



Frequency and Determinants of Tongue Lesions among Patients Reported in a Teaching Institute: A Cross-Sectional Study

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Authors' contributions

This work was carried out in collaboration among all authors. Author MFA did the conceptualization of the study, literature search, data collection, analyzed the data and written the article. Authors SS, AZ, and FS did the conceptualization of the study, literature search, data collection and analyzed the data. Authors GA and HA were done conceptualization, study design, data interpretation and proofreading. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The purpose of the study is to evaluate the frequency, distribution and determinants of tongue lesions in our teaching institute. Also to find an association of common tongue lesions with various study variables.

Study Design: Cross-sectional study design.

Place and Duration of Study: The study was conducted at Fatima Jinnah Dental College & Hospital, Karachi, Pakistan. All the lesions presented on the tongue were included reported from January 2017 to December 2020.

Methodology: There were 670 oral lesions documented in the Department of Oral Pathology and Oral Medicine out of which 93 (13.8%) represented tongue lesions. We included 93 patients with tongue lesions (45 men, 48 women; age range 18-80 years). These lesions include the atrophic

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tongue, geographic tongue, candidiasis, keratotic lesion, ulceration, oral pigmentation, fibroma, black hairy tongue, traumatic neuroma, herpes infection, oral submucous fibrosis, and oral squamous cell carcinoma.

Results: In the study, common clinical presentations on the tongue were ulceration (29%), erythematous/depapillated tongue (22.6%), white keratotic and plaque-like lesions (21.6%), and black discoloration (8.6%). The clinical presentation was statistically associated with gender ($p=0.03$), age ($p=0.04$) and site of lesion ($p<.001$). Atrophic glossitis (19.4%), traumatic ulcer (12.9%), pseudomembranous candidiasis (12.9%), oral pigmentation (8.6%), oral squamous cell carcinoma (7.5%), geographic tongue (6.5%), recurrent aphthous stomatitis (6.5%), and frictional keratosis (6.5%) were most commonly reported tongue lesions. There was a relationship of tongue lesions with causes and site of the lesion ($P<0.001$).

Conclusion: Initial tongue lesions may reflect underlying massive abnormal changes and this could be an early diagnostic parameter. Through vigilant screening of the oral mucosa, we may be able to detect such mucosal alterations and search out the possible cause in order to provide effective treatment to the patient. In this way, we may also prevent the malignant transformation of any susceptible oral lesions.

Keywords: Clinical distribution; frequency; glossitis; oral mucosa; tongue diseases.

1. INTRODUCTION

In the oral cavity, the tongue is an important component that is covered by a thin, protective, specialized layer of stratified squamous epithelium [1]. It comprises skeletal muscle and performs various functions like eating, talking, swallowing and taste sensation [2]. The specialized epithelium of the tongue possesses sensory receptors which stimulate via chemical particles present in the food [3]. Any variation in the physical appearance and perception of sensation may indicate the affected person as well as a clinician about apprehensive changes which may be manifesting as a clinical sign on the lingual tissue [1]. Therefore, a vigilant examination and screening of the oral cavity is necessary while the patient presents to the outpatient department to detect any pathologies in the early stages of its development [4].

There is plenty of information available on the malignancy of tongue in our population and globally, but few studies have been conducted to find the frequency and distribution of reactive or non-malignant lesions of the tongue in our population [5,6]. It is important to find the data about non-malignant tongue lesions because some of the lesions have the potential to transform into a malignancy. Non-malignant lesions can either be atrophic, inflammatory, infective, keratotic, hyperplastic or premalignant in nature depending on the type of stimuli [7]. Sometimes mistakenly, while examining the oral mucosa examiner overlook the minor changes appearing on the tongue such as redness, depapillation, burning sensation, mild

pigmentation, white-coated as usual alteration but these alterations should also be taken into account to rule out major underlying problems [8].

As per the literature, certain studies have been conducted to report the prevalence of non-malignant tongue lesions globally but data is scarce in Pakistan. There are many studies conducted to report the prevalence and determinant of oral malignant lesions in our population [5,6]. In this study, we have evaluated the frequency, distribution and determinants of the tongue lesions in our teaching Institute. Also to find an association of tongue lesions and clinical presentations with various independent study variables (age, gender, cause, and site of the lesion). Moreover, to identify the most susceptible site of tongue for malignant transformation.

2. METHODOLOGY

This is a cross-sectional study conducted at Fatima Jinnah Dental College & Hospital, Karachi Pakistan. The duration of the study was from January 2017 to December 2020. Ethical approval was taken from the Ethical Review Board of the institute (JAN-2020-ORPO1). Verbal consent was taken from patients while taking history and intra-oral examination. The sampling technique was convenience sampling.

The sample size was determined by the availability of tongue lesions in the period of 4-year. There were a total of 670 oral lesions documented in the Department of oral Pathology

and Oral Medicine, out of which 93 (13.8%) represented tongue lesions. All types of tongue lesions were included in the study. These include the atrophic tongue, geographic tongue, oral candidiasis, keratotic lesion, traumatic ulceration, oral submucous fibrosis, aphthous stomatitis, oral pigmentation, fibroma, black hairy tongue, traumatic neuroma, herpes infection, and oral squamous cell carcinoma. In the study, only tongue lesions were included. The tongue lesions were diagnosed by the experts clinically and histological examinations were also performed where ever required.

The patients were thoroughly examined during their dental checkup and detailed notes were prepared by the examining dentist. Information was collected from the patient's record form, about the patient's age, gender, site of the lesion, clinical presentation, cause of the lesion, type of the lesion, localized or generalized, clinical or histological diagnosis. The site of the lesion was categorized into the dorsal surface, ventral surface, lateral border of the tongue, and combination of lateral and dorsal surfaces of tongue. Few tongue lesions biopsy samples were also sent for histological confirmation.

Study data was calculated using SPSS version 20.0. Frequency and percentage were calculated for categorical variables (gender, site of the lesion, cause, clinical presentation and tongue lesions). Mean and standard deviation for the numerical variable (age). A Chi-square test or likelihood test was applied to find an association between different variables of the study. P-value of < 0.05 was considered significant.

3. RESULTS

Among all the samples of tongue lesions, there were 48; 51.6% females and 45; 48.4% males between the age of 18-80 years. The mean age of the patients was 39.4 +/- 15.1. Most of the reported tongue lesions belonged to the age group of 21- 40 years (49, 52.7%) followed by 41-60 years (35, 37.6%). The common clinical presentations on the tongue were found in this study were ulceration (27, 29%), erythematous, depapillated tongue (21, 22.6%), white keratotic and plaque-like lesions (20, 21.6%), and black discoloration (8,8.6%) as shown in Table 1. There was a statistically significant association of clinical presentations on tongue with age (P=.04), gender (P=.03), and site of the lesion (p<.001).

In this study the commonly reported tongue lesions were atrophic glossitis (18, 19.4%), traumatic ulcer (12,12.9%), pseudomembranous candidiasis (12,12.9%), oral pigmentation (8,8.6%), oral squamous cell carcinoma (7,7.5%), geographic tongue (6, 6.5%) Fig. 2, recurrent aphthous stomatitis (6, 6.5%), and frictional keratosis (6, 6.5%). The bar graph demonstrates prevalent reasons associated with tongue lesions in relation to age (Fig. 1). The common determinants of tongue lesions include sharp edges of teeth (17, 18.3%), poor oral hygiene (12, 12.9%), tobacco and betel quid (18, 19.4%), nutritional deficiency (9, 9.7%), idiopathic (9, 9.7%), diabetes mellitus/xerostomia (9, 9.7%). The last three causes were associated with erythematous or ulcerative lesions of the tongue. While the first three with the malignant lesions of the tongue. A statistically significant association of tongue lesions was found with cause and site of the lesion (p<.001).



Fig. 1. Map-like pattern appeared on the dorsal surface of tongue (Geographic tongue)

The highest distribution of lesions was on the dorsal surface (47, 50.5%) followed by the lateral border of the tongue (34, 36.6%). The non-malignant lesions were predominant on the dorsal surface of the tongue while the malignant on the lateral border of the tongue. This is a statistical significance shown by a p-value of <.001 as given in Table 2. Majority of the lesions appeared as a single lesion (66.6%) whereas 33.3% were shown multiple lesions generalized all over the tongue surface. The hyperplastic (fibroma and nodule) and premalignant lesions (keratotic and exophytic) were confirmed by the histopathological evaluation.

Table 1. Represents association of diagnostic findings with gender and age

Diagnostic findings	Gender (n%)			Age (n%)				Total
	Female	Male	Total	<20	20-40	41-60	>60	
Ulcer	9 (9.6%)	18 (19.3%)	27 (29.1%)	3 (3.2%)	17 (18.3%)	7 (7.5%)	0 (0%)	27 (29%)
White, keratotic lesion	5 (5.3%)	5 (5.3%)	10 (10.7%)	0 (0%)	0 (0%)	9 (9.7%)	1 (1.1)	10 (10.7%)
White, Plaque-like	4 (4.3%)	6 (6.5%)	10 (10.7%)	0 (0%)	6 (6.5%)	4 (4.3%)	0 (0%)	10 (10.7%)
Exophytic mass	2 (2.2%)	3 (3.2%)	5 (5.3%)	0 (0%)	2 (2.2%)	3 (3.2%)	0 (0%)	5 (5.3%)
Speckled lesion	1 (1.1)	0 (0%)	1 (1.1)	0 (0%)	0 (0%)	1 (1.1)	0 (0%)	1 (1.1)
Black pigmentation	7 (7.5%)	1 (1.1)	8 (8.6%)	1 (1.1)	5 (5.3%)	2 (2.2%)	0 (0%)	8 (8.6%)
Blisters	1 (1.1)	0 (0%)	1 (1.1)	0 (0%)	1 (1.1)	0 (0%)	0 (0%)	1 (1.1)
Hyperplastic lesion	1 (1.1)	0 (0%)	1 (1.1)	0 (0%)	1 (1.1)	0 (0%)	0 (0%)	1 (1.1)
Depapillated tongue	14 (15%)	7 (7.5%)	21 (22.6%)	0 (0%)	14 (15%)	6 (6.5%)	1 (1.1)	21 (22.6%)
Map-like appearance	1 (1.1)	4 (4.3%)	5 (5.3%)	3 (3.2%)	1 (1.1)	1 (1.1)	0 (0%)	5 (5.3%)
Black hairy	2 (2.2%)	0 (0%)	2 (2.2%)	0 (0%)	1 (1.1)	1 (1.1)	0 (0%)	2 (2.2%)
Papillary outgrowth	0 (0%)	1 (1.1)	1 (1.1)	0 (0%)	0 (0%)	1 (1.1)	0 (0%)	1 (1.1)
Firm Nodule	1 (1.1)	0 (0%)	1 (1.1)	0 (0%)	1 (1.1)	0 (0%)	0 (0%)	1 (1.1)
Total	48 (51.6%)	45 (48.3%)	93 (100%)	7 (7.5%)	49 (52.7%)	35 (37.6%)	2 (2.2%)	93 (100%)
p-value	.03*			.04*				

Table 2. of types of tongue lesion with gender and site of lesion

Types of tongue lesions	Gender (n%)			Site of lesion (%)				
	Female	Male	Total	LB/DS	LB	DS	VS	Total
Atrophic glossitis	12 (13%)	6 (6.5%)	18 (19.3%)	5 (5.3%)	0 (0%)	13 (13.9%)	0 (0%)	18 (19.3%)
Oral candidiasis	7 (7.5%)	7 (7.5%)	14 (15%)	0 (0%)	0 (0%)	14 (15%)	0 (0%)	14 (15%)
Traumatic ulcer	4 (4.3%)	8 (8.6%)	12 (13%)	0 (0%)	11 (11%)	0 (0%)	1 (1.1%)	12 (13%)
Oral pigmentation	7 (7.5%)	1 (1.1%)	8 (8.6%)	0 (0%)	2 (2.2%)	6 (6.5%)	0 (0%)	8 (8.6%)
OSCC	3 (3.2%)	4 (4.3%)	7 (7.5%)	0 (0%)	6 (6.5%)	0 (0%)	1 (1.1%)	7 (7.5%)
Geographic tongue	2 (2.2%)	4 (4.3%)	6 (6.5%)	0 (0%)	0 (0%)	6 (6.5%)	0 (0%)	6 (6.5%)
Frictional Keratosis	3 (3.2%)	3 (3.2%)	6 (6.5%)	0 (0%)	6 (6.5%)	0 (0%)	0 (0%)	6 (6.5%)
RAS	2 (2.2%)	4 (4.3%)	6 (6.5%)	1 (1.1%)	3 (3.2%)	0 (0%)	2 (2.2%)	5 (5.3%)
OSF	1 (1.1%)	2 (2.2%)	3 (3.2%)	0 (0%)	2 (2.2%)	1 (1.1%)	0 (0%)	3 (3.2%)
Herpes Infection	1 (1.1%)	2 (2.2%)	3 (3.2%)	0 (0%)	2 (2.2%)	1 (1.1%)	0 (0%)	3 (3.2%)
Black Hairy tongue	2 (2.2%)	0 (0%)	2 (2.2%)	0 (0%)	0 (0%)	2 (2.2%)	0 (0%)	2 (2.2%)
Aspirin burn	1 (1.1%)	1 (1.1%)	2 (2.2%)	0 (0%)	0 (0%)	0 (0%)	2 (2.2%)	2 (2.2%)
Fissured tongue	0 (0%)	1 (1.1%)	1 (1.1%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	1 (1.1%)
Verrucous SCC	0 (0%)	1 (1.1%)	1 (1.1%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	1 (1.1%)
Fibroma	1 (1.1%)	0 (0%)	1 (1.1%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	1 (1.1%)
leukoplakia	0 (0%)	1 (1.1%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)
Lichen planus	1 (1.1%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)
Traumatic neuroma	1 (1.1%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	1 (1.1%)
Total	48 (51.6%)	45 (48.3%)	93 (100%)	6 (6.5%)	34 (36.5%)	47 (50.5%)	6 (6.5%)	93 (100%)
p-value	.39			<.001*				

*LB (lateral border of tongue), DS (dorsal surface of tongue), VS (ventral surface of tongue)

Table 3. Represents association between diagnostic findings and types of tongue lesions

Types of lesions	Diagnostic Findings													Total
	ulcer	White, keratotic lesion	White, Plaque-like	Exophytic mass	Speckled lesion	Black pigmentation	Blisters	Hyperplastic lesion	Depapillated tongue	Map-like appearance	Black hairy	Papillary outgrowth	Firm Nodule	
Atrophic glossitis	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	18 (19.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	18 (19.3%)
Oral candidiasis	0 (0%)	3 (3.2%)	10 (10.7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	14 (15%)
Traumatic ulcer	12 (12.9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	12 (12.9%)
Oral pigmentation	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	8 (8.6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	8 (8.6%)
OSCC	2 (2.1%)	0 (0%)	0 (0%)	5 (5.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	7 (7.5%)
Geographic tongue	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	5 (5.3%)	0 (0%)	0 (0%)	0 (0%)	6 (6.5%)
Frictional Keratosis	0 (0%)	6 (6.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	6 (6.5%)
RAS	6 (6.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	6 (6.5%)
OSF	2 (2.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (3.2%)
Herpes Infection	3 (3.2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (3.2%)
Black Hairy tongue	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (2.1%)	0 (0%)	0 (0%)	2 (2.1%)
Aspirin burn	2 (2.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (2.1%)
Fissured tongue	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
Verrucous SCC	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	1 (1.1%)
Fibroma	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
leukoplakia	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
Lichen planus	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
Traumatic neuroma	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	1 (1.1%)
Total	27 (29%)	10 (10.7%)	10 (10.7%)	5 (5.3%)	1 (1.1%)	8 (8.6%)	1 (1.1%)	1 (1.1%)	21 (22.5%)	5 (5.3%)	2 (2.1%)	1 (1.1%)	1 (1.1%)	93 (100%)
p-value	<.001*													

Table 4. Shows the association of etiological factors and types of tongue lesions

Types of tongue lesions	Etiological factors														Total
	Sharp edges of teeth	Poor oral hygiene	Betal nut and betel quid	Tobacco	Hormonal changes	Medication	Systemic disease	Idiopathic	Diabetes myelitus/ Xerostomia	Stress	Infection	micronutrient deficiency	Antibiotics use	Reduced salivary flow	
OSF	0 (0%)	0 (0%)	0 (0%)	3 (3.2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (3.2%)
OSCC	0 (0%)	0 (0%)	0 (0%)	7 (7.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	7 (7.5%)
Lichen planus	0 (0%)	0 (0%)	0 (0%)	1 (1.1)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
Leukoplakia	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
Candidiasis	0 (0%)	11 (11.8%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	14 (15%)
RAS	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (2.2%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	3 (3.2%)	0 (0%)	0 (0%)	6 (6.4%)
Traumatic ulceration	11 (11.8%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	12 (12.8%)
Fibroma	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
Oral pigmentation	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (2.2%)	0 (0%)	6 (6.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	8 (8.6%)
Atrophic glossitis	0 (0%)	0 (0%)	3 (3.2%)	0 (0%)	1 (1.1%)	0 (0%)	2 (2.2%)	0 (0%)	6 (6.5%)	0 (0%)	0 (0%)	5 (5.3%)	0 (0%)	1 (1.1%)	18 (18.9%)
Herpes infection	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (3.2%)	0 (0%)	0 (0%)	0 (0%)	3 (3.2%)
Verrucous SCC	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
Fissured tongue	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
Geographic tongue	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (2.2%)	2 (2.2%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	6 (6.4%)
Frictional keratosis	5 (5.3%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	6 (6.4%)
Black Hairy tongue	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	2 (2.2%)
Aspirin burn	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	2 (2.2%)
Traumatic neurofibroma	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
Total	17 (18.3%)	12 (12.8%)	6 (6.4%)	12 (12.8%)	1 (1.1%)	5 (5.3%)	5 (5.3%)	9 (9.7%)	9 (9.7%)	1 (1.1%)	4 (4.3%)	9 (9.7%)	2 (2.2%)	1 (1.1%)	93 (100%)
p-value	<.001														



Fig. 2. Plaque-like white keratotic lesion on the lateral border of tongue (left side)

4. DISCUSSION

In the current study, it has been observed that tongue lesions were slightly predominant in females as compared to males. This could be because of hormonal changes, systemic alterations and nutritional imbalance among the female population [9]. These changes may primarily manifest in the oral cavity including the lingual surfaces [4]. Similarly, in a study conducted by Dhanuthai et al. [10], reported a higher incidence of tongue lesion in females than males in the clinical setting of Thailand. However, studies conducted by Lasisi et al. and Al-Wesabi stated high prevalence of tongue lesions in males as compared to females among the African and Yemini population [11,12]. It has been seen that this variance in the tongue lesions may be because of regional disparity, anatomy, habits, socioeconomic status, level of education, clinical competency, and diagnostic procedures [13]. The statistics of our study represents a strong association of gender with clinical presentations of tongue lesions ($p=0.03$).

In this study, the frequency of tongue lesions was 13.8% among the study population. This is in accordance with studies conducted by Bhattacharya and Patil et al. who reported the frequency of tongue lesions as 13.75% and 12.07% respectively in the Indian population [14,15]. In contrast, another study conducted by Alaeddini et al. stated lower frequency of tongue lesions 6.3% during the period of 25 years in the

Iranian population [16]. The statistics represent that the prevalence of tongue lesions is lower than the lesions on the buccal mucosa and can be cured completely if treated earliest [17]. In the study, the majority of cases belonged to 21-40 years of age (52.7%). Similarly, a study conducted in the Indian population has also stated that most of the tongue lesions were seen in the age group of 31-50 years of age [14]. In this period many age related changes take place in the body which can manifest orally especially on the tongue as it has thin mucosal lining [18]. There is a statistical association of age with the clinical presentation ($p=0.04$).

According to the study findings, most of the patients presented with redness, burning sensation, and depapillation of the lingual tissue, which was clinically diagnosed as atrophic glossitis, fissured tongue, and geographic tongue. The confirmation of the diagnosis was done on the basis of investigations like CBC, serum ferritin, blood pressure, random blood sugar and other micronutrients level. The common causes of above mentioned tongue lesions was found to be diabetes mellitus, hormonal changes, systemic disease and nutritional deficiency. In our study, we have found statistically significant association between tongue lesions and cause of occurrence ($p<.001$). Similarly, Patil et al and Shayeb et al reported high frequency of coated tongue, geographic tongue, fissured tongue, and atrophic tongue as most commonly seen lingual variations

in the Indian and UAE population [15,19]. They reported anemia was the most common systemic disease followed by hypertension and diabetes [19].

In the study, the consumption of tobacco and betel nuts were found to be one of the prevalent causes of tongue lesions. As it is a common practice in our population and products are placed in the buccal sulcus or sublingually, metabolites are released in the vicinity and then causes irritation to the lingual mucosa [20]. As per the current study findings the dorsal surface of the tongue appeared to be the most common site showed alteration. This is also the most common site of malignant transformation according to the literature [21,22]. But in our study the malignant transformation associated with tobacco and areca nuts was noted on the lateral border of the tongue. It is recommended that a thorough examination should be performed of all the surfaces of the tongue with a history of tobacco chewing [1,23]. The site of the lesion also represents statistical association with clinical presentation and tongue lesions ($p < .001$). Dental practitioners enable patients to understand the harmful consequences of continuing usage of tobacco and its product on the oral health. Moreover, we advise them to immediately stop consuming these products, and consuming multivitamins helped in improving their oral condition.

In our study findings other common tongue lesions were traumatic ulcers, oral candidiasis and oral pigmentation. The reasons behind these lesions were found to be poor oral hygiene, sharp or broken edges of the cusp, and the use of homeopathic medicines or broad-spectrum antibiotics. It has been observed that patients while brushing teeth do not clean the dorsal surface of the tongue and underlying systemic disease such as diabetes causes xerostomia which creates an environment for the opportunistic infection [24]. The frequent consumption of tobacco, betel quid, and areca nut reduces the patient's mouth opening which creates a hindrance to maintain a good oral environment [25]. We cannot generalize our finding to the entire population as it was a single-centered study with a limited number of samples.

5. CONCLUSION

Initial lesions on the tongue surfaces may reflect certain abnormal changes taking place in the human body and indicate an early diagnostic

sign of various diseases. In the study, prevalent tongue lesions were atrophic glossitis, geographic tongue, fissured tongue and pseudomembranous candidiasis. These lesions were slightly predominant in females with underlying causes such as micronutrient deficiency, hormonal imbalance, diabetes mellitus, hypertension, and poor-oral hygiene. There must be a need to screen the oral cavity thoroughly and identify these lesions at its earliest. Advise the cessation of associated harmful causative factors and treat them effectively. Organizing large awareness campaigns where in-depth guidance should be given to the general population on how to maintain good oral hygiene and the consequences of systemic diseases or tobacco consumption on oral health. In this way, we may also prevent the malignant transformation of any susceptible oral lesions.

CONSENT

Authors may use the following wordings for this section: "All authors declare that 'written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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