

## Prevalence of Tongue Anomalies in Turkish Children in the Eastern Anatolia Region

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### Abstract

**Background:** In this study, the prevalence of tongue anomalies in children was investigated according to age, gender, systemic diseases, and allergies.

**Materials and Methods:** Eight hundred children ages 3-14 were examined. The age (3-6, 7-10, 11-14 years), sex and tongue anomalies (fissured tongue, geographic tongue, ankyloglossia, atrophic tongue, hairy tongue) were recorded together with any history of systemic diseases and allergies. **Results:** 800 children in total (mean age: 8.37±2.8 years) were evaluated; 414 (51.8%) females, 386 (48.3%) males. The number of children determined to have tongue anomalies was 94 (11.7%). The most common tongue anomaly was fissured tongue, followed by ankyloglossia, geographic tongue, and atrophic tongue. While the prevalence of fissured tongue increased due to age, the prevalence of geographic tongue decreased ( $p=0.00$ ). The number of children with a fissured tongue accompanied by a geographic tongue was 6 (0.8%). Of the children, 5.1% ( $n=41$ ) had systemic disease, 1.5% ( $n=12$ ) were allergic, and 1.1% ( $n=9$ ) were syndromic. Tongue anomaly was found in 6 children with systemic disease, and in 1 of the syndromic patients, no tongue anomalies were found in children with a history of allergy. Tongue anomalies were more common in males.

**Conclusions:** Assessment of tongue anomalies during the pediatric examination may provide clues in determining the child's lifestyle, eating habits, and underlying systemic diseases.

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**Keywords:** Fissured tongue, geographic tongue, pediatric population, systemic disease, tongue anomalies.

### Introduction

The term "tongue anomalies" includes many conditions. Some of these are primarily of little clinical significance to be considered normal variants. Some are significant deformities of the tongue, which in most cases help identify a group of diverse conditions that show evidence of some hereditary syndromes and developmental etiologies (1,2).

In epidemiological studies on children, there are differences in the prevalence of tongue anomalies (3-8). The most common conditions are fissured (3-5) and geographic tongue (6,7). Fissured tongue is a relatively common condition that is characterized by the presence of numerous grooves or fissures on the dorsal tongue surface. It has been reported that fissured tongue is seen in patients with Down syndrome, acromegaly, psoriasis, Sjögren's syndrome, and Melkersson-Rosenthal syndrome (10). Geographic

tongue (GT) is characterized by the loss of filiform papillae, leading to denuded lesions that rapidly undergo change and migrate in a map-like pattern. The lesions typically change over time, with periods of remission (10). Some studies report that geographic and fissured tongue prevalence differences may be due to geography and ethnic origin. Also, it is thought that there may be a connection between the formation of a geographic tongue and fissured tongue (9).

Ankyloglossia is a congenital developmental anomaly of the tongue characterized by a short, thick lingual frenulum resulting in limitation of tongue movement (10). Atrophic tongue or smooth tongue results from atrophy of the filiform papillae, which is well known due to nutritional deficiencies such as vitamin B12, folic acid, or iron. Etiological factors of these conditions include nutritional deficiencies and diabetes, xerostomia, and candidiasis (10). Hairy tongue, excessive accumulation of keratin in the filiform papillae

on the dorsum of the tongue leads to the formation of long hair-like threads (10). To in our knowledge, only a few studies have reported the prevalence of tongue anomalies in children, such as ankyloglossia, atrophic tongue, and hairy tongue (3,5-7).

Traditionally, tongue anomalies have been considered disorders of primary concern regarding oral and general health (11). However, the lack of standard methods to determine tongue anomalies in healthy children and the lack of epidemiological data due to different diagnostic criteria may cause these anomalies to be overlooked. The epidemiological literature in this area, especially on children, is limited (12) despite the recommendations of the World Health Organization. Additionally, the signs and symptoms of oral mucosal disorders in childhood may change with age, and their prevalence may differ from adult oral pathologies.

The purpose of this study was to learn more about the prevalence of tongue anomalies, which are commonly seen in pediatric dentistry.

## Materials and Methods

In this study, 800 Turkish patients between the ages of 3- 14 who came for a routine dental check-up at Inonu University, Department of Pediatric Dentistry, were examined in terms of various tongue anomalies. Again, all of the patients consisted of Turkish children living in the Eastern Anatolia region. Required permissions and approvals for this study were obtained from the Ethics Committee of the university (2022/2981). All patients had their parents' informed consent and consent for data use, and the study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

A pre-designed structured questionnaire recorded age, gender, and systemic disease details. After the anamnesis, a systematic, comprehensive oral clinical examination aided by dental light and mouth mirrors was carried out on all patients. The tongue was examined for surface differences, specific anomalies, and movements. The clinical examination of the oral mucosa and tongue was performed according to World Health Organization (WHO) guidelines (13). Five types of tongue anomalies, namely fissured tongue, geographic tongue, partial ankyloglossia, hairy tongue, and atrophic tongue, were identified in this series. Children were divided into three groups according to age: 3-6, 7-10, and 11-14 years. The data were analyzed according to age groups.

All patients were examined by previously calibrated trained examiners. Photographs of the

patients' tongues which were thought to have tongue anomalies, were taken and stored. In those cases where there were differences in the diagnoses reached by the examiners, the case was discussed and re-evaluated until a common diagnosis was achieved. Diagnosis of tongue anomalies was made based on the consensus of all two examiners. Where this failed, the case was excluded from the study series.

## Statistical analysis

Data were analyzed using Microsoft Excel 2010 (Microsoft Corporation, Redmond, Washington, USA) and SPSS 21.0 (IBM, Chicago, USA) programs, and presented using descriptive statistics and Pearson's chi-squared test. P-values of < 0.05 were regarded as statistically significant.

## Results

Eight hundred children in total (mean age: 8.37±2.8 years) were evaluated, of which 414 (51.8%) were females and 386 (48.3%) males. The number of children determined to have tongue anomalies was 94 (11.7%). Although it was designed for five types, one type (hairy tongue) has never been observed. The most common tongue anomaly was fissured tongue (7.5%) (Fig. 1a), followed by ankyloglossia (2.8%), geographic tongue (2.3%) (Fig. 1b), and atrophic tongue (0.1%), respectively.

The distribution of tongue anomalies by different age groups is shown in Table 1. The prevalence of the most common fissured tongue increased with age. Prevalences determined were 1.7% in the 3-6 age group, 7.3% in the 7-10, and 14% in the 11-14 age group. The prevalence of geographic tongue anomalies decreased with age, unlike fissured tongue. Prevalences were determined as 4.3% in the 3-6 age group, 2.5% in the 7-10 age group, and not found in the 11-14 age group. The difference between the ages was statistically significant ( $p=0.00$ ).

Most of the children had one type of anomaly, and 1.1% ( $n=9$ ) of the children had two types of anomalies together. The number of children with fissured tongue anomalies accompanied by geographic tongue was 6 (0.8%) (Fig. 1c). Two (0.3%) children were detected with both ankyloglossia and fissured tongue anomalies. The number of children with geographic tongue accompanied by ankyloglossia tongue anomaly was 1 (0.1%).

The distribution of tongue anomalies by gender is shown in Table 2. The prevalence of tongue anomalies in males was higher than in females ( $p=0.347$ ).

The prevalence of fissured tongue and ankyloglossia were higher in males, while the prevalence of geographic tongue was higher in females.

According to the anamnesis taken from the parents, 5.1% (n=41) of the children had the systemic disease (heart, diabetes, thyroid, epilepsy, etc.), 1.5% (n=12) were allergic, and 1.1% (n=9) were syndromic (autism, down, etc.). While tongue anomaly was found in 6 children with systemic disease and 1 of the syndromic patients, no tongue anomaly was found in children with a history of allergy. Three of the children with systemic diseases (1 asthma, one heart failure, one blood pressure + one kidney) had fissured tongue, 1 (asthma) atrophic tongue, 2 (1 asthma, 1 epilepsy) ankyloglossia tongue was detected.

The fissured tongue was detected in one child with the syndrome (down syndrome).



**Figure 1:** Tongue anomalies a; fissured tongue, b; geographic tongue, c; combined anomaly of fissured and geographic tongue.

**Table 1.** Prevalence of tongue lesions according to age groups.

Anomalies (some of the children had several anomalies)							
Age Groups*	Children	Fissured tongue	Geographic tongue	Ankyloglossia	Atrophic tongue	No lesions	P value
(years)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
3-6	230	4 (1.73)	10 (4.34)	4 (1.73)	-	214 (93.04)	
7-10	356	26 (7.30)	9 (2.52)	11 (3.08)	-	315 (88.48)	0.000*
11-14	214	30 (14.01)	-	8 (3.73)	1(0.46)	177 (82.71)	
<b>Total</b>	<b>800</b>	<b>60 (7.5)</b>	<b>19 (2.37)</b>	<b>23 (2.87)</b>	<b>1(0.12)</b>	<b>706 (88.25)</b>	

\* Chi-squared test, \*\* p<0.05.

**Table 2.** Prevalence of tongue lesions according to gender.

Anomalies (some of the children had several anomalies)							
Gender*	Children	Fissured tongue	Geographic tongue	Ankyloglossia	Atrophic tongue	No lesions	P value
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Female	414	29 (7.00)	11 (2.65)	9 (2.17)	-	370 (89.37)	
Male	386	31 (8.03)	8 (2.07)	14 (3.62)	1 (0.25)	336 (87.04)	0.347
<b>Total</b>	<b>800</b>	<b>60 (7.5)</b>	<b>19 (2.37)</b>	<b>23 (2.87)</b>	<b>1 (0.12)</b>	<b>706 (88.25)</b>	

\* Chi-squared test.

## Discussion

Tongue anomalies are a common condition in the population. While tongue anomalies sometimes progress with systemic diseases, they can sometimes be seen with an underlying etiology, such as the habits of the living area, the nutritional characteristics, and the drugs used (10). Ethnicity can also create differences in the prevalence of hereditary tongue anomalies (3). In addition, the rate of tongue anomalies in children and adults varies (6, 9). Although previous studies (4, 7, 11) that determine tongue anomalies in children and adults in this country are available, this study is one of the very few studies that evaluate tongue anomalies in children living in the Eastern Anatolia region.

The prevalence of fissured and geographic tongues in children varies in different studies (3-8). In the study Voros-Balog et al. (3), it was reported that fissured tongue anomaly was the most common, with 29.2% in children aged 1-14. Similarly, Abdullah et al. (14) found the most common fissured tongue with 13.1% in the 0-13 age group, and Khozeimeh et al. (5) 11.8% in the 7-17 age group. Contrary to these studies, Majorana et al. (6) identified the most common anomaly as geographic tongue in children aged 0-12 with 9.93%. In our country, Unur et al. (4) study in children aged 0-13, and the most common anomaly was fissured tongue with 3.4%, while in the study of Ugar-Cankal (7) in children aged 6-12, the geographic tongue was the most common condition with 1.8%. Avcı et al. (11) found that in 5150 patients aged between 13 and 83, the most common tongue anomaly in individuals aged 13-20 was again a fissured tongue. In this study conducted with children aged 3-14 years, the fissured tongue was determined as the most common anomaly and it was higher than the geographic tongue prevalence. Furthermore, the prevalence of fissured tongue (7.5%) in this study is higher than in previous studies conducted in our country by Unur et al. (4) and Ugar-Cankal et al. (7), but lower than the studies in Hungary (3), Iran (5), and Erbil (14). The age groups, evaluation criteria, calibrations, education of the examiners, ethnicity, and genetic factors may be the reason for this.

Most patients with fissured tongues are asymptomatic; it is noticed spontaneously during a clinical examination (9). Although the fissured tongue is generally thought to be hereditary, some studies report that it increases with age and is less common in children (especially under the age of 10) than in adults (6,9). Some studies (1-3) state that the geographic tongue increases at younger ages (especially 0-6 years old), unlike fissured ones. In this study, the prevalence

of fissured tongue increased with age, while the prevalence of geographic tongue decreased.

There is also an opinion that the geographic tongue may be a pre-stage of fissured tongue and that fissured tongue and geographic tongue may be two different versions of the same disease (9,15). In a study conducted in Hungary (3), 8.75% of children with fissured tongues also had signs of geographic tongue, while 44.82% of children with geographic tongue also had fissured tongues. In the Abdullah et al. study (14), the prevalence of fissured tongue coexisting with geographic tongue was found to be 1.5%. In the current study, the prevalence of children with geographic and fissured tongues was 0.8%. The prevalence of ankyloglossia may vary according to the socio-economic status, education level, ethnic origin of the families, and individual's age, due to the possibility of children with limitations being treated at an early age. The ankyloglossia tongue anomaly was 1.7% in a study conducted with 600 patients in Malaysia (16), 7.8% in a study conducted in India (17), 3.1% in a study conducted with 520 children in Iraq (14), and 2.8% in this study conducted with 800 pediatric patients. Moreover, in this study, the atrophic tongue was seen only in one (0.1%) patient, while the prevalence of hairy tongue was not found.

In this study, the prevalence of tongue anomalies in males was higher than in females, consistent with previous studies (3,5,7,17-19). In Koey et al.'s (16) study, fissured tongue lesions were more common in males, while geographic tongue lesions were more common in females, similar to this study.

A study evaluating the relationship between tongue anomalies and systemic diseases (16) found a significant relationship between fissured tongue and systemic diseases, especially between the fissured tongue and diabetes mellitus. In another study, Majorana et al. (6) detected tongue lesions mostly in patients with encephalopathy. In this study conducted with pediatric patients, the fissured tongue was observed in 3 (7.3%) children with systemic disease, ankyloglossia in 2 (4.9%), and atrophic tongue anomaly in 1 (2.4%) child. Fissured tongue anomaly was detected in one (11.1%) child with a syndrome. No tongue anomalies were observed in children with allergies.

## Conclusion

Assessment of tongue anomalies during the pediatric examination may provide clues in determining the child's lifestyle, eating habits, and underlying systemic diseases. Clinicians should define these differences and raise awareness in dental examination and contribute to



the literature with studies evaluating the rate of tongue anomalies in children. This study is one of the few studies conducted in this region and these age groups, but further studies with a more comprehensive evaluation of oral lesions in children are necessary.

**Conflict of Interest:** The authors declare that they have no conflict of interest.

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