

Morphological Variations of Tongue Shape in Pediatric Patients Attending Dental OPD of Kanti Children's Hospital, Nepal

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ABSTRACT

Background: The morphology and surface features are characteristics of any individual and these are used for forensic identification too. For this purpose, tongue print has also been an important milieu for identification. This study was aimed to study the variations of tongue shape in pediatric patients visiting Kanti Children's Hospital.

Methods: A descriptive cross-sectional study was conducted among 224 pediatric patients visiting the dental outpatient department of Kanti Children's Hospital, Maharajgunj, Kathmandu, Nepal. The patients were asked to protrude tongue in relaxed position, after which a photograph was taken and the tongue shape, borders and texture were evaluated. The study results were analyzed using descriptive statistical method with Statistical Package for Social Science (SPSS) version 16.

Results: Total 224 children with the mean age 7.91 ± 1.96 years participated in the study. Among the participants half of the participants were male. The U-shaped tongue was highly prevalent 137 (61.2%). Among the study population, 204 (91.1%) had smooth tongue and 206 (92%) had absence of fissures in the tongue. Among the participant's, U shaped tongue was more in males than in females while V shaped tongue was more in females. Smooth border of the tongue was more in females (93%).

Conclusion: From the present study, it can be concluded that variations of tongue were observed among gender in Nepalese pediatric population. The U shaped tongue was present more among male while V shaped tongue was more in female children.

Keywords: Biometric; Forensic; Tongue print.

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INTRODUCTION

Tongue is an important vital organ enclosed within the oral cavity. It performs multitude of functions such as articulation of speech, perception of taste, and formation of food bolus.^{1, 2} It is preserved in a deceased person as it is well encased and protected by oral environment.^{3, 4}

Various research in the study of tongue have employed different technique such as impression method, visual inspection, and digital photography methods.⁵⁻⁷ All of these studies have reported that the color, size, shape, and surface features are unique to everyone and forms a basis in forensic investigations.^{5, 8, 9} Previous studies regarding the shape of tongue have shown different results. The U-shaped tongue was more common in male while V

shaped was common among females.^{3, 5} In another study, Panchbhai et al reported U-shaped tongue to be more prevalent in females.⁷ Similarly, scalloped borders and multiple fissure was prevalent among males.⁵ Females had no fissures while in males central fissure was more common.¹⁰

Most of the published literatures are mainly focused on adults.^{5, 6, 10} Studies related to morphological variations of tongue has not been reported in Nepal. Such studies have not been performed among children too. Hence the present study aimed to analyze the variations of tongue shape among the pediatric population.

MATERIALS AND METHODS

A descriptive cross-sectional study was conducted at the dental outpatient department (OPD) of Kanti Children's Hospital, Kathmandu, Nepal from February 2021 to July 2021. Institutional ethical clearance was taken from Institutional Review Committee of Kanti Children's Hospital (31/2020-021, Ref 853). The sample size was calculated based on the study of Gargi et al⁵, taking formula as $n = z^2pq/d^2$ where $Z=1.96$ at 95% confidence interval and $p=74.3\%$, $q=1-p$, $d=6\%$ margin of error. The total sample size was calculated to be 203.765. However, 224 participants took part in the study. Male and female children of age group 5 to 12 years were included in the study, whereas children who had preexisting tongue disorders and history of systemic illness were excluded from the study. Those parents and child patients who did not give consent and ascent were also excluded from the study.

Before the initiation of study, the motive and procedure of the study was explained to the parents and their children. The informed consent and ascent were also taken as the participants were below 18 years of age. Before the examination, the participants were asked to rinse the mouth gently with water to remove any surface debris or food particles. Then the clinical examination of the tongue was done. After clinical examination, the participants were asked to protrude the tongue in a relaxed position to analyze and to take a photograph of the tongue. The photographs were taken front view and side view and then they were compared in terms of three morphological

characteristics such as the shape, borders, color, and fissures of the tongue as described by Sreepradha et al.¹¹ Data were collected, coded, and entered into Statistical Package for Social Science (SPSS) version 16. Descriptive statistical analysis was done.

RESULTS

In total 224 children participated in the study. The mean age of the children was 7.91 ± 1.96 years. Among the participants 50.9% of participants were female (Table 1).

Among the participant's, U shaped tongue was highly prevalent 137 (61.2%), while V shaped tongue was found in 61 (27.2%). Bifid tongue was observed among 26 (11.6%) children. About 204 (91.1%) participants had smooth tongue and scalloped tongue was observed on 5 (2.2) children. About 206 (92%) had absence of fissures in the tongue while multiple fissure was present in 3 (1.3%). Majority of the children 213 (95.1%) had pink colored tongue (Table 2).

Table 3 showed the gender wise distribution of the different aspect of the tongue. The U shaped tongue was common to both gender. However, among the participant's, U shaped tongue was more common in males 73 (66.4%) than in females 64 (56.1%) while V shaped tongue was more common in females 34 (29.8%) than in males 27 (24.5%). Smooth border of the tongue was more prevalent in females (93%). Most of the males and female children had no fissure. The pink tongue was common in female 110 (96.5%) than in male 103 (93.6%).

Table 1: Demographic characteristics of participants

Characteristics of participants		Frequency (%)
Gender	Male	110 (49.1)
	Female	114 (50.9)
Age (Years) (Mean \pm SD)		7.91 \pm 1.96

Table 2: Frequencies in the evaluation of the morphology of the tongue

Morphology of tongue		Frequency (%)
Shape of tongue	U shape	137 (61.2)
	V shape	61 (27.2)
	Bifid	26 (11.6)
Border	Smooth	204 (91.1)
	Partly scalloped	15 (6.7)
	Scalloped	5 (2.2)
Fissures of tongue	Absence of fissure	206 (92.0)
	Single fissure	15 (6.7)
	Multiple fissures	3 (1.3)
Color	Pink	213 (95.1)
	Pale	11 (4.9)

Table 3: Gender wise distribution of shape, border, fissures, and color of tongue

Morphology of tongue		Male; Frequency (%)	Female; Frequency (%)
Shape of tongue	U shape	73 (66.4)	64 (56.1)
	Bifid	10 (9.1)	16 (14.0)
	V shape	27 (24.5)	34 (29.8)
Border	Smooth	98 (89.1)	106 (93.0)
	Partly scalloped	7 (6.4)	8 (7.0)
	Scalloped	5 (4.5)	0
Fissures of tongue	Absence of fissure	106 (96.4)	100 (87.7)
	Single fissure	3 (2.7)	12 (10.5)
	Multiple fissures	1 (0.9)	2 (1.8)
Color	Pink	103 (93.6)	110 (96.5)
	Pale	7 (6.4)	4 (3.5)

DISCUSSION

Tongue is a complex muscular organ. It has multitude of functions in our oral cavity such as sucking, swallowing, phonation of speech, and taste and stimuli perceptions.¹² The condition of tongue is a good reflection of our general health status. This is also a basis of diagnosis in traditional Chinese medicine where the color and texture of tongue is observed.¹³

Tongue is an important organ during forensic investigation. Since it is enclosed in a closed humid oral environment, it is resistant to decomposition. This is the reason tongue forms an important investigative tool when the deceased is edentulous or in state of lack of comparable data to evaluate the dental arches.⁴ The other factor for tongue is its importance in biometric authentication as the morphological features of tongue differs among every individual. The shape, size, color, texture, and borders vary among genders, race, ethnicity.^{8, 14} In a morphometric analysis of tongue, Beghini et al. have compared the collagen percentage between African and European ancestry. The European ancestry individuals showed higher collagen percentage in tongue.⁴

Many authors have utilized different techniques to study the morphology of tongue in adults.^{2, 15, 16} The most popular method is visual inspection method where the color, texture, shape, border can be evaluated.^{9, 10, 17} This method is aided by photography of the tongue. Creating a positive replica of the tongue with the help of alginate impression have also been practiced by many researchers.^{5-7, 18} Ultrasound imaging has also been an addition in the diagnostic tool to measure the tongue shapes and positions.¹⁹ Apart from this, sublingual vein analysis has also been used to study the tongue.²⁰ Many of them use either single method or combination of methods.^{5, 21}

In the present study, majority of the participants had U-shaped tongue 137 (61.2%). The U shaped was observed more in males as compared to females. The U shape was followed by V shape which was observed more in females as compared to males. The U shape tongue was

more prevalent than any other types. This findings were similar to that reported by Garg et al.⁵ and Sreepadha et al.¹¹ The reason behind the prevalence of U shape tongue in male and V shape tongue in female may be the smaller mandible in females than in male.²²⁻²⁴ The increasing case of bifid tongue among participants is also alarming. Among 224 participants there were 26 participants with bifid tongue. Bifid tongue is a developmental anomaly during the formation of anterior two third of the tongue. It may be syndromic or non-syndromic and generally associated with other oral findings like ankyloglossia too.^{25, 26} However, the objective of present study restricted the authors to go into the depth of the bifid tongue in the participants.

In the present study, the borders of the tongue were smooth in 204 participants (91.1%). Although the prevalence of smooth borders was also shown to be higher in studies performed by Gard et al. and Sreepadha et al.^{5, 11} However, the number of cases with smooth border was higher in the present study. This may be due to the age group of the study population as the pediatric patients are in the phase of continuous growth and development. With advancing age, most of the structures of head and neck are already formed. There are more chances to find the scalloped borders in the adults.^{27, 28} Partly scalloping and scalloping was present in 15 and 2 participants respectively. The scalloped borders in tongue is the physiological condition which appears as the result of combination of factors such as macroglossia, existing dentition status and the pressure exerted by tongue on the surrounding teeth.^{29, 30} The scalloping of the tongue has also been reported to be associated with obstructive sleep apnea.^{31, 32} However, the reason of scalloping was not investigated further in the present study.

Absence of fissures in the tongue was observed in 206 (92%) participants. This finding was in contrast to other studies where fissures were more prevalent.^{5, 11} The higher prevalence of fissure observed in the other studies^{5, 11} may be due to the difference in age group of the participants

selected, the oral hygiene measures practiced by the participants and the associated diseases in the participants. In the present study the shape, border, fissures, and color of the tongue were evaluated in the pediatric patients visiting the Kanti Children's Hospital. Our meticulous literature reviews showed that the morphological variations of tongue in children have not been studied yet. The current study may also form a baseline study for future research for forensic odontologists.

There were some limitations of the study as well. The first limitation is that the study site is Kanti Children's Hospital, so the findings of the study cannot be generalized.

The shape, border, fissure and color of tongue was based upon Sreepadha et al.¹¹ only.

CONCLUSION

The present study concluded the presence of sexual dimorphism of tongue in pediatric patients. Similar to the adult population, U shaped tongue was observed more in male while V shaped tongue was observed more in female. Further large-scale study is also needed to validate the research findings.

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