

## FREQUENCY AND ASSOCIATION OF RISK FACTORS WITH ORAL MUCOSAL LESIONS AMONG COMPLETE DENTURE WEARERS

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### ABSTRACT

#### OBJECTIVES

*This study aimed to determine the frequency of oral mucosal lesions and their association with various risk factors among complete denture wearers.*

#### METHODOLOGY

*A cross-sectional descriptive study was conducted at the Department of Prosthodontics, Khyber College of Dentistry, Peshawar, from February to November 2024, involving 114 complete denture wearers. Data were collected using a structured questionnaire covering demographics, medical history, and denture care practices. Clinical examinations were performed under chair light using sterilized instruments, in accordance with WHO biosafety protocols. Oral mucosal lesions were diagnosed according to WHO criteria, and denture-related factors, including retention, stability, occlusal vertical dimension, and structural integrity, were assessed. Data were analyzed using IBM SPSS Statistics version 22.*

#### RESULTS

*This study reported a 54.5% prevalence of oral mucosal lesions, with traumatic ulcers (19.3%) being the most common, followed by denture stomatitis (14.9%), epulis fissuratum (9.6%), and angular cheilitis (6.1%). A significant association was found between age and lesion prevalence ( $p=0.048$ ), but not between gender ( $p=0.897$ ) or smoking ( $p=0.158$ ) and lesion prevalence. Infrequent denture cleaning and poor prosthesis retention and stability were significantly linked to higher lesion rates ( $p \leq 0.001$ )*

#### CONCLUSION

*This study underscores the high prevalence of oral mucosal lesions in the elderly, emphasizing the need for personalized preventive care. Given their multifactorial causes, age-related changes, systemic health, and behavioral factors, regular dental assessments are crucial to improving oral and overall well-being in this population.*

**KEYWORDS:** Risk Factors, Oral Mucosal Lesions, Complete Denture

## INTRODUCTION

A heterogeneous group of tissue changes, manifested as oral mucosal lesions, occurs among people using removable prostheses. The sequelae of these tissue changes result in further complications.<sup>1,2</sup> Time-related direct and indirect changes occur in the oral cavity after the insertion of a removable prosthesis. These dynamic changes are in response to long-term, continuous wear of dentures, negatively affecting residual ridge form due to progressive alveolar bone resorption and impaired masticatory function. These composite changes lead to soft tissue lesions.<sup>3</sup> The most common mucosal lesions in removable prosthesis wearers are denture-induced stomatitis, angular cheilitis, traumatic ulcers, and inflammatory fibrous hyperplasia.<sup>4</sup> The prevalence of oral mucosal lesions is greatly influenced by age.<sup>5</sup> Martori et al. suggested a weakening of the immune system, leading to a greater risk of acquiring opportunistic infections (such as *Candida albicans*) with

age and systemic diseases while Abu' Eid et al. reported a decrease in collagen synthesis as a cause of vulnerable oral changes with increased age.<sup>6,7,8,9</sup> Nocturnal wear of the denture dramatically increases the potential risk of oral mucosal lesions because of the decrease or no protective action of saliva on the mucosa.<sup>10</sup> In addition to systemic diseases such as diabetes and hypertension, the oral mucosa is also affected by local factors, such as mechanical irritation from the edge of an ill-fitting denture, allergy to denture base material, traumatic occlusal forces, loss of retention, and reactions to the presence of plaque.<sup>11,12</sup> Thermal irritation (smoking), biofilm on oral mucosa or intaglio surface of denture, quantitative or qualitative changes of secreted saliva, and addiction to nicotine.<sup>1,13</sup> Furthermore, some studies have reported a causal association between denture-associated stomatitis, angular cheilitis, and traumatic ulcers and decreased salivary pH, reduced OVD, and residual ridge resorption, respectively.<sup>3,5</sup> Oral health is indispensable

in terms of the mental, physical, and social well-being of an individual. Pertinent knowledge of the prevalence of associated risk factors of oral mucosal lesions can help in early detection, prevention, and correction of these lesions in order to attain quality of life and quality aging of an individual.

## METHODOLOGY

The study was conducted from February 2024 to November 2024, following ethical approval from the institutional review committee. The sample size was calculated using the WHO sample size calculator, with an angular cheilitis frequency of 8%, a 95% confidence level, and a 5% margin of error, resulting in a sample size of 114 participants.<sup>4</sup> Eligible subjects were recruited using a consecutive sampling technique. Eligible patients visiting the Department of Prosthodontics were informed about the study's objectives, procedures, potential risks, and benefits, and written informed consent was obtained from each participant. A single examiner performed all clinical examinations to eliminate inter-examiner variability. The examiner followed standardized clinical criteria and uniform examination protocols throughout the study to minimize subjectivity in the assessment of denture-related parameters. Clinical examinations were conducted under dental chair light using sterilized instruments, in accordance with WHO biosafety guidelines. A standardized questionnaire collected demographic data (name, age, gender, education), general health information (medical conditions, medications), and denture-related habits (brushing frequency, denture hygiene practices, nighttime wear, denture age, and any history of repairs or relining). Intraoral examinations were conducted to evaluate denture-related mucosal lesions in accordance with WHO diagnostic criteria and established clinical pathology references. Denture stomatitis was identified by the presence of erythematous mucosa beneath the denture-bearing area and classified using Newton's classification. Traumatic ulcers were defined as localized mucosal disruptions with a round or oval decubital morphology, while angular cheilitis was characterized by erythematous fissuring at the oral commissures. The clinical examination also included the evaluation of the occlusal vertical dimension (OVD). A difference between the rest vertical dimension (RVD) and OVD of 2-4mm was considered normal, corresponding to the normal freeway space, which was measured using a Willis gauge. The retention of the denture was assessed by placing the index finger and thumb in the premolar area and applying vertical pressure to break the peripheral seal. Dentures that exhibited resistance to displacement in this direction were deemed to have satisfactory

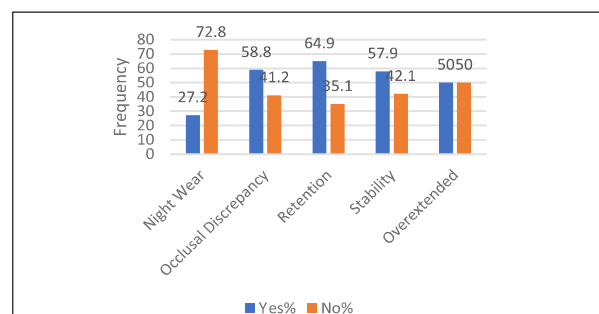
retention, and those that did not were classified as having unsatisfactory retention. The stability of the denture was evaluated similarly, except that the force was applied in rotational and lateral directions. Denture integrity, including any repairs, fractures, or relining, was visually examined, along with resin porosities, irregular borders, and the loss of artificial teeth. Data were analyzed using SPSS version 22. Frequencies and percentages were calculated for categorical variables. Associations between mucosal lesions and risk factors were assessed using the chi-square test. Multivariable analysis was performed using binary logistic regression to identify factors independently associated with oral mucosal lesions. A p-value  $\leq 0.05$  was considered statistically significant. Results were presented in tables and graphs.

## RESULTS

Table 1 presents the frequency and percentage distribution of sociodemographic, medical, and denture-related risk factors among complete denture wearers. A majority of participants were male (57%) and were 61 years of age or older (49.1%). Common comorbidities included hypertension (22.8%) and diabetes (16.7%). Most participants (80.7%) were non-smokers, and 82.5% did not report dry mouth.

**Table 1: Frequency Distribution of Demographics Among Complete Denture Wearers**

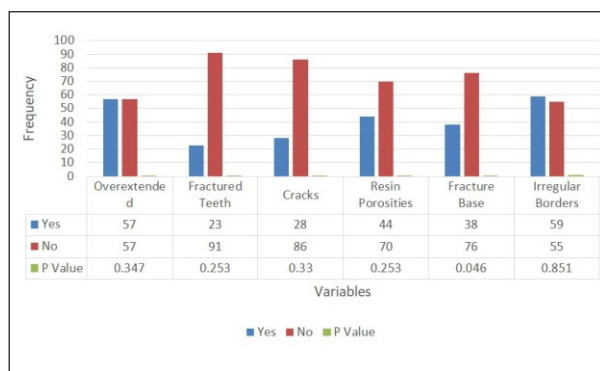
| Variable                 | Categories                             | Frequency | %age |
|--------------------------|----------------------------------------|-----------|------|
| Gender                   | Male                                   | 65        | 57.0 |
|                          | Female                                 | 49        | 43.0 |
| Age in years             | 40-50                                  | 16        | 14.0 |
|                          | 51-60                                  | 42        | 36.8 |
|                          | above 61                               | 56        | 49.1 |
| Education status         | No education                           | 43        | 37.7 |
|                          | Primary education                      | 22        | 19.3 |
|                          | Matriculate                            | 39        | 34.2 |
|                          | High school education (up to 16 years) | 10        | 8.8  |
| Monthly Household income | 20000-50000                            | 47        | 41.2 |
|                          | 51000-80000                            | 45        | 39.5 |
|                          | Above 80000                            | 22        | 19.3 |
| Comorbidity              | No                                     | 60        | 52.6 |
|                          | Yes                                    | 54        | 47.4 |



**Fig 1: Distribution of different variables in oral mucosal lesions according to their prevalence**

**Table 2: Association of Sociodemographic and Systemic Factors with Oral Mucosal Lesions**

| Variable                 | Categories                            | Lesion n(%) | No lesion n(%) | P-Value |
|--------------------------|---------------------------------------|-------------|----------------|---------|
| Gender                   | Male                                  | 35 (30.7%)  | 30 (26.3%)     | 0.894   |
|                          | Female                                | 27 (23.7%)  | 22 (19.3%)     |         |
| Age in years             | 40-50                                 | 07 (6.15%)  | 09 (7.9%)      | 0.048   |
|                          | 51-60                                 | 18 (15.8%)  | 24 (21.1%)     |         |
|                          | above 61                              | 37 (32.5%)  | 19 (16.7%)     |         |
| Education Status         | No education                          | 31 (27.2%)  | 12 (10.5%)     | 0.022   |
|                          | Primary                               | 11 (9.6%)   | 11 (9.6%)      |         |
|                          | Matriculate                           | 15 (13.2%)  | 24 (21.1%)     |         |
|                          | High school education (upto 16 years) | 05 (4.4%)   | 05 (4.4%)      |         |
| Monthly Household income | 20000-50000                           | 24 (21.1%)  | 23 (20.2%)     | 0.161   |
|                          | 51000-80000                           | 29 (25.4%)  | 16 (14.0%)     |         |
|                          | Above 81000                           | 09 (7.9%)   | 13 (11.4%)     |         |
| Comorbidity              | No                                    | 27 (23.7%)  | 33 (28.9%)     | 0.040   |
|                          | Yes                                   | 35 (30.7%)  | 19 (16.7%)     |         |
| Smoking Status           | No                                    | 53 (46.5%)  | 39 (34.2%)     | 0.158   |
|                          | Yes                                   | 09 (7.9%)   | 13 (11.4%)     |         |
| Dry mouth                | No                                    | 46 (40.4%)  | 48(42.1%)      | 0.011   |
|                          | Yes                                   | 16 (14.0%)  | 04 (3.5%)      |         |

**Fig 2: Association of different denture-related variables in oral mucosal lesions****Table 3: Logistic Regression Analysis by Using Mucosal Lesions Presence and Absence as Dependent Variables And Its Association With Other Cofactors**

| Independent Variable  | Categories       | Adjusted OR    | 95% CI |       | P-Value |
|-----------------------|------------------|----------------|--------|-------|---------|
|                       |                  |                | Lower  | Upper |         |
| Night Wear            | Reference Value  | No             |        |       |         |
|                       | Yes              | 8.748          | 2.591  | 1.086 | 0.00    |
| Dry mouth             | Reference Value  | No             |        |       |         |
|                       | Yes              | 2.638          | 0.719  | 9.685 | 0.14    |
| Retention             | Reference Value  | unsatisfactory |        |       |         |
|                       | Yes              | 0.571          | 0.203  | 1.610 | 0.28    |
| Stability             | Reference Value  | unsatisfactory |        |       |         |
|                       | Yes              | 0.504          | 0.185  | 1.373 | 0.18    |
| Frequency of relining | Reference Value  | No             |        |       |         |
|                       | One Time reline  | 0.190          | 0.052  | 0.702 | 0.01    |
|                       | Two Times reline | 0.353          | 0.094  | 1.333 | 0.12    |

**Table 4: Association of denture related factors with oral mucosal lesions**

| Variables                               | Categories                 | Lesion n(%) | No lesion n(%) | P-Value |
|-----------------------------------------|----------------------------|-------------|----------------|---------|
| Frequency of denture cleaning           | Once daily                 | 48 (42.1)   | 00 (0.0)       | 0.000   |
|                                         | Twice daily                | 12 (10.5)   | 11 (9.6)       |         |
|                                         | 3 times/day                | 01 (0.9)    | 25 (21.9)      |         |
|                                         | More than 3                | 01 (0.9)    | 16 (14.0)      |         |
| Denture cleaning method                 | Tooth brush only           | 20 (17.5)   | 16 (14.0)      | 0.068   |
|                                         | Toothbrush with toothpaste | 25 (21.9)   | 12 (10.5)      |         |
|                                         | With soap solution         | 17 (14.9)   | 24 (21.1)      |         |
| Duration of use of the existing denture | 1-6 months                 | 07 (6.1)    | 12 (10.5)      | 0.029   |
|                                         | 6 months-1 year            | 07 (6.1)    | 12 (10.5)      |         |
|                                         | 1-2 years                  | 16 (14.0)   | 14 (12.3)      |         |
|                                         | More than 2 years          | 32 (28.1)   | 14 (12.3)      |         |
| Denture Immersion method                | Only in water              | 39 (34.2)   | 44 (38.6)      | 0.027   |
|                                         | Immersion solution         | 01 (0.9)    | 01 (0.9)       |         |
|                                         | No immersion at all        | 22 (19.3)   | 07 (6.1)       |         |
| Nightwear                               | Yes                        | 27 (23.7)   | 04 (3.5)       | 0.000   |
|                                         | No                         | 35 (30.7)   | 48 (42.1)      |         |
| Frequency of fracture of denture base   | No fracture at all         | 22 (19.3)   | 34 (29.8)      | 0.002   |
|                                         | One time                   | 35 (30.7)   | 12 (10.5)      |         |
|                                         | Two times                  | 04 (3.5)    | 06 (5.3)       |         |
|                                         | More than two              | 01 (0.9)    | 00 (0.0)       |         |
| Frequency of relining of denture base   | No reline at all           | 21 (18.4)   | 29 (25.4)      | 0.020   |
|                                         | One time                   | 24 (21.1)   | 18 (15.8)      |         |
|                                         | Two times                  | 17 (14.9)   | 05 (4.4)       |         |
| OVD assessment                          | 2-4mm                      | 25 (21.9)   | 27 (23.7)      | 0.370   |
|                                         | Less than 2mm              | 22 (19.3)   | 17 (14.9)      |         |
|                                         | More than 2mm              | 15 (13.2)   | 08 (7.0)       |         |
| Occlusal discrepancy                    | Yes                        | 44 (38.6)   | 23 (20.2)      | 0.005   |
|                                         | No                         | 18 (15.8)   | 29 (25.4)      |         |
| Retention                               | Satisfactory               | 35 (30.7)   | 39 (34.2)      | 0.049   |
|                                         | Unsatisfactory             | 27 (23.7)   | 13 (11.4)      |         |
| Stability                               | Satisfactory               | 29 (25.4)   | 37 (32.5)      | 0.013   |
|                                         | Unsatisfactory             | 33 (28.9)   | 15 (13.2)      |         |

## DISCUSSION

This study aimed to assess the association between various risk factors and the development of oral mucosal lesions in complete denture wearers, as these lesions can affect comfort, function, and long-term oral health. Literature shows a wide variation in the prevalence of oral mucosal lesions in geriatric patients. This study reports a high prevalence of oral mucosal lesions at 54.5%, which aligns closely with Cheruvathoor et al., who found a prevalence of approximately 59.5%. Variations in reported prevalence across studies may stem from differences in country of residence, population characteristics, lesion definitions, and lesion types included, compounded by the lack of a universally accepted classification system.<sup>14</sup> In this study, traumatic ulcers were the most common lesion

(19.3%), followed by denture stomatitis (14.9%), epulis fissuratum (9.6%), and angular cheilitis (6.1%). Tosun et al. observed a similar pattern but reported higher prevalence rates, likely reflecting differences in demographics, denture use, or oral hygiene practices.<sup>1</sup> The present study found a statistically significant association between age and the prevalence of oral mucosal lesions ( $P=0.048$ ), aligning with Ankit et al and Radwan, who reported a higher prevalence in individuals over 60.<sup>11,15</sup> This trend may be due to age-related physiological changes, systemic comorbidities, and prolonged exposure to harmful habits. Conversely, no significant gender-based difference was observed (30.7% in males vs. 27.0% in females;  $P=0.897$ ), consistent with Bozdemir et al. ( $P=0.76$ ).<sup>5</sup> In this study, no significant association was found between smoking and oral mucosal lesions ( $p=0.158$ ), which aligns with the findings of Martori et al., who reported a higher lesion prevalence among non-smokers ( $p=0.031$ ).<sup>6</sup> However, the relatively small number of smokers in the sample limits the ability to draw definitive conclusions regarding the effect of smoking on lesion development.<sup>6</sup> Improper denture hygiene promotes plaque and biofilm buildup, leading to oral mucosal lesions, especially with poor cleaning habits and continuous denture wear.<sup>1,16</sup> This study found a significant association between infrequent cleaning and mucosal lesions: 42.1% of participants cleaned only once daily, with the highest lesion prevalence ( $p=0.000$ ), while those cleaning three or more times had fewer lesions. Although the cleaning method was not statistically significant ( $p=0.068$ ), the type of cleaning may still influence hygiene quality. The data show a significant association ( $p=0.027$ ) between denture immersion practices and oral mucosal lesions. A majority of participants (72.8%) immersed their dentures only in water, while a small percentage used immersion solutions (1.8%). These results align with those of Tosun et al. (73.72%) and Algabri et al. where most participants also stored their dentures in water.<sup>1,17</sup> Overnight denture wear was associated with a higher incidence of lesions (35.6%) than non-wearers (8.4%).<sup>17</sup> consistent with the present study, nighttime denture wear was strongly associated with oral mucosal lesions, with significantly higher lesion occurrence among night wearers ( $p<0.001$ ). Continuous nocturnal use increases mucosal trauma and microbial accumulation by reducing salivary protection. Multivariable analysis identified nightwear as the strongest independent predictor, with nearly ninefold increased odds of lesion development (AOR=8.75; 95% CI: 2.59-10.09). This association remained significant after adjustment for denture-related and systemic factors. These findings highlight the removal of dentures at night as a key preventive strategy. Adam et al. reported that denture-related lesion frequency

increases with patient age and prolonged use of the same denture.<sup>18</sup> Similarly, this study found a significant association between lesion presence and more extended denture use ( $p=0.029$ ). Over time, denture wear leads to surface roughness, cracks, and irregular edges, increasing the risk of lesions such as fibrous hyperplasia, denture stomatitis, angular cheilitis, and traumatic ulcers.<sup>18</sup> A cross-sectional study investigating maxillary denture-related lesions identified denture base fractures and repairs as significant risk factors for mucosal pathology, supporting the present study's findings.<sup>4</sup> The observed association ( $p=0.002$ ) between denture fractures and oral mucosal lesions reinforces the understanding that structural damage to dentures can lead to mechanical irritation and tissue trauma. The stability and integrity of a prosthesis can deteriorate over time, leading to traumatic lesions in the oral mucosa. Additionally, the pattern of prosthesis use may also affect the occurrence of these oral mucosal lesions.<sup>9</sup> Gaur et al. reported that oral mucosal lesions can arise from poorly adapted dentures, improper use, and mechanical trauma due to ill-fitting or overextended dentures.<sup>19</sup> In line with this, Limpuangthip et al. stated that denture retention and stability were significantly associated with both overall oral health and specific domains of oral health impact.<sup>20</sup> Similarly, this study identified a significant association between oral mucosal lesions and poor prosthesis retention (35.1%) and stability (42.1%), consistent with previous findings. These findings collectively emphasize the critical role of prosthesis fit in preventing mucosal lesions.

## LIMITATIONS

The cross-sectional study design limits the ability to establish temporal or causal relationships between denture-related factors and oral mucosal lesions. As a single examiner performed all clinical examinations, the possibility of examiner bias cannot be excluded entirely, despite adherence to standardized diagnostic criteria.

## CONCLUSIONS

This study found a high prevalence of oral mucosal lesions among complete denture wearers, with significant associations with age, systemic comorbidities, denture hygiene habits, nocturnal denture wear, duration of denture use, and prosthesis fit. Owing to the observational design, these findings reflect associations rather than causation. The results emphasize the importance of regular clinical assessment and patient education to address modifiable denture-related factors. Further longitudinal research is needed

to clarify causal relationships.

**CONFLICT OF INTEREST:** None

**FUNDING SOURCES:** None

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## AUTHORS CONTRIBUTION

**Asifa Zubair** - Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Final Approval  
**Sadia Saeed** - Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval  
**Humna Ali** - Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval  
**Asma** - Concept & Design; Data Acquisition; Drafting Manuscript; Critical Revision; Final Approval  
**Ismat Iftikhar** - Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval  
**Syed Nasir Shar** - Concept & Design; Data Acquisition; Drafting Manuscript; Supervision; Final Approval

*The authors accept responsibility for all aspects of the work and will ensure that any concerns regarding the accuracy or integrity of any part are properly investigated and resolved.*



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