

## ORIGINAL RESEARCH

# An Analysis of Biopsy-proven Tongue Lesions among 8,105 Dental Outpatients

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## ABSTRACT

**Aim:** The aim of the present study was to analyze data on the characteristics of tongue lesions in dental patients seeking care at the Oral Pathology Service of Tehran University of Medical Sciences, from 1985-2010.

**Materials and methods:** Demographic data and histopathologic diagnoses were recorded for all lesions that were documented as occurring on the tongue according to the patient records in our department. Statistical analysis included chi-square, t-, and Fisher's exact tests. A 95% confidence interval (CI) was calculated, and  $p < 0.05$  was considered significant.

**Results:** Tongue lesions constituted 6.3% of all received specimens which included 46 different defects. The most common lesions were lichen planus (LP), irritation fibroma (IF), squamous cell carcinoma (SCC) and pemphigus vulgaris (PV). Tongue lesions were significantly more common in women compared to men (CI = 0.65-0.94,  $p = 0.02$ ). Mean age (47 years) did not differ between male and female subjects (CI = -2.49 – 3.93,  $p = 0.06$ ). The dorsal surface followed by the lateral aspect was the most common site for tongue lesions.

**Conclusion:** It seems that dental practitioners should be perceptive of LP, IF, SCC and PV, when examining the tongue. Histopathologic analysis is essential for achieving final diagnosis in a considerable number of lesions that commonly occur on this organ.

**Clinical significance:** Access to demographic/prevalence data in different populations may be useful in clinical settings and could be complemented by histopathologic diagnosis in most instances. The present findings can be compared with those obtained from other epidemiologic studies in this field resulting in valuable data which may be used in several types of investigations.

**Keywords:** Tongue, Lichen planus, Squamous cell carcinoma, Irritation fibroma, Pemphigus vulgaris, Cross-sectional study.

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## INTRODUCTION

The tongue is a muscular organ that performs several functions in the human body including perception of taste, deglutition, vocalization and cleaning of teeth.<sup>1</sup> To support these actions, it possesses a complex architecture consisting of intrinsic and extrinsic muscles, a specialized epithelium on the dorsal surface encompassing taste and touch receptors and a nonkeratinized lining on its ventral aspect supported by a richly vascularized lamina propria containing nerves, fat cells, salivary glands and lymphoid structures scattered throughout the body.<sup>2,3</sup> Each of these elements can be the origin of a various number of pathologic lesions, including hamartomas, cysts (e.g. lymphoepithelial cyst), benign proliferations, like irritation fibroma, schwannoma and granular cell tumor and malignancies, such as squamous cell carcinoma, lymphoma and rhabdomyosarcoma.<sup>4-6</sup> The clinical appearance of this organ was widely considered an indicator of health or disease during the 19th century and is still of diagnostic value in oral medicine and pathology.<sup>7</sup>

Establishing a definitive diagnosis in the dental clinic relies on the pathology report of a biopsy, but starts with identification of the patients' chief complaint, obtaining a history and oral examination which leads to generation of a list of differential diagnoses. This list is essentially arranged in order of the frequency with which the particular lesion occurs and its reported prevalence based on region, gender, age, race, genetics, etc. Knowledge of the final diagnosis based on microscopic analysis plays an important role in constructing a more precise record which may prove to change the initial order of occurrence. Therefore, epidemiologic information along with microscopic data can provide valuable information for diagnostic and educational purposes and, at the same time, may also be used for population-based comparisons.

The tongue is considered a major oral site for manifestation of numerous lesions which can differ among various population due to genetic and environmental factors or technical, sampling-related and subjective issues that arise during diagnosis.<sup>8,9</sup> There are several reports from around the world that have studied the clinical prevalence of tongue pathoses,<sup>8-17</sup> supplying valuable information that can not

only be used as references for local practicing clinicians, but also assist in a better understanding of the variations between different countries and eventually offering more specific insight into the possible influencing factors responsible for some lesions. Thus presenting more recent detailed data on the frequency and demographic characteristics of diseased conditions from different geographic regions seems imperative, especially considering the ongoing modifications in patient lifestyle and a general shift toward growing public awareness and sensibility to oral health leading to possible changes in disease pattern.<sup>12</sup> The aim of the present study was to analyze data from the past 25 years on the characteristics of tongue lesions in dental outpatients seeking care at the Oral Pathology Service of Tehran University of Medical Sciences, which is one of the main referral centers in Tehran that accepts patients with oral and maxillofacial lesions from the entire province. Most previous studies have been conducted in clinical settings and were based on inspection, which are significant and informative for a great number of defects; however, knowledge of the precise entity of others may be an essential factor, especially in the process of establishing a treatment plan.

## MATERIALS AND METHODS

Patient records archived in the Department of Oral and Maxillofacial Pathology, Faculty of Dentistry, Tehran University of Medical Sciences were reviewed from 1985 to 2010, and basic data pertaining to age, sex and diagnosis were recorded for all lesions that were documented as occurring on the tongue. Information regarding lesions on other parts of the mouth which may have occurred simultaneously with the tongue was not recorded. All diagnoses in this department are made by trained oral pathology residents and confirmed by their attending professors who are accredited oral and maxillofacial pathologists. These diagnoses are based on internationally accepted references<sup>18-20</sup> and evaluation of additional histochemical- and/or immunohistochemical-stained slides, where required. All cases lacking a definitive histopathologic diagnosis were excluded from the study sample.

As performed in previous investigations, patient age was subdivided into 10-year intervals for analysis purposes.<sup>8-10</sup> Locations of the lesions were arbitrarily classified into dorsal, ventral and lateral surfaces according to the information provided in the patients' records and anterior/posterior localization was also specified where accessible. In order to facilitate further evaluation of lesion types, all defects were categorized into eight groups including developmental, immune-mediated, reactive, benign, premalignant, malignant, retention/inflammatory salivary gland-related and miscellaneous.

Statistical analysis was performed using t-test, chi-square- and Fisher's exact tests. A 95% confidence interval (CI) was calculated and p-values of less than 0.05 were considered significant.

## RESULTS

A total of 8,105 cases were referred to our department during the 25-year study period. Of these, 510 were located on different aspects of the tongue constituting 6.3% of all received specimens. Histopathologic diagnosis of 18 lesions was uncertain which reduced our study sample to 492 cases. There were 46 different types of lesions in the eight groups and the most common of them was the immune-mediated disease category, while the least number of cases were classified under developmental defects (Table 1). Lichen planus showed the highest rate of occurrence among the study sample.

Gender and age-specific prevalence of tongue lesions are shown in Tables 2 and 3. Tongue lesions were significantly more common in females as compared to male patients (CI = 0.65-0.94; p-value = 0.02) with 56.1% developing in women and 43.9% in men (M/F = 0.78). The age of one male subject with verrucous carcinoma was not recorded whereas the rest of the study sample was divided among eight different age-groups (age 5-86 years). In the remaining 491 patients, total mean age was calculated as 47 years; 47.2 years for men and 46.5 years for women. There was no significant difference in mean age between male and female subjects (CI = -2.49-3.93; p-value = 0.06). Similarly in both men and women, we did not observe a significant difference in the number of patients among the studied age groups (CI = 3.09-6.29, p-value = 0.06 and CI = 2.8-5.08, p-value = 0.06 respectively). Only men and women in the 45-54 year age group demonstrated a significant difference in prevalence of tongue problems (CI = 0.43-0.9; p-value = 0.04). The most common age group for development of tongue lesions in females was 45 to 54 years (21.4%) with benign and retention/inflammatory salivary gland-related lesions being the most and least prevalent defects, respectively. In males this age group was found to be 25 to 34 years (19.1%) in which immune-mediated diseases occurred with the highest frequency, while retention/inflammatory salivary gland-related lesions showed the lowest.

The dorsal surface (45.8%) followed by the lateral aspect (40.6%) were the most common sites for tongue lesions. Only 13.6% of the defects were situated on the ventral side of the tongue. A total of 90 and 31 cases of the dorsal and ventral lesions were anteriorly located, while 18 and six occurred posteriorly respectively. The prevalence of different groups of tongue lesions according to site is shown in Table 4. It is noteworthy that 341 lesions occurred in more

**Table 1:** Classification of all tongue lesions, according to histopathologic diagnosis

Group of lesions	Histopathologic diagnosis	No.	Percentage in each group	Percentage in all lesions	Total no. (%)		
Immune-mediated	Lichen planus	124	79.5	25.3	156 (31.7)		
	Pemphigus vulgaris	22	14.1	4.5			
	Benign mucous membrane pemphigoid	1	0.6	0.2			
	Lichenoid reaction	9	5.8	1.8			
Developmental	Lymphoepithelial cyst	1	16.7	0.2	6 (1.2)		
	Epidermoid cyst	1	16.7	0.2			
	Salivary hyperplasia	1	16.7	0.2			
	Lingual tonsil	1	16.7	0.2			
	Leukoedema	2	33.3	0.4			
Reactive	Irritation fibroma	71	63.4	14.5	112 (22.8)		
	Papillary hyperplasia	2	1.8	0.4			
	Fibroepithelial polyp	8	7.1	1.6			
	Foliate papillitis	1	0.9	0.2			
	Giant cell fibroma	9	8	1.8			
	Traumatic neuroma	1	0.9	0.2			
	Pyogenic granuloma	19	17	3.9			
	Granulomatous reaction	1	0.9	0.2			
	Squamous papilloma (single/multiple)	15	48.8	3.1			
Benign	Pleomorphic adenoma	1	3.2	0.2	31 (6.3)		
	Hemangioma	7	22.6	1.4			
	Neurofibroma	1	3.2	0.2			
	Schwannoma	3	9.6	0.6			
	Granular cell tumor	2	6.5	0.4			
	Lymphangioma	2	6.5	0.4			
	Premalignant	Dysplasia	16	94.1		3.3	17 (3.5)
		Carcinoma <i>in situ</i>	1	5.9		0.2	
Malignant	Squamous cell carcinoma	68	85	13.8	80 (16.2)		
	Verrucous carcinoma	10	12.5	2			
	Mucoepidermoid carcinoma	1	1.25	0.2			
	Lymphoma	1	1.25	0.2			
Retention/ inflammatory salivary gland-related	Mucocele	10	90.9	2	11 (2.2)		
	Sialadenitis	1	9.1	0.2			
Miscellaneous	—	79	—	16.1	79 (16.1)		

than one site with lateral and ventral surfaces being the most common regions with a propensity to encompass more than one aspect. All three surfaces were involved in five immune-mediated lesions, one reactive and one miscellaneous case.

Additional clinical information was accessible for a number of patients, e.g. 50 subjects had a concurrent systemic disease of which ten showed diabetes, 10 had increased blood pressure and nine demonstrated heart disease. Of the remaining cases, anemia, allergy and a history of cancer were each reported in four patients and involvement with hyperthyroidism, hypothyroidism and asthma were also each found in three subjects. Oral symptoms consisting of pain and burning sensation were recorded for 160 patients. Data regarding simultaneous involvement of other oral regions

were reported in 82 cases of which the buccal mucosa was the most frequent site of involvement.

## DISCUSSION

Numerous epidemiologic studies have shown tongue abnormalities to constitute a considerable proportion of oral lesions with various prevalences in different countries.<sup>8-14</sup> Genetics, geographical situations, methodology, etc. may be responsible for these variations.<sup>14</sup> In this retrospective study, we evaluated all tongue lesions documented in the archive of the Department of Oral and Maxillofacial Pathology, Tehran University of Medical Sciences, during a 25 years period and according to our findings, 6.3% of all cases occurred in different aspects of the tongue. Other studies providing prevalence estimates

**Table 2:** Prevalence of tongue lesions, according to gender

Groups of lesions	Female		Male		M/F	CI	Total	
	No.	%	No.	%			No.	%
Immune-mediated	83	53.2	73	46.8	0.8	0.63-1.21	156	31.7
Developmental	2	33.4	4	66.6	2	—	6	1.2
Reactive	74	66	38	34	0.5	0.33-0.75	112	22.8
Benign	16	51.6	15	48.4	0.9	0.44-1.97	31	6.3
Premalignant	8	47	9	53	1.1	0.4-3.3	17	3.5
Malignant	40	50	40	50	1	0.6-1.5	80	16.2
Retention/inflammatory salivary gland-related	6	54.5	5	45.5	0.8	0.18-3.08	11	2.2
Miscellaneous	47	59.5	32	40.5	0.6	0.42-1.06	79	16.1
Total	276	56.1	216	43.9	0.78	0.65-0.94	492	100

**Table 3:** Prevalence of tongue lesions, according to age

Age groups (year)	Group of lesions																	
	Immune-mediated		Developmental		Reactive		Benign		Pre-malignant		Malignant		R/ISGR*		Miscellaneous		No. of patients	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
5-14	0	0	0	0	6	5.4	3	9.7	0	0	0	0	3	27.3	5	6.3	17	3.5
15-24	10	6.4	1	16.7	13	11.6	5	16.1	1	5.9	1	1.2	5	45.4	3	3.8	39	7.9
25-34	31	19.9	1	16.7	23	20.5	6	19.3	1	5.9	4	5.1	0	0	15	19	81	16.5
35-44	31	19.9	2	33.2	18	16.1	6	19.3	2	11.7	7	8.9	0	0	10	12.7	76	15.5
45-54	38	24.4	1	16.7	24	21.4	3	9.7	2	11.7	9	11.4	0	0	22	27.8	99	20.2
55-64	27	17.3	0	0	19	17	3	9.7	6	35.3	18	22.8	2	18.2	13	16.4	88	17.9
65-74	15	9.6	1	16.7	6	5.3	4	13	4	23.6	27	34.2	0	0	7	8.9	64	13
75-86	4	2.5	0	0	3	2.7	1	3.2	1	5.9	13	16.4	1	9.1	4	5.1	27	5.5
Total	156	31.8	6	1.2	112	22.8	31	6.3	17	3.5	79	16.1	11	2.2	79	16.1	491	100

\*Retention/inflammatory salivary gland-related

**Table 4:** Prevalence of tongue lesions, according to site

Groups of lesions	Gender	Lesion site			
		Lateral no. (%)	Dorsal no. (%)	Ventral no. (%)	Total no. (%)
Immune-mediated	F	71 (24.5)	72 (24.8)	14 (4.8)	157 (54.1)
	M	57 (19.7)	58 (20)	18 (6.2)	133 (45.9)
Developmental	F	2 (18.2)	1 (9.1)	1 (9.1)	4 (36.4)
	M	3 (27.2)	2 (18.2)	2 (18.2)	7 (63.3)
Reactive	F	33 (20.8)	66 (41.5)	8 (5)	107 (67.3)
	M	14 (8.8)	37 (23.3)	1 (0.6)	52 (32.7)
Benign	F	9 (19.1)	14 (29.8)	2 (4.2)	25 (53.2)
	M	7 (15)	14 (29.8)	1 (2.1)	22 (46.8)
Premalignant	F	6 (20.7)	4 (13.8)	4 (13.8)	14 (48.3)
	M	6 (20.7)	8 (27.6)	1 (3.4)	15 (51.7)
Malignant	F	31 (21.1)	22 (15)	18 (12.2)	71 (48.3)
	M	36 (24.5)	26 (17.7)	14 (9.5)	76 (51.7)
Retention/inflammatory salivary gland-related	F	4 (23.5)	0 (0)	6 (35.3)	10 (58.8)
	M	2 (11.8)	0 (0)	5 (29.4)	7 (41.2)
Miscellaneous	F	36 (26.1)	38 (27.5)	9 (6.5)	83 (60.1)
	M	23 (16.7)	22 (15.9)	10 (7.3)	55 (39.9)
Total	F	192 (22.9)	217 (25.9)	62 (7.4)	471 (56.2)
	M	148 (17.7)	167 (19.9)	52 (6.2)	367 (43.8)
	Sum	340 (40.6)	384 (45.8)	114 (13.6)	838 (100)

for tongue lesions have either evaluated the tongue as part of the entire oral mucosal environment, or selectively explored a number of lesions involving this organ. In the first category, tongue involvement was reported in 15.5,<sup>21</sup> 15.9<sup>22</sup> and 7.9%;<sup>23</sup>

while in the second group lesions were found in 9.2,<sup>14</sup> 3.96,<sup>12</sup> 52.2<sup>8</sup> and 35.3%<sup>11</sup> of cases. Various factors, like race, study design, diagnostic criteria, patients' age, may be responsible for the differences observed between these studies and the

present investigation. Additionally, it should be noted that most reports discussing the prevalence of tongue lesions are based on clinical observations that do not require histopathologic evaluation (e.g. fissured tongue, glossitis, geographic tongue, hairy tongue) or include an important group of lesions like malignancies; whereas in the current study, histopathologic diagnosis was our main priority, which despite its positive aspect as to providing more accurate information, has also led to loss of information regarding these types of lesions. Therefore, comparison between studies, at least in part, could be ambiguous and may result in drawing inaccurate conclusions.

According to the results obtained in the present study, the highest prevalence of tongue lesions was found in patients between 45 and 54 years of age and mean age was calculated as 47 years. There is a wide variation in prevalent age range among different studies, with 1 to 19 years in Malaysia,<sup>10</sup> 20 to 30 years in Libya<sup>14</sup> and older than 60 years in Turkey<sup>8</sup> and Hungary.<sup>13</sup> In addition to factors, such as genetics and clinical vs histopathologic evaluation of tongue lesions, other elements may also be involved in these differences e.g. patients attending a lung-screening station<sup>13</sup> may be older than those referred to a primary dental care unit at a faculty of dentistry,<sup>10</sup> like the patients we evaluated. Also, ethnic and cultural characteristic of individuals residing in those regions, like patient and parental awareness of dental care in children and adolescents, can affect the reported age range.

Most previous investigations have found tongue lesions to be more common in women compared to men; however, further information regarding statistical significance has not been provided.<sup>10,12-14</sup> Similar to these reports, we also observed a higher occurrence of these lesions in female patients, which was statistically significant. On the other hand, there are a few reports indicating a significantly larger number of males involved with tongue lesions in comparison to females.<sup>8,11</sup> In the current investigation reactive lesions was the most common group of lesions found in women, which were significantly higher as compared to men. Considering that this group includes lesions like pyogenic granuloma that has been reported to be associated with female hormones and that at least some irritation fibromas (which are also more common in females)<sup>19,20,24,25</sup> form as a result of fibrotic changes in a pre-existing pyogenic granuloma, this finding seems logical. In addition, other studies have reported similar findings as to a higher development of reactive lesions in women compared to men.<sup>26</sup>

The most common site of tongue involvement in our study was the dorsal, followed by the lateral surface, which concurs with the results reported by Shulman et al<sup>21</sup> and Byahatti and Ingafou.<sup>14</sup> The majority of studies which we were able

to access had not given additional information on the exact region of the evaluated tongue lesions. Of course, this is due to the type of studied lesions which usually occurred on a specific site, e.g. hairy tongue, papillary atrophy and coated tongue that were evaluated in these papers,<sup>8-10,13</sup> are dorsal tongue lesions, according to definition.<sup>19,20</sup> It is noteworthy that delineation of the exact position of oral mucosal lesions can be problematic at times especially when considering large lesions that involve more than one area like the ventral tongue and floor of the mouth.<sup>27</sup> In addition, the classification of dorsal, ventral and lateral surfaces used in our study is somewhat arbitrary and other investigations may only state the anterior or posterior position of tongue lesions<sup>28</sup> or use other systems to report the area of the tongue affected by disease.

The most common group of lesions in the current investigation was the immune-mediated disease category, of which lichen planus showed the highest rate of occurrence. When considering lesions separate from their groups, lichen planus (25.2%) was still the most prevalent; followed by irritation fibroma (14.5%), squamous cell carcinoma (13.8%) and pemphigus vulgaris (4.5%) in decreasing order of frequency. The prevalence of lingual lichen planus in different studies varies from 15<sup>29</sup> to 65%,<sup>30</sup> with most papers reporting values higher than 44%.<sup>30-32</sup> To explain the lower percentage of lichen planus found in the present study, in addition to geographical, genetic and study-design related factors, it should be noted that we evaluated all tongue lesions of which lichen planus was one of them, while most other studies have investigated oral lichen planus and reported its prevalence on the tongue. Irritation fibroma occurred in 14.4% of our samples which is similar to the 14.6% presented by Barker and Lucas,<sup>33</sup> but less than that found by Toida et al.<sup>24</sup> Considering that irritation fibroma can be affected by oral habits,<sup>34</sup> which in turn are known to be related to social stress and cultural factors, this element may have a role in the differences observed between populations. Squamous cell carcinoma showed a prevalence of 13.8% in the current investigation which falls at the lower end of the 10.7 to 53%<sup>27,35-37</sup> reported in other studies. There is a long list of items affecting the occurrence of squamous cell carcinoma ranging from the use of tobacco to phenolic agents and a number of systemic diseases<sup>19</sup> which can be responsible for these variations. The prevalence of pemphigus vulgaris was 4.5% in the present study, constituting the second most common lesion in the immune-mediated group of diseases, similar to the results obtained by Carvalho et al,<sup>38</sup> however, none of their cases occurred on the tongue. Prevalences of 5 and 20%<sup>39,40</sup> have been reported on the tongue in other studies.

## CONCLUSION

In the population studied in this survey, lichen planus, irritation fibroma, squamous cell carcinoma and pemphigus vulgaris were the most common lesions which deserve more attention during clinical examination, especially regarding the fact that earlier treatment of squamous cell carcinoma and pemphigus vulgaris can significantly affect patients' health.

## CLINICAL SIGNIFICANCE

Considering that the tongue can be the origin of various important lesions, knowledge of their histopathologic diagnosis in different population would be essential for the clinician in rendering a final diagnosis and planning a proper treatment approach. Comparisons between findings of several studies on different groups of individuals could be useful for many types of investigations.

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