

Prevalence of Fissured and Geographic Tongue Abnormalities among University Students in Khartoum State, Sudan

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Abstract

Background: It is believed that the tongue represents the state of the body's health and thus individuals need to pay close attention to any changes that may occur such as altered or loss of taste, burning sensations and abnormal texture.

Objective: To determine prevalence of fissured and/or geographic tongue abnormalities in relation to gender and to assess level of awareness of their existing tongue abnormality among a sample of Sudanese university students.

Materials and Methods: A cross-sectional study for 400 university students within 16 to 22 years old who participated was examined and tongue abnormality was identified and photographed. Chi square test was used to analyse data.

Results: Overall incidence was 54.5% (19.5% among males and 35.0% among females). Most frequent tongue abnormality was fissured tongue (24.0%), ankyloglossia (2.5%), geographic tongue (1.2%), fissured and geographic tongue (0.5%), smooth tongue (0.25%) and lingual thyroid (0.25%). Level of awareness was 55.97% (10.26% in males and 45.71% in females).

Conclusion: This study offers information concerning prevalence of tongue abnormalities, gender association, and types of tongue abnormalities with assessment of level of awareness of existing tongue abnormality among a subgroup of the university students of the Sudanese population.

Keywords: Prevalence; Fissured tongue; Geographic tongue; Ankyloglossia; Students

Background

The tongue is considered as one of the vital organs of the body with various important functions including taste, speech, mastication, deglutition, and breathing. Abnormalities that are developmental, genetic or environmental in nature can affect the tongue [1].

Fissured tongue is a common non-malignant and subclinical disorder characterized by indentations extending along the lateral parts and dorsum of the tongue in different degrees of depth, common in individuals with a mental disability such as Down's syndrome, Melkersen-Resenthal Syndrome and Trisomy [2]. The Tongue is usually protected by filiform papilla, this protective mechanism is diminished in fissured tongue and keratohyaline granules and keratin may lead to inflammation [3].

In geographic tongue there is recurrent appearance and resolution of irregular, smooth red patches with sharply defined borders on the dorsum and lateral parts of the tongue. Although the exact aetiology is unknown, it may be hereditary, or associated with other conditions such as psoriasis, vitamin B12 or zinc deficiency [4]. Geographic tongue or benign migratory glossitis is a benign asymptomatic condition that results in destruction of filiform papillae causing a change in taste sensation and may make feeding troublesome [5]. Disturbance during the 4th week of intrauterine life (period of tongue formation) can lead to formation of *ankyloglossia*: (partial or complete) congenital shortness of the lingual frenulum extending to the tip or near the tip of the tongue restricting movement of the tongue as it is bound to the floor of the mouth; and bifid tongue: divergence (mild, moderate or severe) at the tip of the tongue [1,6]. Patients are aware that it is custom for clinicians to inspect the tongue. Thus, patients check their own tongue and as a result may be concerned about minor changes and assume that normal characteristics such as foliate papilla are a reason for apprehension [4].

In traditional Chinese medicine (TCM) tongue examination is vital in obtaining noteworthy information on the physiological body condition [7].

Several studies on tongue abnormalities were published from around the globe. And different results have been obtained [1,8-25].

Among the Arab population prevalence of tongue abnormalities ranged from 9.2-58.1% with an overall slight male predilection. Fissured tongue was more common than geographic tongue in most of the studies which had a sample range from 44-2000 individuals [9,15].

In the Asian population, on the other hand, studies on prevalence of tongue abnormalities had a much wider range 4.6-83.3% [1,16-24]. With a relatively equal gender predilection on a sample ranging from 600-5000 individuals.

In the South American population, Vieira-Andrade et al., and Anaya et al., reported the prevalence of tongue abnormalities 84.9% (with female predilection) on 511 patients and 79.9% on 134 children, respectively [8-25].

It is believed that the tongue represents the state of the body's

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health and thus individuals need to pay close attention to any changes that may occur such as altered or loss of taste, burning sensations and abnormal texture, as these changes may be the body's method of sending warning signals to seek therapy for an underlying condition.

To our knowledge prevalence of tongue abnormalities in Sudan was not well documented in previous literature and since it is thought that the tongue is a window to the body's health and changes in texture or otherwise may usually go unrecognised, this study was designed to evaluate the prevalence among a Sudanese population of different ethnic backgrounds, to raise awareness and provide didactic education methods through self-constructed leaflets and to act as a base line for future studies.

Methodology

This cross-sectional study was carried out to determine the prevalence of fissured and/or geographic tongue among students of the UMST (University of Medical Sciences and Technology). UMST is a well-known qualified educational institution with 13 faculties providing 5110 students with golden standard education by lecturers bearing several degrees and years of experience in education including Bachelor's, Master's and Doctor of Philosophy. This is university has students from different ethnic backgrounds and is well populated with students and for this reason was selected for this study.

The sample size was calculated according to the formula below:

$$\text{Sampling size: } n = \frac{N^* z^2 p(1-p)}{\left[\left[N^* d^2 \right] + z^2 p(1-p) \right]}$$

Where,

n=sample size

N=population size (5110)

z=standard normal deviation at 95% confidence level (1.96)

p=proportion in target population estimated to have a particular characteristic (0.5)

d=degree of accuracy or the accepted margin of error (0.05)

Therefore the sample size will be:

$$n = \frac{5110 * (1.96)^2 * 0.5(1-0.5)}{\left[\left[5110 * (0.05)^2 \right] + \left[(1.96)^2 * 0.5(1-0.5) \right] \right]} = 357 \text{ students}$$

The target population was found to be 5110 students from which the sample size was extracted as 357 using the formula above, but the target population was increased to 400 to increase reliability and accuracy of the result. An equal number of males and females were selected to allow thorough and adequate comparison since the ratio of females to males in the university is high. A list of the attending university students was obtained for each faculty year and students were randomly selected. The inclusion criteria of this study; Sudanese male or female students who study at UMST and agreed to participate in the study. It excluded the students who refused to participate, student with no treatment regarding tongue abnormalities students who were absent on the day of examination.

The research was divided into two stages. In the first stage, 400 students (200 males and 200 females) were randomly selected and approached. Each student was informed about the aims, advantages and process of the study and it was ensured that any photographs taken will only be used for research purposes and will be included in

the publication of this paper. Verbal and/or written consent forms were taken from students who agreed to participate. Students then underwent analysis for presence or absence of the tongue abnormality by clinical examination through direct inspection of the oral cavity with the use of non-sterile disposable gloves under natural, and/or artificial light.

In the second stage, those with tongue abnormalities underwent photographic documentation by the main investigator using Fujifilm FinePix J × 500, Fujinon lens, 14.0 mega pixels, 5 × optical zoom and a questionnaire, which was self-constructed, was filled by the investigator. The questionnaire consisted of three parts. Part one included personal data, part two was to determine presence or absence of a tongue abnormality, part three was to assess level of awareness.

During time of clinical examination, participating students were informed of their tongue abnormality if any, and given a leaflet to educate them. In addition if needed, referral to appropriate department (s) was done.

Ethical clearance and permission was obtained from the University of Medical Science and Technology, Khartoum, Sudan, ethical committee to carry out the study and consent was obtained from each faculty's registrars. A written consent form was signed by each student prior to carry out the clinical examination and taken of photograph, and the one whose photograph included in the manuscript signed another permission consent form.

Data Analysis

Computer program used was Statistical Package for Social Sciences (SPSS) for Windows, version 20 and Microsoft Excel for cross tabulation. Chi square test was used to study the prevalence and types of tongue abnormalities, in association with gender and level of awareness of existing tongue abnormality. For all statistical tests a P-value of less than 0.05 was considered to be significant.

Data was grouped and analysed using frequencies and percentages thus the final results were grouped in forms of tables and figure.

Strengths and limitations

The study was simple to carry out- short quick clinical examination followed by a brief questionnaire. It is doable, time efficient and economical. It was not represent the Sudanese population as a whole. It only considered university students and no other category.

Results

A total of 400 students 50% males and 50% females 16 to 22 years old were included in this study. Tongue abnormalities were reported in 109 students (54.5%) with more prevalence in females 70 (35.0%) than males 39 (19.5%), and there was a significant difference (P=0.001) (Figure 1).

Table 1 showed details prevalence of different tongue abnormalities in relation to gender.

Fissured tongue (Figure 2) was the most common in 24.0% out of the overall 400 students and more frequent in females 60 (30.0%) than males 36 (18.0%). Geographic tongue (Figure 3) was reported in 5 (1.2%) of the 400 students with a slight female predilection 3 (1.5%).

Fissured and geographic tongue (Figure 4) was seen in only one (0.2%) of participants, and only in females (0.5%). Other tongue abnormalities observed in 7 (1.8%) of the participants; 1 (0.5%) males

and 6 (3.0%) females, observation included ankyloglossia (2.5%) (Figure 5), smooth tongue (0.25%) and bifid tongue (0.25%) of the all participants. (Figure 6).

(Table 2) Charts the prevalence of students' awareness about the present tongue abnormality. Overall percentage was 55.97% where females were found to be more aware of their tongue abnormality (45.71%) than males (10.26%).

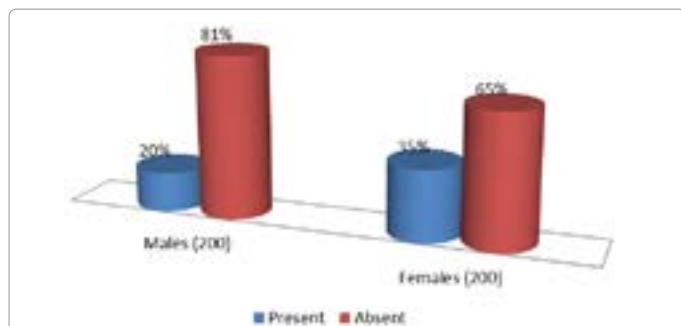


Figure 1: Illustrated the prevalence of Tongue Abnormalities according to gender among a sample of Sudanese university students.

Gender	Types of Tongue Abnormality (%)					Total
	Fissured Tongue	Geo-graphic Tongue	Fissured and Geographic	Other Ab-normality	No Abnormal-ity	
Male	36 (18)	2 (1.0)	0 (0.0)	1 (0.5)	161 (80.5)	200(100.0)
Female	60 (30)	3 (1.5)	1 (0.5)	6 (3.0)	130 (65.0)	200 (100.0)
Total	96 (24)	5 (1.2)	1 (0.2)	7 (1.8)	291 (72.8)	400 (100.0)

Table 1: Prevalence of tongue abnormality according to types.



Figure 2: Demonstrated fissure tongue which was the most common tongue abnormalities among the examined Sudanese university students.



Figure 3: Demonstrated geographic tongue.



Figure 4: Demonstrated fissured and geographic tongue.



Figure 5: Demonstrated ankyloglossia.

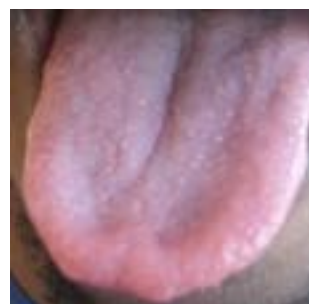


Figure 6: Demonstrated bifid tongue which was the least common one.

Statistical analysis showed that a significant relationship existed between prevalence of tongue abnormalities among genders, types of tongue abnormalities (fissured tongue, geographic tongue, fissured and geographic tongue and other tongue abnormalities) and subjects' awareness of existing tongue abnormality. All results showed a significant difference ($P < 0.05$)

Discussion

This is cross-sectional study aimed to assess the prevalence of fissured and/or geographic tongue abnormalities among a sample of Sudanese university students in relation to gender, types of tongue abnormality and level of awareness of present tongue abnormality with comparison to several areas of population (mention below). After analysis it was concluded that prevalence rate was 27.3% and showed a significant difference ($P=0.001$), there was a female predominance of 35.0% compared to males (19.5%). Moreover, 33.02% were aware of their present tongue abnormality with a female predominance of 45.71%. In terms of types of tongue abnormalities; fissured tongue was the most frequent (24.0%) of which females were more affected (30.0%) compared to males (18.0%), geographic tongue was found in 1.2% of the population where 1.5% were females and 1.0% were males,

		Level of Awareness		Total (%)
		Aware (%)	Not Aware (%)	
Gender	Male	4 (10.26%)	35 (89.74%)	39 (100.0%)
	Female	32 (45.71%)	38 (54.29%)	70 (100.0%)
Total		36 (33.03%)	73 (66.97%)	109 (100.0%)

Table 2: Subject's level of awareness of their tongue abnormality.

fissured and geographic tongue (0.2%) were found in 0.5% of the females, other tongue abnormalities had a frequency of 1.8% of where 3.0% were females and 0.5% were males. Other tongue abnormalities included: complete ankyloglossia (2.5%), smooth tongue (0.25%) and bifid tongue (0.25%). To the best of our knowledge this study is one of the few studies carried out in Sudan to particularly determine the prevalence of tongue abnormalities. It was reported 27.3% with a female predilection (35.0%) whereas a previous study among Sudanese population showed a less prevalence of tongue abnormality (23.2%) [10]. However among the Arab population a slightly higher percentage (29.9%) was found in 2000 Jordanian dental outpatients by Azmi et al., [9] And more than 50% was reported in Kuwait (58.1%) by Ali et al., although the number of participants was less 530 patients [11].

In contrast a less prevalence 17.4% and 9.2% was reported by Aljawfi et al., and Byahatti et al., on 500 Yemeni schoolchildren and on 320 Libyan patients, respectively [12,13].

In the Asian population a broad range of tongue abnormalities prevalence 4.6%-98.0% were observed [1,16-24]. The highest prevalence of tongue abnormalities was reported in Iran by Pegah et al., 98.0%, with a slight female predilection, they had a much stronger finding compared to our 23.7% even though their sample size was 50% less than the present study [24].

Jahanbani et al., assessed a prevalence rate of 28.0% and this is one of the closest findings to our study 27.3%, although he had a smaller sample size of 286 Iranian patients [22]. Ugar-Cankal et al., and Ali Riza et al., of Turkey saw a relatively equal prevalence of tongue abnormalities of 4.95% and 4.6%, respectively [20,21].

From the South American population, Vieira-Andrade et al., and Anaya et al., reported a strong prevalence of 84.9% and 79.9% in Brazil and Columbia, respectively [8,25]. They had a small sample size which may be the reason for their dominant finding in comparison to current results (27.3%).

With respect to the types of tongue abnormalities, the most frequent was fissured tongue 24.0% where there was a female predilection of 30.0% in comparison to males 18.0%, this result is more dominant than a previous study in Sudan (7.0%), [10]. and their finding for geographic tongue was more (6.4%) than this study (1.2%), however no comparison between genders was made in their study. Moreover our result of fissured tongue was in line with those of the Jordanian and Iraqi population, 11.50% (12.90% males and 10.7% females) and 18.18% (6.81% males and 11.36% females), respectively [9,14]. Whereas, geographic tongue was consistent with that of the Kuwaiti and Iraqi population, 3% (52.94% males and 47.05% females) and 0.3% (0.4% in males and 0.3% in females), respectively [11,15].

The predominant result for fissured tongue and geographic tongue almost twice our findings was in the Libyan population where fissured tongue 48.4% (46.45% in males and 53.55% females) and geographic tongue 17.20% (52.73% in males and 47.27% females), this high percentage could be due to consideration of only patients with tongue abnormalities [13]. The least findings included that of the Iraqi population where fissured tongue 2.1% (3.5% in males and 1% females)

and geographic tongue 0.3% (0.4% in males and 0.3% females) [15]. Taking into account the Asian population, our findings for fissured tongue (24.0%, 18.0% in males and 30.0% females) and geographic tongue (1.2%; 1.0% in males and 1.5% females) were consistent with that of the Thai population (fissured tongue 22.8%; 29.7% in males and 18.3% females) and the Turkish population (geographic tongue 1.8%; 1.5% in males and 2% females) [19,20].

The current result for geographic tongue (1.2%) was also in line with the Iranian population (0.9%) [24]. Although in some researches geographic tongue was found to have a higher frequency over fissured tongue [1,16,18,20,21,23] the most prevailing result for fissured tongue that was almost three times of current result (24.0%) was by Pegah et al., (66.5%) [24]. In addition another Iranian population had the highest finding (31.6% in females and 21.4% in males) [23].

Low findings for fissured tongue and geographic tongue were in the Turkish population (fissured tongue 0.9%; 1.1% in males and 0.7% in females) and (geographic tongue 0.3% with female predilection), respectively [20,21]. The closest finding for presence of ankyloglossia as this study (2.5%) was in the Indian population (3.5%) [17]. Observations of geographic tongue by Vieira-Andrade et al., and Anaya et al., of the South American population, were more or less coherent with present findings (1.2%; 1.0% males and 1.5% females), 4.0% (30% in males and 70% in females), and 0.8% and of their populations moreover 66.97% were not aware of which 89.74% were males and 54.29% were females., respectively [8,25]. Whereas, fissured tongue was found to be slightly less (24.0%, 18.0% in males and 30.0% in females) but also had female predominance 10% (41.2% in males and 58.8% in females) [8].

In terms of level of awareness of existing tongue abnormality, 33.02% in total were found to be aware of which 10.26% were males and 45.71% were females,

The variation in prevalence of tongue abnormalities in previous literature may be attributed to difference in sample size, type of sample (patients, schoolchildren, university students, and elderly individuals), environmental factors, ethnic background of participants as well as the genetic factors and the study design.

Conclusion

1. Incidence of tongue abnormalities was 27.3%, a significant difference between genders was reported with female predominance in all cases observed.

2. The most prevalent was fissured tongue (24.0%) and geographic tongue was 1.2%.

3. Approximately half of the females (45.71%) were more aware of their tongue abnormality than males (10.26%). Although external and internal factors may affect occurrence of fissured and/or geographic tongue no direct relationship in terms of gender could be established.

Recommendations

In the future, additional researches should be conducted among a larger population with a more diverse age range and in different localities of Sudan to have an outline about prevalence and types of tongue abnormalities among the general Sudanese population. Dental practitioners and health care providers should be familiar with aetiology, diagnosis and suitable therapy of tongue abnormalities. It is recommended to implement proper dental home care regularly. Brushing of the dorsal aspect of the tongue is usually disregarded and overlooked but should be included in oral hygiene habits as the tongue

can act as a reservoir for bacteria and other microorganisms which may later develop into infections of the oral cavity.

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