

Research Article

Epidemiological Analysis of Tongue Lesions in a Tertiary Health Facility in Tanzania

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Abstract

Background: The tongue is susceptible to a multitude of conditions that can be of developmental, neoplastic, or inflammatory nature, whose occurrence varies globally by age, sex, and ethnicity. The objective of the present study was to determine the incidence of tongue lesions among cases managed in a tertiary hospital in Tanzania.

Methods: This study analyzed histological results of patients with tongue lesions diagnosed between 2016 and 2021. Data on the age and sex of the patients and histological diagnosis were collected. Data analysis was done using Statistical Package for the Social Sciences version 27.

Results: A total of 190 samples of tongue lesions were studied and 18 different histological diagnoses were observed. Generally, a majority (84.2%) of the biopsied tongue lesions were malignant. The most common (74.7%) lesions diagnosed were squamous cell carcinoma followed by hemangioma (5.3%). A significant association was noted between the nature of the lesions and the age group and sex of the patients.

Conclusion: This analysis depicts that tongue lesions are frequently encountered in patients managed in tertiary health facilities in Tanzania. A majority of these lesions are malignant tumors. The sex and age of the patients are determining factors for the occurrence of tongue lesions.

Keywords: tongue, neoplastic lesions, squamous cell carcinoma, Tanzania

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1. Introduction

The tongue, a muscular organ located within the oral cavity, is responsible for several important functions like speech, chewing, tasting, swallowing, and breathing [1, 2]. On its dorsal surface, this organ is covered by stratified keratinized squamous epithelium, whereas a non-keratinized epithelium lines its ventral surface [3]. It comprises minor salivary glands, nerve endings, fat cells, blood vessels, and lymphoid tissues [3, 4]. Embryologically, at approximately the fourth week of gestation, tongue development starts. Initially, from the first pharyngeal arch, a medial swelling (tuberculum impar) is formed, followed by two lateral swellings, which fuse to form the anterior two-thirds of the tongue [5]. The posterior third of the tongue arises from a hypobranchial eminence, that is, a median swelling (copula), which emerges from the mesoderm of the second to fourth pharyngeal arches [1, 6].

Due to the different embryological origins of the tongue, its vast content of structures, and its anatomical position, the tongue is susceptible to a diverse group of lesions ranging from developmental to neoplastic and inflammatory conditions [3, 4]. The incidence of tongue lesions varies globally by age, sex, and ethnicity [7, 8]. According to age, pediatric patients usually suffer from benign conditions whereas the elderly are prone to malignant tongue lesions [9, 10]. In India [11] and Nigeria [4], malignant conditions like squamous cell carcinoma of the tongue were predominant, whereas in Thailand [10], the inflammatory conditions were predominantly diagnosed as lesions of the tongue.

Despite the importance of the tongue, generally, a very limited number of studies have reported

clinicopathological reviews of histologically diagnosed tongue lesions [4], and of these none is from Tanzania. It is thus not known the exact incidence of tongue lesions and the nature of these lesions among patients who attended a tertiary health facility in Tanzania. Lack of this knowledge hinders clinicians from having a high level of suspicion when they encounter patients with tongue lesions, and this leads to either under- or over-diagnosis of the condition.

Therefore, the objective of the present study was to determine the incidence of tongue lesions among cases managed in a tertiary hospital in Tanzania.

2. Materials and Methods

This study analyzed the histopathologic reports of patients with tongue lesions managed in a tertiary health facility in Tanzania. The study covered a period of six years starting from 2016, January 2nd to 2021, December 31st. The inclusion criteria were all histopathological reports of lesions of the tongue over the stated period, in cases where there were more than one histological report, such as one of pre-surgery incisional biopsy and another for post-surgical excision of the lesion, the post-op result was included. Whereas, any report with inconclusive diagnoses or without a final diagnosis and reports of lesions that started from surrounding structures (e.g. floor of mouth) and subsequently spread to the tongue were excluded.

Convenience sampling method was used. The information captured in this study included patient's age and gender, location of the lesion, and histological diagnosis. Coding and analysis of data collected in this study was performed using the Statistical Package for Social Sciences software (SPSS) for Windows (Version 27, Armonk,

New York: IBM Corp). The presentation of age was done by using mean, median, and interquartile range (IQR). For categorical variables percentages were used.

The age of patients was categorized into four groups: <18 years (pediatrics), 18–39 years (young adults), 40–59 years (middle-aged adults), and ≥ 60 years (older adults). For regression analysis, the age was categorized as ≤ 40 years and > 40 years. The tongue lesions were categorized into their nature as malignant, benign, and non-neoplastic (which included infections and inflammatory and developmental conditions).

The Chi-square tests and One-way Analysis of Variance (ANOVA), where applicable, were utilized to assess the association of patients' age and sex with the nature of the tongue lesion. The $\alpha < 0.05$ was selected for statistical significance. To ascertain the degree to which the age and sex were related to the nature of tongue lesions, the multivariate logistic regression model was applied.

3. Results

3.1. Sociodemographic of patients

Out of the 1824 histology results of patients diagnosed with orofacial lesions retrieved, 190 (10.4%) belonged to patients who had tongue lesions. The patients' ages at the time of diagnosis ranged from 1 to 84 years, with a mean age of 51.3 (SEM = 1.20) years. The median age was 52 (IQR = 22) years. The middle-aged were predominantly affected ($N = 83$, 43.7%), and there was a male preponderance ($N = 114$, 60%) with a female-to-male ratio of 1:1.

3.2. The general histological diagnoses

A total of 18 different diagnoses were observed from the 190 tissue samples of tongue lesions. Generally, the most frequent lesion was squamous cell carcinoma ($N = 142$, 74.7%; Figure 1), followed by hemangioma ($N = 10$, 5.3%; Figure 2).

A majority ($N = 160$, 84.2%) of the biopsied tongue lesions were malignant. A significant association was observed between the nature of the lesions and the patients' age group ($P < 0.05$). Except for benign lesions, the sex of the patient was significantly associated with the nature of the lesion (Table 1).

3.3. The malignant tongue lesions

Of the 160 histological reports with diagnoses of malignant lesions of the tongue, 101 (63.1%) were reports of male patients with a male-to-female ratio of 1.7:1. The age range of patients at the time of diagnosis was 8–84 years, with a mean age of 54.2 (SEM = 1.08) years and a median age of 52.5 (IQR = 20) years. The chances of males being diagnosed with a malignant tongue lesion were two times higher than those of female patients and 11 folds higher for individuals aged > 40 years (Table 2). A total of seven types of malignant lesions of the tongue were diagnosed; of these, squamous cell carcinoma predominated ($N = 142$, 88.8%; Figure 3).

3.4. The benign tongue lesions

Benign lesions of the tongue were noted in the histological reports of 14 (7.4%) patients. There was a slight male predilection (male: female = 1.3: 1). The age of patients at the time of diagnosis ranged between 1 year and 64 years with a

TABLE 1: Overall distribution of patients according to age groups, sex, and the nature of the tongue lesions.

Age and sex of the participants	Nature of the tongue lesion					
	Malignant		Benign		Non-neoplastic	
	No	Yes	No	Yes	No	Yes
Age group (yr)						
<18	5 (71.4%)	2 (28.6%)	2 (28.6%)	5 (71.4%)	7 (100%)	-
18–39	14 (40.0%)	21 (60.0%)	29 (82.9%)	6 (17.1%)	27 (77.1%)	8 (22.9%)
40–59	7 (8.4%)	76 (91.6%)	81 (97.6%)	2 (2.4%)	78 (94.0%)	5 (6.0%)
60+	4 (6.2%)	61 (93.8%)	64 (98.5%)	1 (1.5%)	62 (95.4%)	3 (4.6%)
P-value	<0.001		<0.001		0.008	
Sex						
Female	17 (22.4%)	59 (77.6%)	70 (92.1%)	6 (7.9%)	65 (85.5%)	11 (14.5%)
Male	13 (11.4%)	101 (88.6%)	106 (93.0%)	8 (7.0%)	109 (95.6%)	5 (4.4%)
P-value	0.042		0.821		0.014	

TABLE 2: Crude odds ratio to ascertain the association between age groups and the nature of the tongue lesions.

Age group and sex of the patients	Unadjusted odd ratio		
	Malignant UOR (95%CI, P-value)	Benign UOR (95%CI, P-value)	Non-neoplastic UOR (95%CI, P-value)
Age group (yr)			
≤40	Ref [1]	Ref [1]	Ref [1]
>40	11.33 (4.78–27.17, $P < 0.001$)	0.04 (0.08–0.174, $P < 0.001$)	0.26 (0.09–0.74, $P = 0.012$)
Sex			
Male	2.24 (1.02–4.93, $P < 0.046$)	–	0.27 (0.09–0.815, $P = 0.02$)
Female	Ref [1]	–	Ref [1]

mean age of 25.00 (SEM = 4.94) years and a median age of 26.5 (IQR = 29) years. Individuals aged >40 years were 96% less likely to be diagnosed with a benign tongue lesion (Table 2). Four different histological diagnoses were made, whereby hemangioma accounted for the majority ($N = 10$, 71.4%), followed by lymphangioma ($N = 2$, 14.3%). There was one case each of fibromatosis and fibroepithelial polyp.

3.5. Non-neoplastic lesions of the tongue

A total of 16 (8.4%) histological reports of patients had final diagnoses indicative of non-neoplastic

lesions. Females were more ($N = 11$, 68.8%) affected than males, with a male-to-female ratio of 1:2.2. The patients' age ranged from 22 to 88 years at the time of diagnosis, and the mean age was 45.13 (SEM = 4.98), while the median age was 40.5 (IQR = 29) years. Patients aged 40 years and less were nearly four times more likely to have non-neoplastic conditions of the tongue than those aged above 40, whereas, the odds of males being diagnosed with non-neoplastic tongue lesions were 73% less compared to females (Table 2). Seven histological types of lesions were observed of which chronic inflammation and pyogenic granuloma were the frequent diagnoses (Figure 4).



Figure 1: Gross view of the ulcerative lesion on the lateral aspect of the tongue which was histologically diagnosed as squamous cell carcinoma.

4. Discussion

Several epidemiologic studies have pointed out that tongue lesions make up for a significant fraction of oral lesions with varying proportions in different countries [7, 8, 12]. However, to date in Tanzania there is a paucity of documentation on the profile of types of lesions to commonly affect the tongue. Thus, there was a need to study the occurrence of tongue lesions among patients managed in a tertiary health facility in Tanzania. This health facility, being a national referral center, receives patients from all over the country.

In the present study, around 10% of all biopsied lesions in the orofacial region involved the tongue similar to a report from Iran [13]. On the contrary, the prevalence was higher than reports from Nigeria [4] and Iran [12] but lower than findings from Turkey [7] and India [9]. The difference in proportion between various epidemiologic studies

from different countries may be attributed to factors like genetics, geographical location, study methodology, and sociodemographic status of the population [12, 14, 15].

Although a multitude of lesions do affect the tongue [4, 7, 9, 12], a great variation in the proportion of lesion types exists between various geographical locations. In the current study, approximately 20 different types of tongue lesions were found of which a majority were malignant, this finding was in line with the report from Nigeria [4]. On the other hand, immune-mediated lesions of the tongue were the most frequently diagnosed tongue lesions in Iran [12], while benign tongue lesions were predominantly noted in Turkey [3]. The high proportion of malignant conditions among the biopsied tongue lesions in our setting may be attributed to both the clinical practice of the clinicians and the social background of the population. The practice in our setting calls



Figure 2: Clinical presentation of the hemangioma involving the dorsal aspect of the tongue.

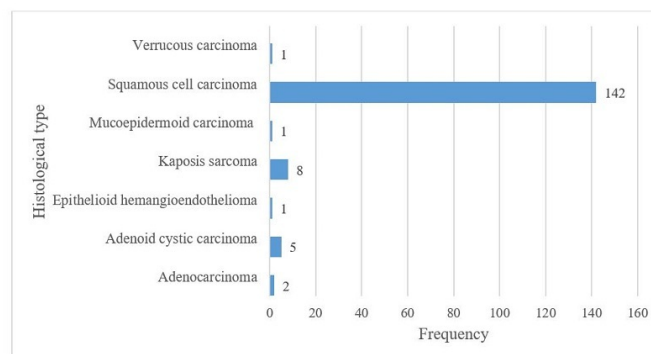


Figure 3: Distribution of different types of malignant tongue lesions according to the frequency of occurrence.

for performing a biopsy on any lesion that persists for more than two weeks despite intervention; and in most instances, these lesions do turn up being malignant. Since malignant lesions are painful and subsequently interfere with the function of the tongue, patients tend to seek medical care often which necessitates a biopsy. On the contrary,

immune-mediated tongue lesions are mostly self-limiting [16], although they do heal within two weeks, clinicians rarely submit samples from the lesion for histopathological analysis. However, the tongue is generally more prone to malignancy because of multiple factors. Being covered by thin non-keratinized epithelium, the tongue's ventral surface is easily penetrated by carcinogens from

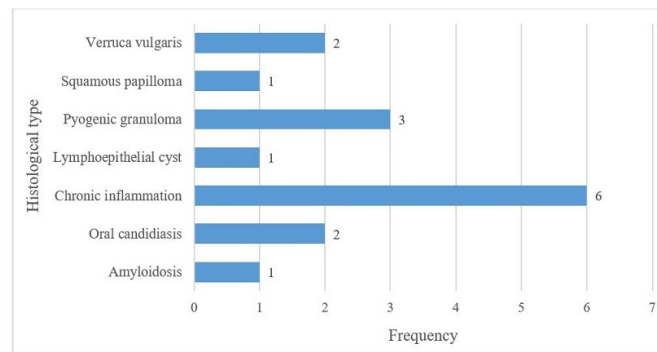


Figure 4: Distribution of different types of malignant tongue lesions according to the frequency of occurrence.

tobacco and alcohol to reach the progenitor cell compartment [17], however, also chronic trauma to the tongue may have a role [18].

The findings from this study depicted that the chances of males being diagnosed with a malignant tongue lesion were two times higher than those of female patients, and 11 folds higher for individuals aged >40 years. Although on the contrary, both Alaeddini *et al.* [12] and Altintas [3] found that there was no sex predilection for the occurrence of malignant tongue lesions and the prevalence was higher in patients aged >40 years. Similarly, Sohal *et al.* [19] reported that older individuals had higher odds of suffering from oral cancers because of the cumulative effect of carcinogenic substances over time. Several previous studies from Tanzania [20, 21] have reported that males are more affected by malignant orofacial lesions (tongue included). Males tend to engage more in risky behavior (alcohol consumption, tobacco use, etc.) than females and are thus prone to malignancies [19].

From the current study, it was depicted that the odds of occurrence of benign lesions in older adults were significantly lower than in young individuals. Since the pathogenesis of neoplastic conditions relies on changes in genes accountable for tumor growth [22], it may be speculated that gene modifications in benign tumors tend

to appear during initial years of life. Hence, the number of mutated cells increases rapidly during an individual's growth phase/spout, causing the occurrence of tumors (e.g., hemangioma) to occur early in life.

Squamous cell carcinoma was the most predominant tongue lesion in the current analysis, unlike other reports. In Iran [12], lichen planus was found to be prevalent, while in Turkey [3], squamous papilloma was frequently diagnosed. Reports from Italy [23] and Thailand [10] revealed fibrous reactive hyperplasia, and squamous cell carcinoma were frequent diagnosis. Squamous cell carcinoma is the most prevalent tongue lesion because of its location which exposes it to a large number of carcinogens that pass through the mouth [21], coupled with the fact that the tongue is lined with epithelial cells [19].

5. Limitations

This study had a few limitations. Firstly, the clinicians might have not sent every excised pathological lesion for histological analysis. This may be so because some lesions were diagnosed based on their clinical appearance. This practice could lead to under-reporting of some lesions like geographic tongue, aphthous ulcers, and various other immune-related conditions. Secondly, it was

a single-center study, hence generalizability of the findings is a challenge. Another shortcoming was absence of data about the exact location of each lesion on the tongue. This deficiency has been documented and to overcome this challenge, it has been suggested to design a standard reporting form that will contain all variables of prognostic importance [19]. Nevertheless, this study provides valuable information on the types of tongue lesions commonly biopsied in our settings by age and gender.

6. Conclusion

This analysis depicts that tongue lesions are frequently encountered in patients managed in tertiary health facilities in Tanzania. A high proportion of these conditions are of malignant nature. The sex and age of the patients are determining factors for the occurrence of tongue lesions. Males and middle-aged patients are predominantly affected. Due to the presence of a large number of conditions affecting the tongue, clinicians should consider histopathological examination of all tongue lesions, as it is the gold standard for confirming the diagnosis and should not rely on clinical examination alone. For better characterization of tongue lesions in the Tanzanian population, multicentric clinical studies should be conducted.

Acknowledgements

None.

Ethical Considerations

Ethical clearance for conducting this analysis was sought from the Muhimbili University of Health

and Allied Sciences (MUHAS) research and ethics committee (DA.25/111/01B/208), and permission to use the data was obtained from the appropriate authorities of the Department of Oral and Maxillo-facial Surgery.

Competing Interests

None.

Availability of Data and Material

The materials described in the study are available from the corresponding author upon reasonable request.

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