable partial denture. Consequently, 66 participants wearing old removable complete dentures in both arches were included in this study.

Among the included participants, 40 patients (60.61%) had denture-related oral lesions, whereas 26 patients (39.39%) did not present any lesions associated with denture use. Detailed characteristics of the study population, including sex, age, general health, medical treatment, intellectual level, reason for consultation, patient satisfaction, prosthetic hygiene, and denture stability, are summarized in Table 1.

Table 1: Characteristics of study population

Characteristics of population	**Sample size ***
Sex	
Female	43 (65.2)
Male	23 (34.8)
Age **	61.2±8.35
General health	
Healthy	40 (60.6)
Unhealthy	26 (39.4)
Oral lesion	
Yes	40 (60.6)
No	26 (39.4)
Tobacco	
Yes	30 (45.5)
No	36 (54.5)
Intellectual level	
Primary school	21 (31.8)
Secondary school	11 (16.7)
University school	3 (4.5)
Illiterate	31 (47.0)
Consultation reason	
Pain	46 (69.6)
Aesthetic deficit	12 (18.1)
Defective prosthesis	8 (12.3)
Oral hygiene	
Sufficient	62 (93.9)
Unsufficient	4 (6.1)
Prosthetic hygiene	
Sufficient	4 (6)
Insufficient	62 (94)
Prosthetic stability	
Sufficient	19 (27.3)
Insufficient	47 (63.6)
Lateral edge situation	
Underextended	18 (27.3)
Correct	42 (63.6)
Overextended	6 (9.1)
Lateral edge thickness	
Thin and sharp	21 (31.8)
Correct	34 (51.5)
Thick	11 (16.7)
Vertical dimension of occlusion	
Underestimated	24 (36.4)
Correct	35 (53.0)
Overestimated	7 (10.6)

Salivary flow	
Low	16 (24.2)
Normal	44 (66.7)
Abundant	6 (9.1)
Denture wear	
Continuous	30 (45.5)
Discontinuous	36 (54.5)
Patient satisfaction	
Satisfied	16 (24.6)
Dissatisfied	49 (75.4)

The prevalence of denture-related oral lesions among complete denture wearers was 60.61% (40 patients), while 39.39% (26 patients) did not exhibit any such lesions. The most observed lesion was denture stomatitis, affecting 50% of the participants (20 patients). Among them, 13 patients had type I, 4 patients had type II, and 3 patients had type III denture stomatitis. The prevalence of hyperplasia, epulis, and ulcerations was 17.5%, while flabby ridge was observed in 12.5% of cases. The lowest prevalence was recorded for angular cheilitis (5%) as shown in Figure 1.

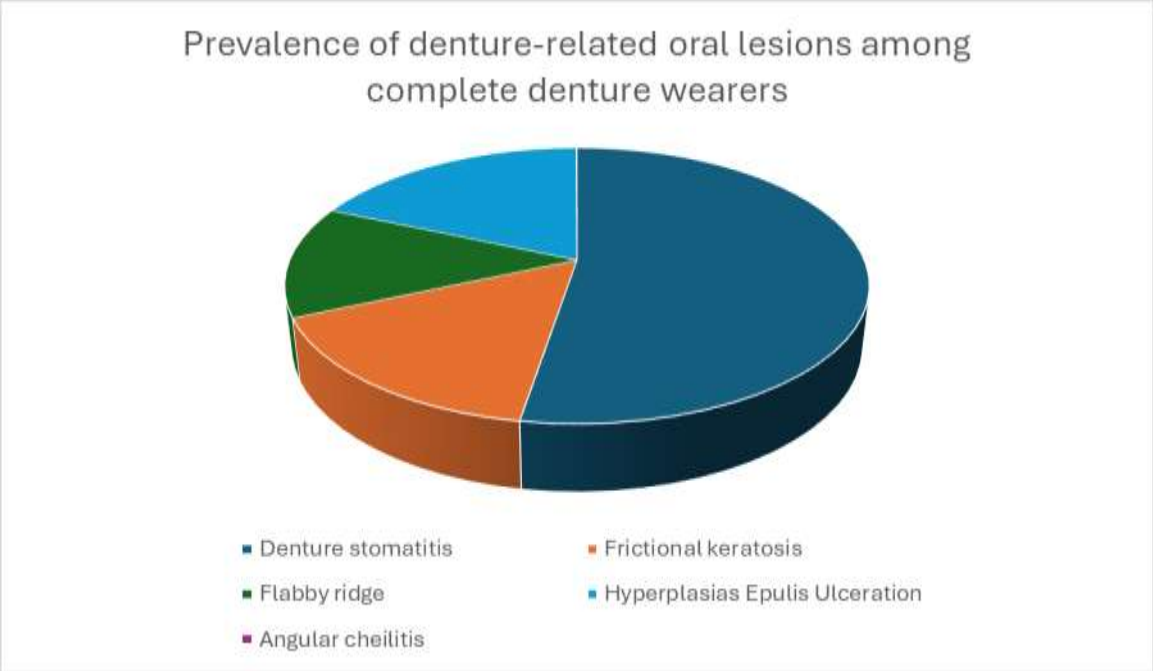

Figure 1: Prevalence of denture-related oral lesions among complete denture wearers

Due to the small sample size, we have chosen five qualitative variables (Sex, salivary flow; tobacco, prosthetic hygiene, denture wearing frequency) associated to the presence or not of oral lesions, using binomial logistic regression analysis, with a confidence interval of 95%. The univariate analysis has shown that continuous denture wearing and Tobacco, as risk factors, were the most statistically significant with a p value⩽0,001(CI: 2,93-35,57/5,89-82,1); OR brut: 10,21/22). The evaluation of the sex and salivary flow to the presence or not of the denture-related oral lesion had not shown a statistically significant result (p>0,05). The multivariate analysis of associated risk factors (salivary flow, tobacco, poor prosthetic hygiene, continuous denture wearing) confirmed the same results of the univariate analysis and had shown that Tobacco and continuous denture wearing were the most statistically significant. Hence, they can be considered as risk factors for the development of denture-related oral lesions among complete denture wearers as presented in Table 2.

Table 2: Univariate and multivariate analysis of probable factors in denture-related oral lesions

Variables	Univariate analysis			Multivariate analysis		
	OR brut	CI 95%	p value	OR adjusted	CI 95%	p value
Sex	1.35	0.47- 3.83	0.57			
Salivary flow Abundant- low	0.64	0.09-4.58	0.65	4.77	0.16-140.64	0.36
Tobacco	22	5.89-82.1	0.001	176.09	9.07-3416.08	<0.001
Prosthetic hygiene Bad	11.62	1.06-127.24	0.04	15.78	0.85-292.28	0.06
Denture wearing frequency Continuous	10.21	2.93-35.57	<0.001	88.24	4.40-1768.96	<0.003
OR : Odds ratio, CI : confidence interval						

5. DISCUSSION

Oral health is a crucial component of an individual's quality of life, particularly in the elderly. The elderly edentulous population is at a higher risk of developing oral mucosal lesions compared to younger individuals due to age-related changes in the oral mucosa. The oral epithelium has been reported to be thinner with connective tissue descending of collagen synthesis resulting in decreased of tissue regeneration and resistance to microbial and traumatic factors (Jainkittivong et al. 2002; Ribeiro et al. 2005). A decrease in the protective functions of the oral mucosa increases vulnerability to pathogens and harmful substances and contribute to the development of oral pathological lesions. These oral mucosal lesions can still significantly impact patients' quality of life by causing difficulties in chewing, swallowing, and speaking, ultimately leading to functional and psychosocial impairments (Villanueva-Vilchis et al. 2016). Therefore, wearing ill-fitting removable complete dentures can lead to alterations in the oral mucosa of edentulous patients. Based on the etiological factors, denture related-oral lesions can be categorized into infectious and inflammatory lesions (denture stomatitis, angular cheilitis), traumatic lesions (traumatic ulcer, epulis fissuratum, fibrous and papillary hyperplasia), allergic lesions (allergic contact stomatitis) and malignant lesion (oral squamous cell carcinoma) or potential premalignant lesions (Oral Leukoplakia and Erythroplakia) (Budtz-Jorgensen 1981; Jainkittivong et al. 2010; Dorey et al. 1985).

The prevalence of oral mucosal lesions in complete denture wearers has been extensively studied by various researchers (Jainkittivong et al. 2002; Atashrazm et al. 2013; Shah & Ahmad, 2011). In our study, the prevalence of oral lesions among complete denture patients was found to be 60.61% (n=40). An other study has reported a prevalence of 76% of oral lesions in complete denture wearers (Sghaireen 2015). The prevalence of denture stomatitis varies from 25-65% depending on the geographic variation, the population studied, sample size selection and methodology. In the present study, denture stomatitis was the most common lesion, affecting 50% of the participants (n=20). Among them, 13 patients presented with Newton type I denture stomatitis, 4 patients had Newton type II, and 3 patients exhibited Newton type III denture stomatitis (Table 2). This was quite higher than the findings of Atashrazm et al (2005) reporting a prevalence of 36% in Iranian population, and that of Sghaireen (2015) in Saudi Arabia noticed a prevalence of 41% of oral lesions. Also, Shah et al (2011) reported a prevalence of 30% of Newton type 1 denture stomatitis,

18% type 2 and 21% type 3 denture stomatitis in the elderly population of Pakistan. The etiological factors of denture stomatitis include denture-induced trauma, continuous denture wear, and poor oral and denture hygiene, often accompanied by a superimposed Candida albicans infection. Poor denture hygiene, continuous denture use, and certain drug therapies, particularly antibiotics and steroids, can contribute to an increased prevalence of yeast infections (Atashrazm et al 2005; Budtz-Jorgensen et al. 1970). In elderly patients, conditions such as stroke and other disabilities may further impair their ability to maintain proper denture hygiene, increasing the risk of infection (Shah et al 2011; Budtz-Jorgensen et al. 1970). This affection is described to be more prevalent in female than in male, which has been confirmed by other studies (Choufani et al. 2020; Filgueiras et al. 2016), this may be attributed by the fact that women wear their dentures continuously for aesthetic reasons .Indeed, overnight prosthetic wear increases the risk of Candida Albicans colonization and the development of denture stomatitis. However, this contrasts with the findings of other studies, which reported that males are more frequently affected by denture stomatitis than females (Sghaireen 2015; Petersen 2003). The prevalence of hyperplasias and epulis fissuratum were 17,5% (n=7). However, others studies have reported a prevalence of 23% (Sghaireen 2015),while findings from study of Atashrazm & Sadri (2013) reported a prevalence of 16,4% for epulis fissuratum among complete denture wearers. This hyperplasic lesion has been associated to the length of denture usage (Mandali et al. 2011). It is usually located in the muccobuccal or muccolabial folds, and it is seen more frequently in patients wearing ill-fittinng dentures with an overextented borders. Ill-fitting dentures increase parafunctional movements, which in turn lead to mucosal trauma and the formation of hyperplastic soft tissue in vulnerable anatomical regions (Budtz-Jorgensen et al. 1981). In our study, flabby ridge and angular cheilitis had the lowest prevalence, at 12.5% and 5%, respectively. These rates are significantly lower than those reported by Coelho et. al (2003), who found a prevalence of 17% for flabby ridge and 19% for angular cheilitis among complete denture wearers.

Our study revealed that a significant number of participants had poor denture hygiene (n=62), unstable dentures (n=47), and wore their dentures continuously, both day and night (n=30). Additionally, 30 patients were smokers. These factors have been recognized as major risk factors for the development of oral lesions, particularly among individuals with ill-fitting dentures. This association was confirmed through logistic regression analysis, which identified tobacco use, poor prosthetic hygiene, and continuous denture wearing as the most significant risk factors for oral lesions in our study population ($p < 0.05$). Several risk factors have been implicated in the development of these lesions. Among the most critical are reduced salivary flow, tobacco use, poor denture hygiene, continuous denture wearing, and ill-fitting dentures. Reduced salivary flow has been strongly associated with an increased risk of oral lesions in edentulous patients, predisposing them to mucosal irritation and infections, particularly denture stomatitis caused by Candida albicans. Additionally, tobacco use is a well-documented risk factor for various oral pathologies, including oral cancers, periodontal disease, and denture-related lesions. Its harmful effects on the oral mucosa, primarily due to its irritative, immunosuppressive, and vasoconstrictive properties, make smokers more susceptible to both localized trauma and infectious conditions such as oral candidiasis. Poor prosthetic hygiene is another key factor in the development of denture-related lesions. Inadequate denture cleaning leads to plaque and microbial biofilm accumulation, significantly increasing the risk of denture stomatitis and other mucosal conditions. Studies have shown a strong correlation between poor denture hygiene and a higher prevalence of Candida infections, which can promote fungal overgrowth, exacerbate mucosal irritation, and lead to inflammation. Continuous denture wearing has also been identified as a major risk factor for development of denture stomatitis in completely edentulous patients. Given its strong association with these conditions, patients should be properly

educated and motivated to maintain good denture hygiene and remove their dentures overnight to minimize risks (Baran & Nalçacı 2009; Takamiya et al. 2011; Campos et al. 2023).

Several systemic conditions can predispose individuals to denture intolerance. The study conducted by Mandali et. al (2011) evaluated the factors influencing the distribution and prevalence of oral mucosal lesions in complete denture wearers. The results indicated that patients with denture stomatitis and traumatic ulcers were statistically significantly older than those without these lesions. Additionally, based on the duration of denture use, patients with a flabby ridge, fibrous inflammatory hyperplasia, traumatic ulcers, and denture stomatitis had been wearing their dentures for a statistically significantly longer period than those with healthy oral tissues. Thus, disorders associated with xerostomia, such as Sjögren's syndrome, can complicate denture use, as insufficient salivary lubrication increases mucosal irritation. Additionally, these patients are more susceptible to Candida infections. Certain oral mucosal disorders do not directly affect the denture-bearing mucosa but are still influenced by denture use. The high prevalence of angular cheilitis in denture wearers is often linked to a decreased vertical dimension of occlusion, which promotes moisture accumulation at the corners of the mouth. It may also result from intraoral candidiasis spreading from the denture-bearing mucosa (Safour & Sassi, 2007).

Prolonged denture use, especially overnight, can degrade the acrylic resin, leading to rough surfaces and irregular edges that promote biofilm accumulation, further increasing the risk of oral lesions. Patients must be adequately informed about proper denture maintenance and the importance of avoiding continuous and nighttime denture use. Regular dental check-ups are essential for monitoring and addressing these issues (Brantes et al. 2019).

Research indicates that poor denture hygiene and biofilm accumulation are major contributors to oral lesions, particularly denture stomatitis. Given these findings, community centers, dentists, and healthcare professionals should play a crucial role in educating elderly denture wearers about oral health, proper denture hygiene, care practices and preventive dental programs.

6. CONCLUSION

This study highlights the high prevalence of denture-related oral lesions among completely edentulous patients, with denture stomatitis being the most commonly observed condition. Our findings indicated that poor denture hygiene, tobacco use, and overnight denture wear were the most significant risk factors contributing to the development of these lesions. Implementing targeted interventions aimed at improving hygiene practices and discouraging harmful habits, such as smoking and continuous denture use, could help to reduce the incidence of these oral lesions and enhance the overall oral health of denture wearers.

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