Section: Miscellaneous

Original Research Article

EPIDEMIOLOGICAL PREVALENCE AND CLINICODEMOGRAPHIC PROFILE OF ORAL MUCOSAL VARIATIONS: A CROSS-SECTIONAL STUDY

Syeda Laraib Fatima[1], Faisal Asghar[2], Faiqa Hassan[3], Syed Hammad Ahsan[4], Mohsina Waheed[5], Saman Malik[6]

[1]House Officer, Bakhtawar Amin Medical and Dental Hospital, Multan, Pakistan
[2]Assistant Professor, Oral Medicine, Multan Medical and Dental College, Multan, Pakistan
[3,6]Associate Professor, Dental College, HITEC Institute of Medical Sciences (HITEC-IMS), Taxila, Pakistan
[4]Assistant Professor, Department of Oral Pathology, Dow International Dental College, Karachi, Pakistan
[5]BDS, C- Endo, Dental Surgeon, Life Care International Hospital, Islamabad, Pakistan

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Corresponding Author:
Dr. Syeda Laraib Fatima,
House Officer, Bakhtawar Amin Medical and Dental Hospital, Multan, Pakistan.
Email: fatimasslaraib@gmail.com

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ABSTRACT

Background: Oral mucosal variations occur frequently and may show normal variation or benign conditions. These changes may be affected by demographics, habits, and other factors. Knowing the prevalence of these variations and their distribution may permit correct diagnosis and help avoid needless procedures. The aim is to describe the clinicodemographic profile and the prevalence of oral mucosal variations.

Materials and Methods: A cross-sectional study performed with 150 patients from the outpatient dental clinics over a six-month study period. The participants were adult (18+) patients enrolled on a consecutive basis. Age, sex, education, occupation, smoking, and systemic illness were recorded on a pretested data collection form. Participants underwent a complete oral examination conducted by trained dental professionals to detect oral mucosal variations. The results were analyzed using descriptive statistics and Chi-square tests. A p-value of <0.05 was considered significant.

Results: Of the 150 participants, 54.7% (82) were females, 45.3% (68) were males, and the mean age was 36.8 ± 12.4 years. Oral mucosal variations were seen in 65.3% (98). The most common were Fordyce granules (24.7%), fissured tongue (18.0%), linea alba (15.3%), geographic tongue (10.7%), leukoedema (8.7%), and lingual varicosities (6.0%). Oral mucosal variations were noted among participants aged above 40 years (p=0.021) and smokers (p=0.013). There were no significant associations in terms of gender (p=0.284). The presence of multiple oral mucosal variations was noted among 27.3% of the affected population.

Conclusion: Among the studied population, variations of oral mucosa were extensive, and the major findings were Fordyce granules and fissured tongue. Significant associations with age and smoking status were noted. Routine oral examinations enable the identification of oral mucosal variations and differentiation from pathological lesions, thus improving diagnostic and treatment approaches for the patient.

Keywords: Oral mucosal variations, Epidemiology, Prevalence, Clinicodemographic profile, Fordyce granules, Fissured tongue, Cross-sectional study.

INTRODUCTION

The oral mucosa protects the oral cavity and covers the structures found in it. The oral mucosa maintains the overall health of the oral cavity and the body. The oral mucosa can undergo changes, which can be normal or pathological. Variations in the oral mucosa are commonly noted during dental checkups. These

variations can be Fordyce granules, fissured tongues, geographic tongues, linea alba, leukoedema, or lingual varicosities. These variations are usually harmless and do not require any treatment. They may be confused with a pathological condition. It is therefore necessary to have a clear understanding of their clinical presentation and prevalence.[1,2]

Oral mucosal changes are present across the globe according to epidemiological studies. The prevalence of oral mucosal lesions and the variations that are classified as normal do not show a consistent prevalence. Studies have shown that the prevalence can be as low as 10% or as high as 60% depending on the population that the study is focusing on, the age distribution, and the geography among other factors.[3,4]

There are many clinicodemographic factors that affect oral mucosal variations. A common example is age, and in this case, older people are more likely to present with lingual varicosities. Variations of the oral mucosa can also be related to some lifestyle factors. These factors can be the use of tobacco and alcohol, poor oral hygiene, and the use of tobacco among other factors. It is also necessary to understand these factors to improve oral disease prevention strategies.[5]

Fordyce granules, which are sebaceous granules, are one of the common oral mucosal variations. They present as small papules on buccal mucosa and lips, and are yellowish in color. They are benign and are left untreated. Similarly, fissured and geographic tongues are benign conditions and their prevalence and presentation can be influenced by age and environment.[1]

Detecting conditions in the oral cavity can be used to diagnose some systemic conditions. During an oral inspection, a clinician can determine the presence of an otherwise undiagnosed systemic condition. Because of this, it is as important to recognize both the pathological and normal variations of oral mucosa.[6]

There is a growing acknowledgement of the association between the state of oral mucosa and systemic well-being. Changes to the microbiome of the oral cavity and alterations to the immune system can affect the integrity of oral mucosa and can be the onset of oral mucosal disorders. This gives an impetus to research on the health status of oral mucosa.[7]

There is a demonstrated disparity in oral mucosal disorders in studies conducted in specific geographic regions. European and Asian studies cite frequencies of Fordyce granules, fissured tongues, and geographic tongues; showing them as common variations of oral mucosa. These disparities may be due to genetic and environmental variations, as well as variances in healthcare and lifestyle amongst the populations.[8]

Although variations of the oral mucosa are clinically important, research addressing their epidemiology has largely been absent in many developing countries. This absence of research may result in inadequate recognition of normal variations of the oral mucosa, inappropriate referrals, and even unintended treatment. Thus, studies focused on the prevalence and the clinicodemographic patterns of oral mucosal variations will assist many clinicians, and will help both clinicians and health care planners. (4). Insight into the distribution of oral mucosal variations may be achieved by integrating findings of oral mucosa and clinicodemographic patterns. This may also assist recognition of risk factors and enhance awareness of benign oral findings to the healthcare practitioners associated with this field.[9]

In light of the above, this study focused on the epidemiology and the clinicodemographic patterns of oral mucosal variations of patients who visited dental health care centers. The results of this research are anticipated to enhance the literature to allow clinicians to recognize oral mucosal variations in a timely manner and allow clinicians to manage these variations appropriately.

MATERIALS AND METHODS

Study Design: The current study uses a cross-sectional observational design to investigate the prevalence and clinicodemographic characteristics of patients with variations of the oral mucosa. The advantage of the cross-sectional observational design is that it can measure the prevalence and association of variations in oral mucosa with demographic and clinical characteristics in a single study.

Study setting and duration: This study was conducted in the outpatient departments of selected dental hospitals and clinics. The data collection period lasted 6 months between January 2026 and June 2026. All assessments were done in a clinical setting with standardized procedures.

Study population: This study consisted of adult patients visiting outpatient dental clinics for routine dental check-ups, consultations, and treatments. Participants were recruited regardless of their complaints for the purpose of obtaining a representative sample from the general dental patient population.

Sample size: This study was conducted with a sample of 150 participants. The sample size was justified for the purpose of estimating the prevalence of oral mucosal variations and their associated demographic and clinical characteristics.

Sampling technique: Consecutive sampling was used to recruit the required sample. All eligible patients reporting to the selected dental clinics during the study period were invited to participate in the study.

Inclusion and Exclusion Criteria

Eligible study participants were adult patients (18 years and older) who visited the specified dental outpatient clinics during the specified time frame. Written informed consent was the basis of study recruitment. Participation required a thorough oral examination and the completion of a demographic

and medical history questionnaire. All patients, regardless of their primary dental complaint, were included to attain an adequate sample of the dental patient population.

Participants were excluded if they hadacute dental infections that required emergency interventions, had a diagnosis of oral cancer, or were undergoing treatment of oral mucosal lesions that may affect the normal appraisal of oral mucosal variation. Participants were also excluded if they were unfit to participate in the clinical examination, had incomplete clinical documentation, or did not provide informed consent.

Study Variables: The main outcome variable of the study was the presence of oral mucosalvariation based on the clinical examination. Some of the conditions of oral mucosal variations included Fordyce granules, fissured tongues, geographic tongues, linea albas, leukoedema, lingual varicosities, and other benign variations of oral mucosa. The study considered participants' clinicodemographic and health-related characteristics as independent variables. Age, gender, educational level, and occupation were the demographic variables used. The clinical variables were smoking status, tobacco use and its pattern, presence of systemic medical conditions, medication history, and oral hygiene practices. All these variables were analyzed to understand their impact on the formation and distribution of variations of the oral mucosa in the study population.

Data Collection Procedure: Having received informed consent, the study population was subjected to an interview where clinicodemographic data was collected through the use of a structured questionnaire. This questionnaire included age, gender, education, and occupation, as well as variables on smoking, use of tobacco, presence of systemic medical conditions, medication history, and oral hygiene practices. This was followed by a detailed intraoral examination, which was performed by a trained dentist using a disposable mouth mirror, gauze, and an adequate source of illumination. All mucosal surfaces of the oral cavity were examined. Variations of the oral mucosa were documented based on common clinical writings standards. The variations assessed included Fordyce granules, fissured tongue, geographic tongue, linea alba, leukoedema, lingual varicosities, and other variations of a benign nature. The results were recorded on a clinical examination form.

Research Instrument

Two instruments were used for data collection.

1. Clinicodemographic Questionnaire: The questionnaire was used to record demographic and clinical data of the respondents.
2. Oral Mucosal Examination Form: A form used to conduct a clinical examination to record the nature, site, and count of oral mucosal variations.

Quality Control: Prior to data collection, all examiners participated in calibration sessions. Diagnostic criteria were standardized and a small-scale feasibility study provided an opportunity to assess and refine the data collection methods. Research personnel participated in calibration sessions and diagnostic criteria were standardized.

Ethical Considerations: Participants completed a written informed consent and were provided full autonomy to refuse participation or withdraw from the study with no repercussions. During the study, control was provided to the participants to ensure their privacy and anonymity.

Statistical Analysis: Data were analyzed using the Statistical Package for the Social Sciences (SPSS version 26). Descriptive statistics calculated means with standard deviation and frequencies with percentages for demographic and clinical variables. The percentage of the population of interest was reported. Association of oral mucosal variations with clinicodemographic characteristics was tested using the Chi-square test. Statistical significance was determined with $p < 0.05$.

RESULTS

Table 1: Demographic Characteristics of Participants (N = 150)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	68	45.3
Gender	Female	82	54.7
Age Group (Years)	18–30	52	34.7
Age Group (Years)	31–40	40	26.7
Age Group (Years)	41–50	35	23.3
Age Group (Years)	>50	23	15.3

Table 2: Overall Prevalence of Oral Mucosal Variations

Status	Frequency (n)	Percentage (%)
Present	98	65.3
Absent	52	34.7
Total	150	100.0

Table 3: Distribution of Different Oral Mucosal Variations

Variation	Frequency (n)	Percentage (%)
Fordyce Granules	37	24.7
Fissured Tongue	27	18.0
Linea Alba	23	15.3

Geographic Tongue	16	10.7
Leukoedema	13	8.7
Lingual Varicosities	9	6.0
Other Variations	11	7.3

Table 4: Association Between Age Group and Presence of Oral Mucosal Variations

Age Group	Present n (%)	Absent n (%)	χ^2	p-value
18–30	28 (53.8)	24 (46.2)		
31–40	25 (62.5)	15 (37.5)		
41–50	28 (80.0)	7 (20.0)		
>50	17 (73.9)	6 (26.1)	9.72	0.021*

Table 5: Association Between Gender and Presence of Oral Mucosal Variations

Gender	Present n (%)	Absent n (%)	χ^2	p-value
Male	47 (69.1)	21 (30.9)		
Female	51 (62.2)	31 (37.8)	1.15	0.284

Table 6: Association Between Smoking Status and Presence of Oral Mucosal Variations

Smoking Status	Present n (%)	Absent n (%)	χ^2	p-value
Smoker	35 (83.3)	7 (16.7)		
Non-Smoker	63 (58.3)	45 (41.7)	6.18	0.013*

Table 7: Number of Oral Mucosal Variations per Affected Participant (n = 98)

Number of Variations	Frequency (n)	Percentage (%)
Single Variation	54	55.1
Two Variations	27	27.6
Three or More Variations	17	17.3
Total	98	100.0

DISCUSSION

This cross-sectional study aimed to determine the epidemiological prevalence and the clinicodemographic profile of oral mucosal variations in patients found in dental outpatient clinics. Findings showed that oral mucosal variations were prevalent and found in 65.3% of the study population. Such high prevalence undoubtedly indicates the need for oral examination. This also advocates clinicians' acknowledgment of the distinction between normal mucosal variations and pathological lesions. Patil et al,[10] have reported similar findings, stating that oral mucosal changes are common among the general population and are usually benign and do not require management.

In the present study, the most commonly reported oral mucosal variation was Fordyce granules, followed by the fissured tongue and linea alba. The findings of dominant Fordyce granules were in concurrence with findings by Jahanbani et al,[11] as they stated that Fordyce granules were common among adult normal findings in oral mucosa. The lesions in question are developmental variations as opposed to pathological findings and in fact are older age findings.

Fissured tongue was the second most commonly reported variation in the study. Similarly, Dafar et al,[12] noted that fissured tongue was often found in adults and was found to be commonly associated with aging and a genetic predisposition. While fissured tongue is usually asymptomatic, it may be uncomfortable and may be associated with bad breath if debris becomes trapped.

The results regarding the prevalence of geographic tongue in our study is comparable to results reported by Kullaa-Mikkonen and Sorvari,[13] in which they described geographic tongue as a benign irritative phenomenon and described the presence of geographic tongue as areas of dorsal tongue surface depapillation which may be migratory. While the phenomenon has been associated with a number of factors including genetic predisposition, perturbation of the immune and nervous systems, and various environmental factors, the cause of this phenomenon is unknown.

A statistically significant relationship was observed between age and the presence of oral mucosal variations. The changes were more frequently observed in the participants over 40 years of age and were less frequent in the younger participants. These results are in agreement with the findings by Al-Maweri et al,[14] in which it was reported that oral mucosal changes are more frequent in older individuals due to changes in the oral environment over time and age-related changes to oral tissues.

This study identified a significant relationship between oral mucosal variations and smoking. The prevalence of changes to the oral mucosa was significantly greater in the smoking participants compared to the non-smoking participants. Similar findings were reported by Hassona et al,[15] in which tobacco use was reported to be a significant factor in the development of oral mucosal changes. Changes to the oral epithelium, oral pigmentation, and changes to oral mucosal keratinization were noted in tobacco smokers and these changes were observed during the routine clinical examination of the oral cavity.

No significant relationship was found between oral mucosal variations and gender. This finding is in agreement with the findings of Pentenero et al,[16] in which it was concluded that oral mucosal variations are equally present in males and females and there is a greater influence of environmental and behavioral factors than the biological sex-related factors.

A wide variety of oral mucosal presentations may affect a significant number of subjects. This variety of presentations has been described by others, including Feng et al,[17] where subjects had more than one oral mucosal condition. This often complicates diagnosis and demonstrates the need for a thorough clinical oral examination.

The results of the current study provide useful epidemiological data regarding the presence of oral mucosal variations among adults. Recognition of these variations may help to avoid misdiagnosis, mitigate unnecessary treatment, and enhance the effectiveness of client education. Additionally, appreciation of the clinicodemographic factors associated with variations of the oral mucosa may help the clinician identify patients who may benefit the most from enhanced monitoring and preventive virtual visit counseling.

The results of the current study confirm what has been previously reported, that variations of the oral mucosa are commonly encountered in dental practice. The need for continued epidemiological studies is warranted to better determine the variations of oral mucosa and the associated determinants in practice, as well as provide indications of prevalence for specific populations.

CONCLUSION

The results of the current study confirm that oral mucosal variations are commonly found in adult patients of a dental practice. The most frequent oral mucosal variations were found to be Fordyce granules, fissured tongue, and linea alba. The presence of oral mucosal variations was found to be significantly associated with increasing age and the participant's smoking status, and not with the participant's gender. The identification of these benign oral mucosal changes is essential to avoid misdiagnosis and unnecessary treatment. This will help in improving the outcomes of oral health.

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