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Prevalence of Oral Mucosal Lesions among Palestinian Geriatric Patients: A Cross-Sectional Study

Fahed Samir Habash, Ra'ed Omar Abu Hantash, Mohammad Hasan Abu Younis, Rania Mahmoud Halase, Nicolas Ghazi Nour, Moanad Mamdouh Aker

School of Dentistry, Al Quds University, Jerusalem, Palestine
Email: rhantash@staff.alquds.edu

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Abstract

Objectives: Oral health in older adults is a critical aspect of the general health and well-being. Data related to that concern is scarce in Palestine. This cross-sectional study investigated the prevalence of oral mucosal lesions among elderly patients in Palestine. **Materials and Methods**: 266 patients aged ≥ 60 years participated in the study; 57.1% were males, and 42.9% were females. Two trained examiners conducted the oral diagnosis for the patients under the supervision of a senior oral medicine consultant. Participants were asked to complete a valid and reliable questionnaire which assessed medical and dental history, smoking, dentures wearing, and oral hygiene habits. **Results**: Overall, 54.5% had at least one lesion, with pseudomembranous candidiasis and Fordyce's granules most common, 3.5% of them were potentially malignant lesions. Males were more affected than females. Most of the lesions were found on the tongue (29.1% of the participants) and buccal mucosa (27% of the participants). Chi-square analysis showed significant associations with smoking and denture use ($P < 0.001$). **Conclusions:** Smoking is considered a risk factor for the development of potentially malignant lesions. Denture wearer's patients should be aware of the development of denture related oral lesions. This study highlights the considerable burden of oral lesions among geriatric Palestinian dental patients and underlines the importance of early diagnosis and preventive care.

Keywords

Cross-Sectional Study, Palestinian Geriatric Patients, Potentially Malignant Lesions, Smokers, Oral Mucosal Lesions

1. Introduction

The prevalence of oral mucosal lesions in geriatric patients is a significant concern, as highlighted by various studies across different regions. Numerous global studies have indicated that the prevalence of oral mucosal lesions increases significantly with age. These findings have emphasized the necessity of focused and accessible dental care tailored specifically to geriatric populations. These studies reveal a high occurrence of oral mucosal lesions among the elderly, with specific types of lesions being more prevalent depending on the population and lifestyle factors [1]. The findings underscore the need for targeted oral healthcare strategies for the aging population.

Studies have shown a connection between aging and oral mucosal lesions [2]. Elderly populations are more susceptible to developing oral mucosal conditions at a faster rate due to decreased immune response [3], diminished DNA repair abilities, altered carcinogen metabolism, and deterioration of oral tissues, particularly the oral epithelium and salivary glands.

The occurrence of oral mucosal lesions is significantly affected by age [4]-[7]. Research has consistently demonstrated that older individuals have a higher prevalence of these lesions compared to their younger counterparts. However, age is not the only contributing factor; other elements such as injury, medications, and oral and denture care practices can also influence the development of oral mucosal lesions. In the elderly, these lesions often arise from systemic illnesses, nutritional deficiencies, medication side effects, or the use of poorly fitting dentures [8] [9].

Besides age, other factors like sex, educational background, smoking habits, and systemic diseases may contribute to the formation of oral lesions [10]. Educational attainment, being a key factor in maintaining oral hygiene, could significantly impact the occurrence of oral lesions. Oral health is essential for overall well-being, encompassing physical, social, and psychological aspects. Timely identification and prevention of oral lesions by dental professionals can improve the quality of life for older adults and promote healthy aging [1]. The frequency of oral mucosal conditions serves as a crucial indicator in assessing the oral health of elderly individuals. Consequently, this study aims to investigate the prevalence of oral lesions in relation to various factors including gender, age, medication use, systemic diseases, duration of denture wear, education level, oral hygiene practices, and consumption of tobacco and alcohol.

2. Materials and Methods

An observational descriptive study was conducted at the School of Dental Medicine at Al-Quds University, situated at the Abu Dis Campus in Jerusalem-Palestine. The study population comprised geriatric patients aged 60 years and above who sought dental care at the university's Oral Medicine Clinics between September, 2023 and April, 2025. *A consecutive sampling strategy was chosen in this research*. A total of 266 patients were clinically examined to determine the prevalence of oral mucosal lesions. *The sample size was comparable to and sufficient*

for the scope of older research papers addressing the same topic. The overarching goal of this study was to document the types and frequencies of oral mucosal lesions observed and to explore possible associations with demographic, medical, and behavioral factors.

This cross-sectional study used bivariate analysis to identify associations between lesion occurrence and variables such as age, gender, and systemic health conditions. Ethical approval was obtained from the Research Ethics Committee-Deanship of Scientific Research (Ref. No.: 564/REC/2025). All participants provided informed consent before being included in the study. The examinations were carried out by trained fifth-year dental students, with direct oversight from a licensed oral medicine consultant, ensuring both ethical compliance and diagnostic reliability. *Standardized oral examination techniques were reviewed and practiced. All diagnoses were reassessed by the gold standard*.

A structured reliable and valid questionnaire was used for data collection. This form was divided into four main sections:

1) Demographic Information which included the patient's age, gender, educational background, occupation, place of residence, and smoking habits. These factors were assessed due to their potential correlation with oral health outcomes.

2) Medical History which concerned past hospitalizations, current medical conditions, medications, and allergies. A comprehensive checklist of systemic diseases was also provided, allowing patients to indicate any relevant past or current diagnoses. Given the strong relationship between systemic diseases (such as diabetes, hypertension, and cardiovascular diseases) and oral health, this section was vital.

3) Dental History: that focused on oral hygiene habits, frequency of dental visits, and any dental prosthetics used, such as removable dentures. Special attention was given to denture-wearing habits, as poorly maintained or ill-fitting dentures are a known risk factor for certain types of oral mucosal lesions.

4) Clinical Examination which involved a detailed intraoral examination, where the presence or absence of specific mucosal lesions was recorded.

Each part of the oral cavity was coded, and examiners were required to document any pathological findings using these codes. Fifth-year dental students received structured training from oral medicine consultants on how to accurately complete the examination and record findings.

In cases where potentially malignant or unclear lesions were discovered, patients were referred for histopathological (biopsy) or radiographic investigations. However, the majority of diagnoses were made through careful history-taking and thorough clinical assessment.

Inclusion Criteria: To ensure consistency and relevance, only new patients aged 60 years and above who attended the oral medicine clinic during the study period were included. This allowed for an accurate representation of the elderly population and minimized the risk of bias due to repeated cases or follow-ups. While clinical observation remained the primary diagnostic method, additional diagnostic tools such as radiographic imaging were used when required. For more complex or suspicious lesions, biopsy procedures were performed to confirm the

diagnosis. All lesions were categorized according to the criteria established by the World Health Organization (WHO). This classification provided a reliable and internationally recognized framework for the identification and categorization of oral mucosal lesions.

Statistical Analysis Data were entered and analyzed using the Statistical Package for the Social Sciences Software (SPSS Version 25). The Chi-square test was employed to assess statistical associations between the presence of lesions and variables like age, gender, systemic conditions, and lifestyle factors. A p-value of less than 0.05 was considered statistically significant, providing a robust basis for identifying meaningful correlations.

The examination protocol followed in this study included:

- Physical Examination: Thorough intraoral and extraoral inspection of each patient.
- Medical and Dental History Questionnaire**:** Including social habits such as tobacco use and denture care.
- Radiographic and Biopsy Analysis: Conducted when deemed necessary for a conclusive diagnosis.

The structured and multi-faceted approach allowed for a comprehensive understanding of the patient's oral health and the prevalence of mucosal lesions within this geriatric population.

3. Results

The distribution of participants according to the age, gender, place of residency, and education variables can be shown in Table 1. The majority of the participants were between the ages of 51 - 65 years old (Figure 1). 57.1% were males and 42.9% were females (Figure 2). Most of the participants lived in cities (Figure 3). The Education variable shows that 20.7% of the participants' educational level were less than high school, 27.8% were high school graduates, 27.8% for college, while, 3.1% hold Master's degree and more (Figure 4).

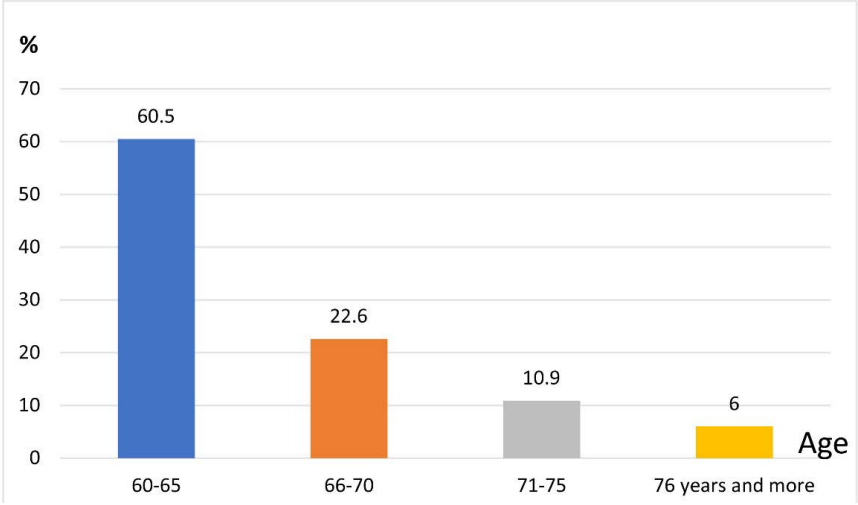

Figure 1. Distribution of the participants according to the age.

Table 1. Distribution of study sample according to the patient's personal details variables.

	Responses	Number (%)
Age	60 years	76 (28.6%)
	61 - 65	85 (31.9%)
	66 - 70	60 (22.6%)
	71 - 75	29 (11%)
	76 years and more	16 (6.1%)
Gender	Male	152 (57.1%)
	Female	114 (42.9%)
Place of Residency	City	130 (48.9%)
	Village	121 (45.5%)
	Camp	15 (5.6%)
Education	No answer	36 (13.5%)
	Less than high school	55 (20.7%)
	High school graduate	74 (27.8%)
	College	74 (27.8%)
	Bachelor's	19 (7.1%)
	Master's and more	8 (3.1%)

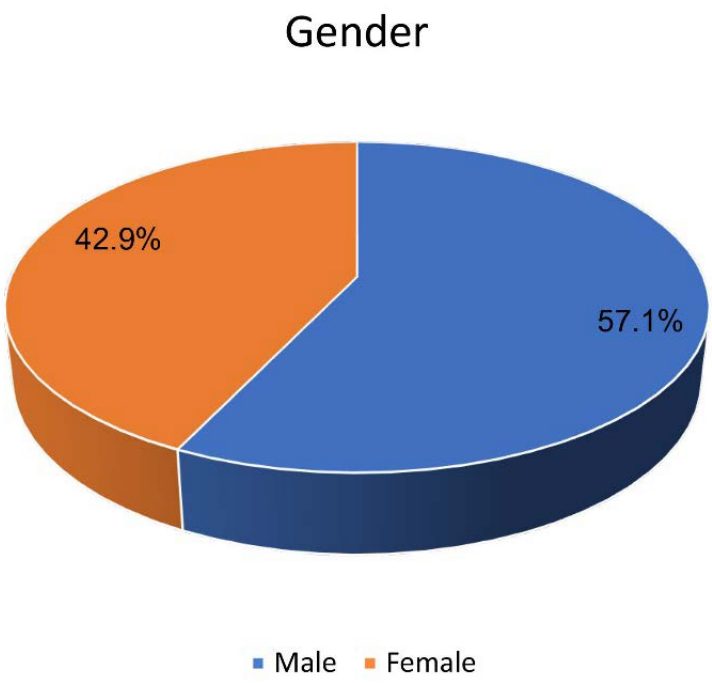

Figure 2. Distribution of the participants according to the gender.

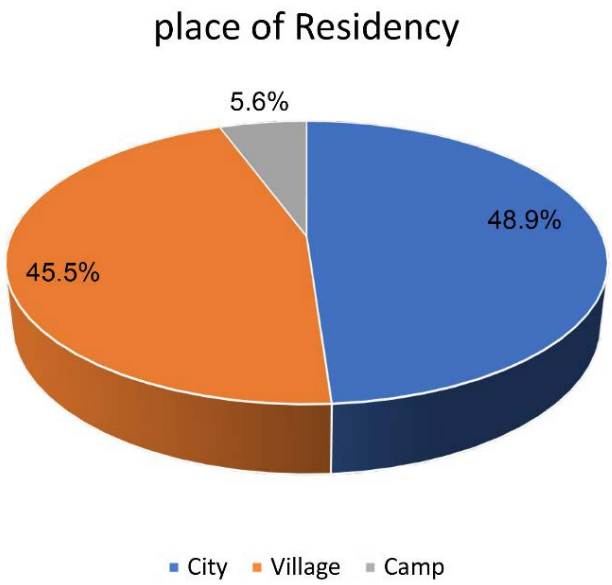

Figure 3. Distribution of the participants according to the place of residency.

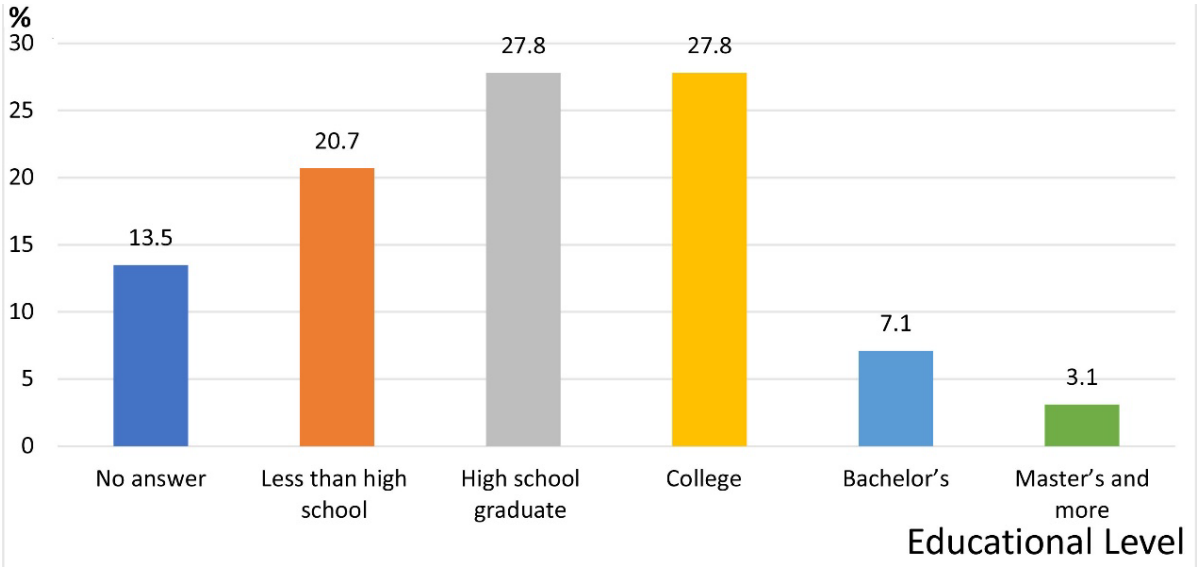

Figure 4. Distribution of the participants according to educational level.

3.1. History of Tobacco Use

About 35.7% of the study population were smokers while 64.3% of them were nonsmokers (Figure 5). Moreover, more than 39% of smokers were from 20 years and less, and 22.6% of them from 21 - 30 years, and 15.1% of them from 31 - 40 years, and 22.6% of them from 41 years and above (Table 2).

Cigarettes were the most common type of smoking as shown in Figure 6.

More than 15% of the respondents smoked (1 - 5) cigarettes per day, 24.7% of them smoked (5 - 10) cigarettes, 28.6% smoked (10 - 20) cigarettes, 20.8% smoked (20 - 40) cigarettes, while 10.4% of them smoked more than 40 cigarettes (Figure 7).

Table 2. Distribution of study sample according to the history of tobacco use variables.

Items Related to smoking Habits	Responses	Number (%)
Smoking Status	Yes	95 (35.7%)
	No	171 (64.3%)
Age started	20 years and less	21 (39.6%)
	21 - 30 years	12 (22.6%)
	31 - 40 years	8 (15.1%)
	41 years and more	12 (22.6%)
Type of smoking	Cigarettes	61 (68.5%)
	Shisha	12 (13.5%)
	Cigar	7 (7.9%)
	Cigarettes and Shisha	9 (10.1%)
No. of Cigarettes per day	1 - 5	12 (15.6%)
	5 - 10	19 (24.7%)
	10 - 20	22 (28.6%)
	20 - 40	16 (20.8%)
	More than 40	8 (10.4%)

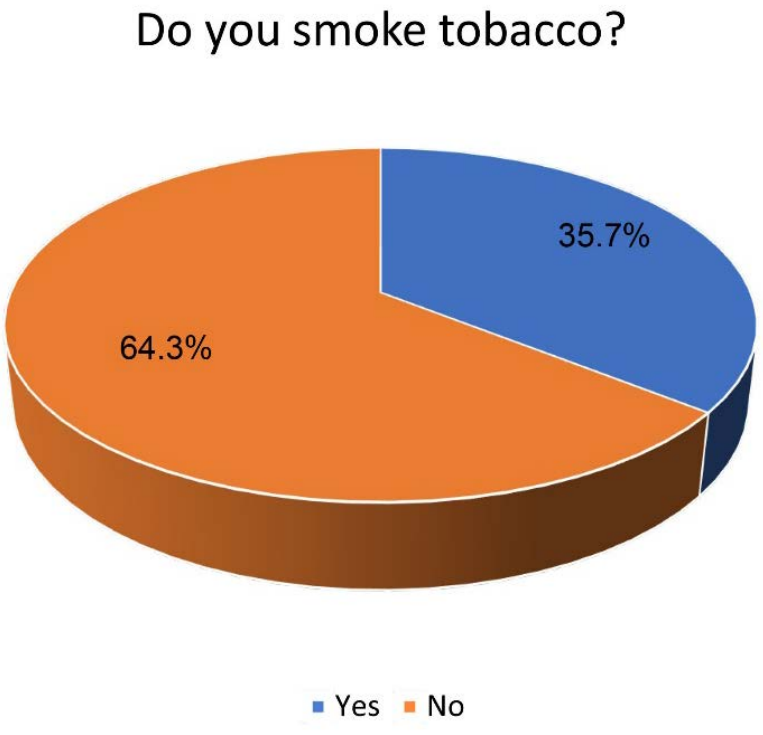

Figure 5. Frequency of study population according to smoking tobacco.

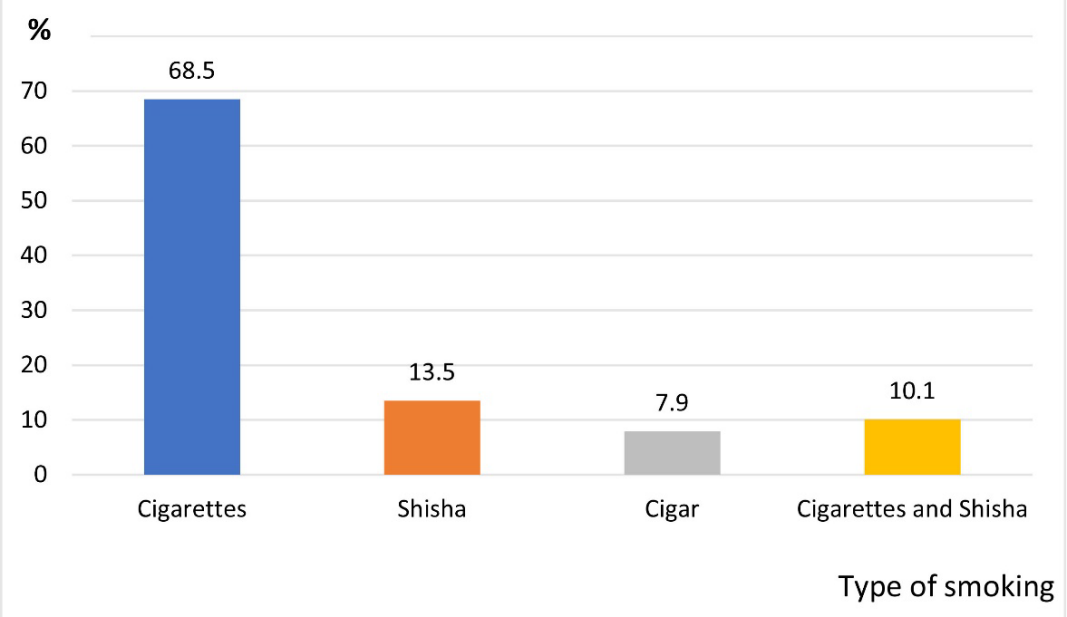

Figure 6. Frequency of smokers according to types of smoking.

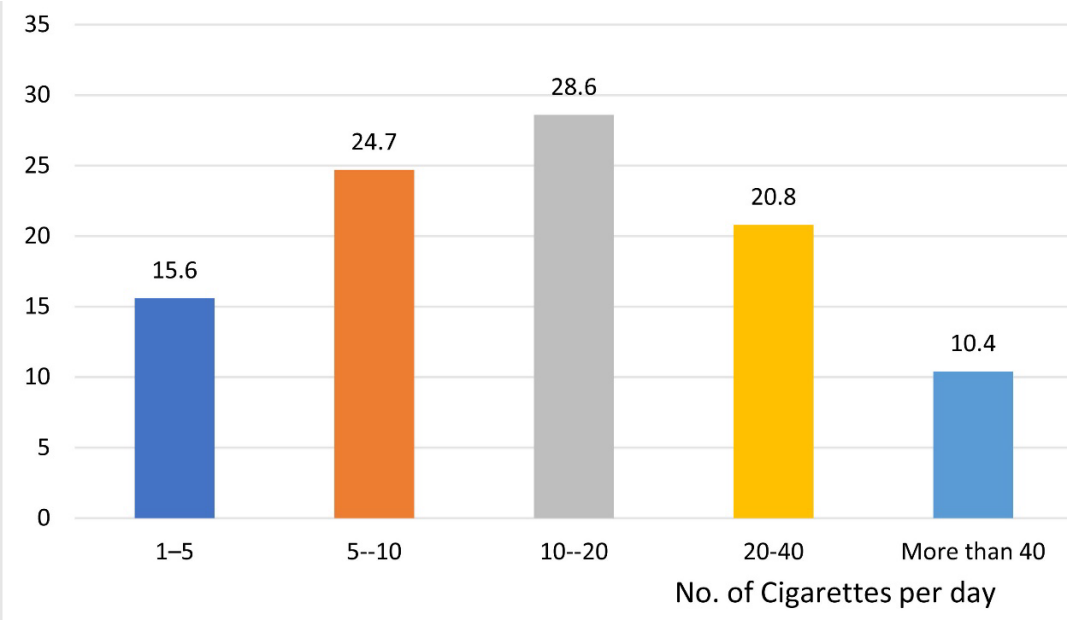

Figure 7. Frequency of smokers according to no. of cigarettes per day.

3.2. Patient's Medical History

Table 3 shows the distribution of respondents according to the medical conditions and treatments, previous hospitalization, and any drug allergies. 9.2% of the study population were medically fit, 12.9% of them had heart diseases, 2% of them had bleeding disorder, 21.3% of them were hypertensive, and 2.4% of them experienced Angina, 1.4% of them had Artificial Heart Valves, 26.1% of them were diabetics, 1.6% of them complained from Arthritis, 3.4% of them had renal diseases, 1% of them had artificial joint displacement, Hepatitis or Liver Disease, and ma-

lignancies.

Table 3. Distribution of study sample according to the patient's medical history variables.

	Responses	Number	Percentage %
Medical Conditions	No answer	46	9.2
	Heart Disease	65	12.9
	Bleeding Disorder	10	2
	Abnormal Blood Pressure	107	21.3
	Angina	12	2.4
	Artificial Heart Valves	7	1.4
	Diabetes	131	26.1
	Arthritis	8	1.6
	Renal Disease	17	3.4
	Artificial Joint Displacement	5	1
	Hepatitis or Liver Disease	5	1
	Drug or Alcohol Addiction	4	0.8
	Malignancies	5	1
	Epilepsy	8	1.6
	Fainting	9	1.8
	Vitamin/Folic Acid Deficiency	9	1.8
	Asthma	9	1.8
	hyperlipidemia	10	2
	Osteoporosis	8	1.6
	Other Conditions	27	5.4
Under medical treatment now	Yes	196	73.7
	No	70	26.3
Hospitalization	Yes	174	65.4
	No	92	34.6
Allergy to medications	No answer	242	91
	Local anesthesia	2	0.8
	Penicillin	10	3.8
	Other	8	3
	Penicillin & Aspirin	3	1.1
	Local anesthesia & Penicillin & Aspirin	1	0.4

3.3. Dental History

Nearly ninety-four percent of the participants had previous dental visits (Figure 8). The main reason behind that was prosthodontic care (Figure 9). Hence, 69.2% of them were denture wearers (Figure 10). However, 53% of the participants had poor oral hygiene levels as shown in Figure 11. 45.9% of them never brushed their teeth (Figure 12).

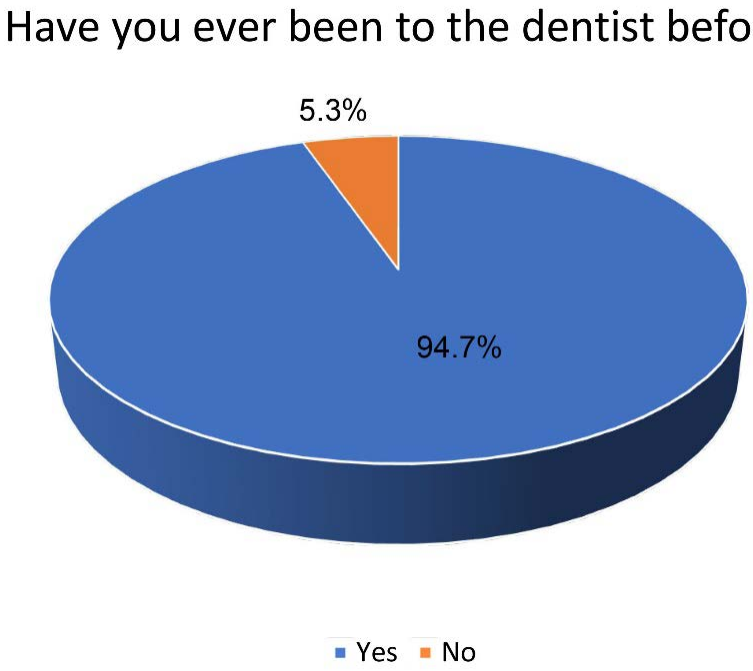

Figure 8. Frequency of study population according dental visits.

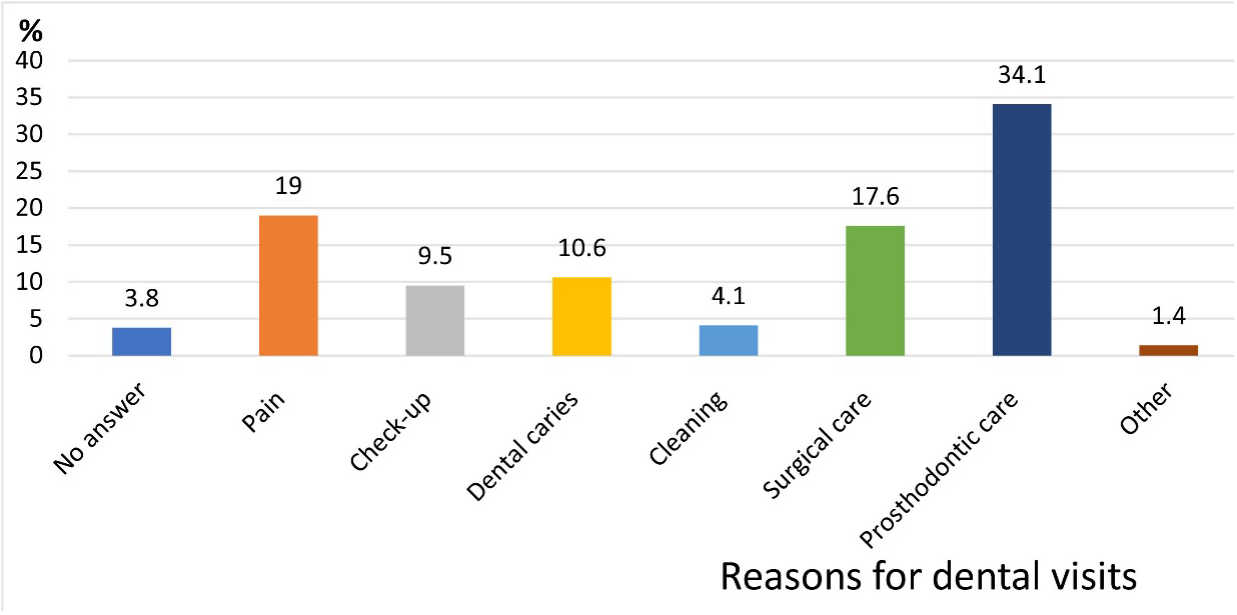

Figure 9. Frequency of study population according to reasons for dental visits.

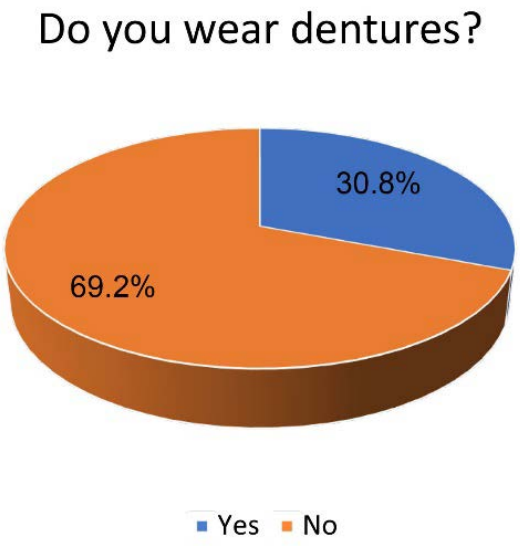

Figure 10. Frequency of denture wearers in the study.

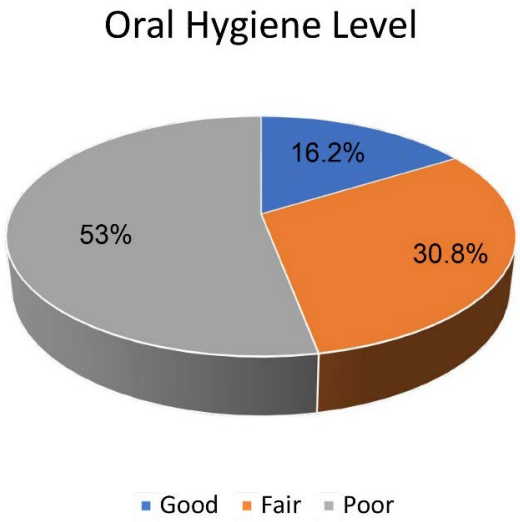

Figure 11. Frequency of study population according to oral hygiene level.

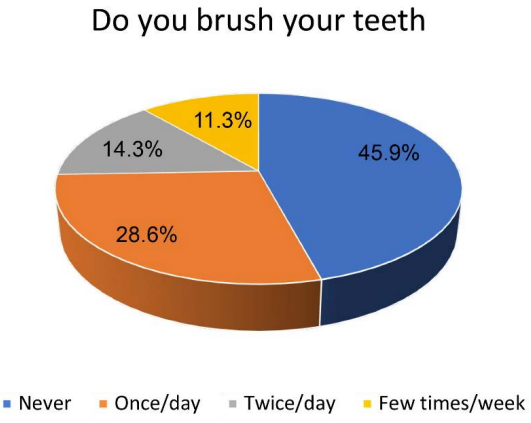

Figure 12. Frequency of study population according to brushing their teeth.

3.4. Oral Mucosal Lesions

More than half of the participants had oral mucosal lesions (54.5%) (Table 4). The oral lesions, percentages and numbers that were detected in the study can be shown in Table 5. The most common oral lesions were pseudomembranous candidiasis and Fordyce's granules (12.7% for each).

Most of the lesions were found on the tongue (29.1%) followed by bucall and labial mucosa (Figure 13). Seven potentially malignant lesions were clinically diagnosed namely: Homogenous leukoplackaia 3 cases, non homegenous leukoplakia, erythroplakia, lichen planus, and actinic chelities one case for each.

Table 4. Distribution of study sample according to the mucosal lesions.

Having Oral mucosal lesions	Number (%)
Yes	145 (54.5%)
No	121 (45.5%)

Table 5. Distribution of Mucosal Lesions in the study population.

Oral Mucosal Lesions	Number	Frequency %
Homogeneous Leukoplakia **	3	1.7
Non-Homogeneous Leukoplakia **	1	0.6
Erythroplakia **	1	0.6
Frictional Keratosis	10	5.6
Chronic Pseudomembranous Candidiasis (Denture Stomatitis)	23	12.8
Angular Cheilitis	3	1.7
Denture Epulis Fissuratum	3	1.7
Fibroepithelial Polyp	20	11.1
Lichen Planus **	1	0.6
Traumatic Ulcer	17	9.4
Recurrent Aphthous Ulceration	5	2.8
Nicotinic Stomatitis	1	0.6
Smoker Melanosis	3	1.7
Atrophic Glossitis	1	0.6
Fissured Tongue	26	14.4
Geographic Tongue	7	3.9
Coated Tongue	11	6.1
Sublingual Varicocele	6	3.3
Actinic Cheilitis **	1	0.6
Lip Fissures	3	1.7
Lip Swelling	2	1.1

Continued

Fordyce's granule	23	12.8
meloanotic keratosis&Nevi	4	2.2
leukoedema&veroeositis	1	0.6
denture stomatitis	1	0.6
trigeminal neuralgia	1	0.6
dark purple lesion	1	0.6
Telangiectasia	1	0.6
Total	**180**	

*** Potentially Malignant Lesions.*

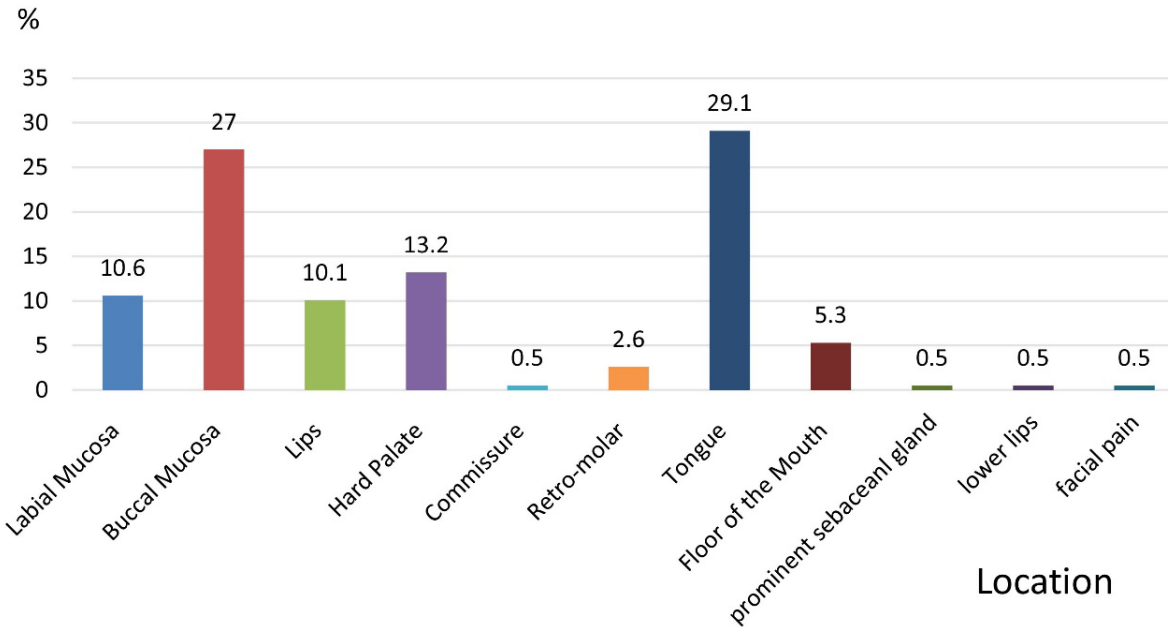

Figure 13. Frequency of mucosal lesions according to location.

Chi-Square Tests were used to assess the effects of the independent variables (Age, gender, Education, smoke tobacco, Medical Conditions, under medical treatment now, hospitalization, dental visits, have you had any prolonged bleeding following dental treatments, wearing dentures, Oral hygiene level) of Oral Mucosal lesions and Geriatric Patients.

Table 6. Chi-Square Tests between dependent and independent variables and Mucosal lesions and conditions in geriatric patients.

Oral Mucosal Lesions & Variables	Value of Chi-Square	Significance
Age	111.174	0.138
Gender	27.96	0.262

Continued

Education	89.122	0.677
Do you smoke tobacco	70.24	0.001*
Medical Conditions	1158.771	0.256
Under medical treatment now	24.871	0.413
Have you ever hospitalized before	14.23	0.941
Have you ever been to the dentist before	14.604	0.932
Have you had any prolonged bleeding following dental treatments	24.737	0.42
Do you wear dentures	75.329	0.0001*
Oral hygiene level	31.595	0.967

*(*P value is significant* < 0.05).

It was noted from the previous table that all the values of Significance are more than 0.05, except smoking and denture wearing habits (P value < 0.05), which indicates that those two factors are associated significantly with oral lesions (Table 6).

4. Discussion

Oral mucosal lesions are common in geriatric patients due to a combination of age-related, physiological changes, systemic diseases, medications, and poor oral hygiene.

In our study, Candidiasis, which is a fungal infection is a common lesion (12.7%) and angular cheilitis (1.7%). Candidiasis is common in elderly due to reduced immunity, xerostomia, denture use, poor oral hygiene and due to systemic conditions (diabetes mellitus, malignancy, malnutrition).

The oral mucosa is an essential anatomic structure of the oral cavity. It prevents harmful pathogens from entering the body. Many systemic diseases and/or conditions have an oral mucosal manifestation [11] [12]. Therefore, regular patient visits to the dental office and regular checkup of the oral mucosa are mandatory measures of revealing systemic and even local diseases/conditions (e.g. oral cancer) [13].

In our study, the prevalence of oral mucosal findings and lesions among 266 geriatric patients attending oral medicine and diagnosis clinics at Al-Quds University in Palestine was 54.5%, which is close to studies performed in Turkey 41.7% [14], India 41.2% [15], and Spain 58.8% [16]. Habash *et al.* revealed a high prevalence of aphthous and traumatic ulcers among adults not geriatric patients [13].

The most common lesion was recurrent fissured tongue 14.4%. This finding is similar to a study which was conducted in Jordan, 2000 dental outpatients were diagnosed to detect any tongue lesions. The most common tongue lesion found was fissured tongue (11.5%), followed by coated tongue (8.2%), then geographic tongue (4.8%), and hairy tongue (2.4%). Median rhomboid glossitis was diag-

nosed in 0.5% of patients. Most of the patients were not aware of their tongue lesions [12]. The etiology behind this lesion is not well identified but is thought to be multifactorial [9]. Factors implicated include: hormonal fluctuation, microelement deficiencies (such as vitamin B12), infections, genetic predisposition, systemic diseases, mechanical injuries, and stress [11]. Males were found to have more oral lesions than females. In Kuwait, the most common lesion detected was Fordyce's granules [17]. This study also found statistically significant correlation between smoking and potentially malignant lesions $P < 0.05$. This emphasizes the importance of executing such investigations in order to examine the Palestinian individuals for intercepting currently active diseases and probe the etiology behind them in order to prevent future cases from happening by targeting the risk factors. Oral lesions prevalence studies are important in assessing the risk factors behind the development of oral lesions and aid in constructing guidelines concerned with the early detection and management of those lesions. In a study done by Ali *et al.*, the prevalence of lesions increased with older age, alcohol and tobacco consumption [8], stressing out the importance of adopting routine examination of the oral mucosa for adults [4]. The fact that the study has been done in the oral medicine clinic might have skewed the percentage of patients with lesions. In the University, patients either go directly to the oral medicine clinic or are referred to it from other departments when they have a condition/oral lesion that needs to be further investigated and/or diagnosed. This means that the number might be higher than it actually is for the Palestinian population since patients are intentionally referred to the oral medicine clinic if they have been found to have an oral mucosal lesion. Therefore, this study may not be representative of the prevalence of oral lesions among the Palestinian population and a larger-scale study must be done in order to assess that. As a third world country, Palestine could benefit from incorporating a systematic approach to detecting oral lesions through proper diagnosis in the dental clinic. The integration of such a protocol into the curriculum of the dental school is the gateway for targeting lesions in their early stages. Oral cancer could be manifested as a potentially malignant lesion before becoming cancerous [2]. Early detection, counselling habit cessation, periodic re-evaluation and long-term follow-up of potentially malignant lesions such as lichen planus and leukoplakia is key for improving their prognosis [3] [8]. *According to the WHO, A potentially oral premalignant lesion is defined as "any oral mucosal abnormality that is associated with a statistically increased risk of developing oral cancer". These include: Leukoplakia* (*homogenous and non-homogenous*), *Erythroplakia, Oral submucous fibrosis, Oral Lichen Planus, Actinic Cheilitis, Palatal lesions in reverse smokers, Oral lichenoid reactions, Graft-versus-host disease, and Dyskeratosis congenita* [18].

The present study has shown that males were more affected than females. This finding is consistent with Sri *et al.* (2023) who conducted a similar investigation in India [17]. However, smoker's melanosis was the most frequent oral mucosal lesion (37%) and buccal mucosa was the most frequent site of occurrence (49%)

as observed in their study due to different patterns of smoking habits in India. Whereas Rohini *et al.* (2020) elucidated that oral submucous fibrosis was the most common oral lesion found in elderly Indian patients [19]. Non oral habits (vitamin deficiency and stress) could be risk factors.

In our study, the percentage of patients visiting the dentist in the past 6 months is low. Low dental visit rates among the elderly can delay the early detection of potentially malignant lesions which are critical for preventing oral cancer. A significant proportion among geriatric patients has not visited a dentist in the past 6 - 12 months could be due to perceived lack of need especially among edentulous patients, financial reasons, mobility issues and also due to lack of awareness about oral health importance. Therefore, poor oral hygiene levels, lack of teeth brushing and recall dental visits might be considered to be associated with oral mucosal lesions observation among elderly patients. However, further investigations are needed to show such claim.

Complete oral healthcare interpositions should be designed to the specific needs of elderly individuals to formulate targeted preventive protocols [**2**0]. Hence a policy must be implemented by the Palestinian Ministry of Health to address this problem; this can be addressed by outreach programs to offer regular screening and oral health care to the elderly.

5. Conclusions

This study highlights the considerable burden of oral mucosal lesions among geriatric Palestinian dental patients and underlines the importance of early diagnosis and preventive care. The study reveals that the prevalence of oral mucosal lesions and disease is high in geriatric population and the risk increases with advancing age, presence of habits (especially smoking), and use of dentures.

Oral health is an important factor determining the quality of life in aged individuals. Understanding the types of lesions and their associated risk factors allows healthcare providers to offer new treatment strategies and reinforces the importance of early detection and monitoring of such lesions, particularly as some can have a premalignant potential. This knowledge is mandatory for the improvement of oral health promotion and prevention programs for older age groups, as recommended by the World Health Organization, especially considering the aging of the global population. Continued research in this area can contribute to improved public health policies and better clinical outcomes.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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