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Variations in Shape of Tongue among Students attending Chitwan Medical College

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ABSTRACT

Introduction: The need for a new biometric system is gaining importance. Tongue print is also getting acceptance as a system for biometric authentication. The tongue is an extremely muscular organ used for communication, taste, and deglutition. Studies have shown variations in the morphology of the tongue. Studies pertaining to the morphology of the tongue is lagging in Nepal. Hence this study was carried out to assess the various morphological variations of the tongue such as shapes, borders, and color among the bachelor level students in a tertiary care center in Nepal

Methods: A descriptive cross-sectional study was conducted among 312 bachelor-level students of Chitwan Medical College. The convenience sampling method was used to collect the data. All the data was recorded in a proforma. The sociodemographic details of the participants were recorded. The borders, colors, fissures, and shapes of the tongue's morphology were documented. The collected data were entered into Microsoft excel 2019 and transported into Statistical Package for Social Science (SPSS) version 16. The data was then analyzed using descriptive statistical methods. The data was also calculated in form of frequency and percentage and later on, they were presented in form of a table.

Results: Among 312 students who took part in the study, 126 (40.4 %) of the participants were male and 186 (59.6 %) of them were female. The mean age of participants was 22.38 ±2.008 years. U-shaped tongue was prevalent followed by V-Shape tongue and bifid tongue. More than half of the participants 180 (57.7 %) had partially scalloped tongues. While comparing gender wise U-shaped tongue was more common in both males and females. The bifid tongue was observed more in males 11 (8.7 %) while the V-shaped tongue was more in females 52 (28 %).

Conclusions: The conducted study showed a variation in tongue morphology in Nepal. The U-shaped tongue was more prevalent. The variation was also present among gender. This study also forms a baseline study for forensic experts and paves a way for additional studies.

INTRODUCTION

The tongue is an extremely muscular organ. It is used for communication, taste, and deglutition.[1] It is enclosed inside the oral cavity.[1, 2]

Biometric authentication is a method used in forensic investigations

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for personal identification. In humans, different structures in our body such as fingerprints, palm prints, and iris scans are used for identification. All these structures show variations in morphology. Tongue prints have also been used for personal identification.[3] Several studies have also revealed the difference in the morphology of the tongue. The color, shape, size and surface texture of the tongue varies from one another.[3] Such features are also different in identical twins.[2]

Studies related to morphological variations of the tongue have not been performed in the Nepalese population. The purpose of the study was to assess the various morphological variations of the tongue such as shapes, borders, color among bachelor-level students in a tertiary care center of Nepal.

METHODS

The study was a descriptive cross-sectional study, conducted among bachelor-level students at the School of Dental Sciences, Chitwan Medical College, Nepal. The data was collected from June 2022 to August 2022. Ethical clearance for the study was obtained from the Institutional Review Committee of Chitwan Medical College (CMC-IRC/078/079-213). Based on the study of Sreepardha et al[4], using the formula as $n=Z^2pq/d^2$ where Z=1.96 at 95% confidence interval and p=72%, q=1-p, d=5% margin of error. The total sample size was calculated to be 309.657. However, in this study, the data was collected from 312 students. The convenience sampling method was used to collect the data. Bachelor-level students of both genders who were willing to participate and give consent were included in the study. Those participants who had pre-existing tongue disorders and a history of systemic illness were excluded from the study.

The study objective and the procedure were explained to the participants. Informed consent was taken. The participants then rinsed their mouths to remove any surface debris or food particles. The examination of the tongue was done. The participants were then asked to remain in a relaxed position and then protrude their tongues. The picture of the tongue in the front and side view was taken. The morphological characteristics tongue of participants taken in photographs were then assessed based on the shape, borders, and fissures of the tongue according to Sreepradha et al.[4]

All the data was recorded in a proforma. The collected data were entered into Microsoft excel 2019 and transported into Statistical Package for Social Science (SPSS) version 16. The data was then analyzed for the measure of central tendency (mean) and measure of dispersion (standard deviation). The data was also calculated in form of frequency and percentage and later on, they were presented in form of a table.

RESULTS

Our observation demonstrated that the mean age of participants was 22.38 ±2.008 years. Among 312 students who took part in the study, 126 (40.4 %) of the participants were male and 186 (59.6 %) of them were female. Studying the participants on the basis of religion, most of them were Hindu 186 (93.3 %) (Table 1).

Table 1: Socio-demographic characteristics of the participants

Characteristics		Frequency (%)
Mean Age (years) ± SD		22.38±2.01
Gender	Male	126 (40.4)
	Female	186 (59.6)
Religion	Hindu	293 (93.9)
	Buddhist	11 (3.5)
	Christian	4 (1.3)
	Muslim	4 (1.3)
Ethnicity	Brahmin	166 (53.2)
	Chhetri	47 (15.1)
	Newar	17 (5.4)
	Others	82 (26.3)

Most of the study population had U-shape tongue- 213 (68.3 %) followed by V-Shape tongue and bifid tongue which was demonstrated in 82 (26.3 %) and 17 (5.4 %) respectively. More than half of the participants 180 (57.7 %) had a partially scalloped tongue and 74 (23.7 %) had a single fissure in the tongue while 33 (10.6 %) had multiple fissures in three tongues. Remarkably majority of the participants 295 (94.6 %) had pinkish tongues Table 2.

While comparing gender wise U-shaped tongue was more common in both males and females. The bifid tongue was observed more in males 11 (8.7 %) while the V-shaped tongue was more in females 52 (28 %). In the border of the tongue, the partially scalloped feature was more prevalent in both genders while the absence of fissure was mostly found in both genders too (Table 3).

Table 2: Morphological characteristics of the tongue of the participants

Characteristics of tongue	Frequency (%)
Shape	
U-Shape	213 (68.3)
V-Shape	82 (26.3)
Bifid	17 (5.4)
Borders	
Partially Scalloped	180 (57.7)
Smooth	106 (34)
Scalloped	26 (8.3)
Fissures	
Absence of Fissure	205 (65.7)
Single Fissure	74 (23.7)
Multiple Fissure	33 (10.6)
Colour	
Pink	295 (94.6)
Pale	16 (5.1)
Pigmented	1 (0.3)

Table 3: Gender-wise distribution of the characteristics of tongue

Characteristics of tongue		Male	Female
Frequency (%)		Frequency (%)	
Shape	U shape	85 (67.5)	128 (68.8)
	Bifid	11 (8.7)	6 (3.2)
	V shape	30 (23.8)	52 (28.0)
Border	Smooth	40 (31.7)	66 (35.5)
	Partly scalloped	76 (60.3)	104 (55.9)
	Scalloped	10 (7.9)	16 (8.6)
Fissures	Absence of fissure	82 (65.1)	123 (66.1)
	Single fissure	32 (25.4)	42 (22.6)
	Multiple fissures	12 (9.5)	21 (11.6)
Color	Pale	6 (4.8)	10 (5.4)
	Pink	120 (95.2)	175 (94.1)
	Pigmented	-	1 (0.5)

DISCUSSION

The morphology and texture reveal important details about a person's health and oral hygiene. The investigation of form and texture highlights the tongue's individuality and exposes noticeable distinctions between individuals, making it an effective tool for personal identification. It can express a lot of information about a person's health status in addition to serving as a tool for identification.[5, 6] Due to its location inside the oral cavity it is said to be preserved in dead people.[7] The morphology of the tongue varies among gender, race and ethnicity.[3, 8] Due to this variation in morphology, the tongue has served as one of the important organs for biometric authentication.

In the present study, the commonly found tongue was U shaped (68.3 %) followed by V-shaped (26.3 %). Among the study participants, the present study revealed that U-shaped and V-shaped tongue was found more in females. The present observation was similar to the other studies.[8-10] The prevalence of U-shaped and V-shaped tongue more in females may be due to the smaller mandible in females.[9, 11-14] This study also showed the presence of a bifid tongue among 17 participants and in gender-wise comparison it was more observed in males. It generally occurs due to developmental disturbances in the anterior two-third region of the tongue and most people with ankyloglossia have a bifid tongue.[15]

With growth the tongue takes tooth indentations forming a scalloped border. It may also be associated with a person's parafunctional habits such as bruxism, and tongue thrust. Other factors such as macroglossia, temporomandibular disorders, and malocclusion can also lead to the scalloped border.[9, 16] In the present study smooth borders of the tongue were observed around less than 35 % in both genders. However, partly scalloped borders of the tongue were prevalent and were observed more in males than in females. The presence of scalloping more in males than in females may be due to the prevalence of parafunctional habits in males. In contrast to the present study Garg et al revealed the prevalence of smooth borders among the similar age group as in the present study.[9] Sreepradha et al also reported the prevalence of smooth borders in their study.[4] The present observation may be difference in the sample size, geographical setting, food habits and stress.

Fissured tongue is a benign, asymptomatic condition of unknown etiology. A polygenic or autosomal dominant cause is said to be the cause. It is usually observed in the general population in different age groups and both genders.[17] The present study demonstrated the absence of fissures in 205 (65.7 %) of participants.

Similarly, a single fissure in the tongue was demonstrated in 23.7% and multiple fissures in 10.6% of the study population. The single fissure was observed more than multiple fissures. The single fissure was more in males and multiple fissures were more in females. In contrast to the present study Garg et al[9] and Sreepradha et al[4] reported a prevalence of multiple fissure more in males than in females. In another study, Surendra et al also observed the prevalence of fissured tongues more on males.[18] The difference may be due to the difference in the sample size. However, differences in race, ethnicity, age group and gender cannot be denied.[17]

Surendra et al in their study reported the prevalence of pale color tongue in 76.7% individuals, pink colour in 16.7%.[18] In another study, Astekar et al in their study reported whitish-colored tongue in 80% of the patients, and pale pink in 14%.[14] However, in the present study majority of participants had pink-colored tongue (94.6 %). The difference might be due to the varying sample size and study population.

This study also has limitations. The results of the study were confined to the students of Chitwan Medical College so the findings cannot be generalized. The morphology of the tongue can be studied using different techniques such as visual inspection method,[14, 19, 20] photography method, impression method,[2,5,9,21] ultrasound.[22] In this study only visual inspection and photography method was used. The present study did not observe the factors behind the formation of scalloped, fissure and bifid tongues as they were not the objective of the present study.

CONCLUSIONS

Each person's tongue is different in terms of form and surface texture. The present study reported the variation of the tongue in Nepal too. The variations were also observed among males and females. This study also forms a baseline study for forensic experts and paves a way for additional studies.

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