



## Prevalence of tongue alterations and related factors in children attending the University of Cartagena, Colombia

### *Prevalencia de alteraciones linguales y factores relacionados en niños que consultan a la Universidad de Cartagena, Colombia*

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#### ABSTRACT

**Aim:** The aim of the present study was to describe prevalence of tongue alterations and related factors observed in child patients attending the University of Cartagena, Colombia. **Method:** The present study was of a cross-sectional, descriptive nature. 134 children were randomly examined after attending consultation during the second semester of 2011. Selected children were subjected to clinical examination, their medical history was reviewed and their mothers were interviewed, in order to ascertain presence of tongue alterations. A classification was undertaken and socio-demographic characteristics were noted as well as possibly related factors (drug intake, anemia, nutritional problems, vitamin B deficiencies, allergies, stress, psoriasis and oral hygiene. Proportions, confidence intervals and  $\chi^2$  statistical test were used, assuming significance lesser than 0.05. **Results:** Prevalence of tongue alterations was 79.9%. Most frequent lesions were coated tongue (74.6%) and ankyloglossia (5.2%). No statistically significant relationship was found between presence of tongue alterations and assessed factors. **Conclusion:** Tongue alterations in children were highly prevalent, especially coated tongue cases. Bearing this in mind parents and children should be encouraged to implement healthy oral hygiene habits stressing hygiene of the tongue's dorsal surface.

**Key words:** Alterations of the tongue, ankyloglossia, related factors, fissured tongue, geographical tongue, coated tongue.

**Palabras clave:** Alteraciones de la lengua, anquiloglosia, factores relacionados, lengua fisurada, lengua geográfica, lengua saburral.

#### RESUMEN

**Objetivo:** Describir la prevalencia de alteraciones linguales y factores relacionados en niños que asisten a las clínicas odontológicas de la universidad de Cartagena, Colombia. **Métodos:** Estudio descriptivo de corte transversal, se examinaron aleatoriamente 134 niños que consultaron en el segundo semestre del año 2011. Se realizó examen clínico al niño, revisión de su historia clínica médica y una encuesta a la madre, para evaluar la presencia de alteraciones linguales, clasificación, características sociodemográficas y los posibles factores relacionados (ingesta de medicamentos, anemia, problemas nutricionales, déficit de vitamina B, alergias, estrés, psoriasis e higiene bucal). Se utilizaron proporciones, intervalos de confianza y la prueba estadística  $\chi^2$ , asumiendo una significancia menor a 0.05. **Resultados:** La prevalencia de alteraciones linguales fue de 79.9%, siendo las lesiones más frecuentes la lengua saburral con el 74.6% y anquiloglosia con el 5.2%. No hubo relación estadísticamente significativa entre la presencia de alteraciones linguales y los factores evaluados. **Conclusión:** Las alteraciones linguales en niños tuvieron una alta prevalencia en especial la lengua saburral, en este sentido se deben implementar protocolos de manejo para incentivar en los niños y los padres conductas de higiene bucal saludables enfatizando en la superficie dorsal de la lengua.

#### INTRODUCTION

The tongue is a muscle organ which, besides possessing the sense of taste, participates in the articulation of phonemes as speech modulator, participates in the processes of deglutition, and breathing and facilitates suction of liquids,<sup>1</sup> therefore its alterations could affect the subject's development. In dental practice, assessment of soft tissues, including the tongue, is paramount. This is especially due to its usefulness for the early diagnosis of systemic diseases, deformations, ulcerative lesions, infectious diseases, white lesions and other tongue disorders.<sup>2</sup>

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Large numbers of children's diseases can affect the oral mucosa. Counted among these are tongue alterations which elicit taste disturbances, speech difficulties and breastfeeding difficulties.<sup>3,4</sup> It is then necessary to early detect these lesions, emit a correct diagnosis and design suitable treatment plan, always bearing in mind all possibly related factors.

Epidemiological studies conducted in recent years have exhibited considerable variation in tongue alteration prevalence.<sup>5-7</sup> This is due to ethnic, gender and age differences as well as to different diagnostic and methodological criteria used by different researchers.<sup>8</sup> Geographical tongue is the condition which has most interested clinical operators. This is due to the fact that it causes filiform papillae destruction, eliciting thus taste alterations and discomfort when feeding.<sup>9</sup>

The following are some of the factors related to tongue alterations: allergies, habits, stress vitamin deficiencies, anemia, chemotherapy, drug intake, psoriasis as well as nutritional problems.<sup>10-13</sup> Nevertheless, it has not been possible to establish a model in children involving interaction of all these factors as an exploration of the risks of presenting tongue alterations.

The aim of the present study was to describe prevalence of tongue alterations as well as assessing related factors in children seeking treatment at the dental clinics of the University of Cartagena, Colombia.

## METHODS

The present study was descriptive and cross-sectional in nature, conducted on a finite population. A simple 134 subject random sample was taken from children seeking treatment at the dental clinics of the University of Cartagena during the second semester of 2011. The size of the sample was calculated based on the expected frequency of the studied phenomenon (16.0%),<sup>14</sup> confidence was 95% and relative error 5%. The present study was presented and approved by the ethics committee of the University of Cartagena.

Inclusion criteria were, among others, the following: children with ages ranking from 2-13 years having parents or responsible caretakers willing to participate in the study through written informed consent. In order to restrict acceptance of children which might confuse result interpretation, exclusion criteria were children with some sort of congenital, syndromic or hereditary anomaly related to tongue alterations, explained in the history and which might not have available clinical history records.

Two formats were developed so as to be able to classify the subjects of the study and assess variables.

The first format consisted on a guided, structured survey with 12 polytomous questions and 5 dichotomous questions, to assess personal data of the participant (name, age, gender, address and socio-economic level) as well as factors related to tongue alterations, which are now presented with measurement levels: frequency of brushing ( $\leq 2$ ,  $\geq 3$  times a day), cleansing of the tongue (almost always, sometimes, never) use or oral rinse (always, almost always, sometimes, never). Additionally, bearing in mind the medical clinical history of each child the following was recorded: drug intake (yes/no) anemia (presence/absence) problems with bodily size and weight (presence/absence), vitamin B deficiencies (presence/absence) stress (presence/absence) psoriasis (presence/absence) and allergies (presence/absence). The second format was composed by clinical exam findings.

Instrument calibration and later pilot evaluation were performed of the children with characteristics similar to the sample: calibration exercise consisted on submitting the exercise to two expert judges to assess in the instrument category sufficiency, extension of the questionnaire as well as its relevance. This gave way to necessary modifications. The instrument was then applied to evaluate the degree of understanding of the questions according to the context in which they were going to be applied. The instrument was thus validated, and it was assessed whether it met with the requirements of all variables indicators. The internal consistency was also measured through a test of examination-re-examination. The clinical examiner expert in detection and diagnosis of tongue alterations was standardized by measuring each one; initially through a process conducted with photographs, and later, directly on the subjects with a kappa intraexaminer test with value over 0.80.

With the use of a program for random numbers children names were randomly selected from attendance lists. Children were then located to request participation in the program. Parents or respondent caretakers signed written consent forms, after this surveys and clinical history revision were undertaken. The subject in charge of gathering data was different from the professional who performed clinical examinations. Clinical examinations were undertaken with the help of artificial light, number 5 oral mirror, tongue depressors and gauze so as to examine all surfaces of the tongue. Tongue examination began with the dorsal surface, inspection was achieved from the posterior third up to the anterior, then, lateral surfaces were examined, then the ventral surface was studied. After this, the entire tongue was subjected to palpation.

Data were tabulated on a matrix table in Microsoft Excel (2007 version). Data were analyzed with STATA

software, version 10.1. Initially, a descriptive analysis was applied to proportions and relative and absolute frequency distributions, assuming 95% confidence intervals. To assess significance of relationships among variables the statistical test  $\chi^2$  «square Chi», assuming significance lesser than 0.05.

**RESULTS**

47 out of the initially selected children did not meet with selection criteria, and 19 parents declined participation. Finally, 134 subjects were selected, average age 6.9 years (SD = 1.9), the larger group, representing ages 6-9 constituted 72.4% of the sample. Sample was composed of 50.7% male and 49.3 female patients. 88.1% of sample was within low socio-economic level and 11.9% belonged to middle class.

79.9% (CI 95%, 73.0-86.7) of sample (107 cases) presented tongue alterations. Most frequent alterations were coated tongue 74.6% (CI 95%; 66.2-82.1), followed by ankyloglossia, 5.2% (CI 95%; 1.4-9.1) (Table I).

74.6% of all cases exhibited presence of pseudo-plaque. Alterations were most frequently found in the dorsal surface of the tongue (76.1%) and the ventral surface (3%). Most frequent related factors were brushing  $\leq$  2 times a day (66.4%), little or no cleansing of the tongue (20.1%), problems with size and weight (26.9%) and drug intake (23.1%) (Table II).

No statistical significance was obtained when relating tongue alterations with socio-demographic variables with possible related factors (Table III).

**Table I.** Prevalence of tongue alteration types in children seeking treatment at the University of Cartagena, Colombia.

| Type of tongue alterations | CI = 95%   |             |
|----------------------------|------------|-------------|
|                            | Fr (%)     |             |
| Coated Tongue              |            |             |
| Presence                   | 100 (74.6) | 67.2 - 82.1 |
| Absence                    | 34 (25.4)  | 17.9 - 32.8 |
| Geographical tongue        |            |             |
| Presence                   | 1 (0.8)    | -0.7 - 2.2  |
| Absence                    | 133 (99.2) | 97.7 - 100  |
| Hairy tongue               |            |             |
| Presence                   | 1 (0.8)    | -0.7 - 2.2  |
| Absence                    | 133 (99.2) | 97.7 - 100  |
| Ankyloglossia              |            |             |
| Presence                   | 7 (5.2)    | 1.4 - 9.1   |
| Absence                    | 127 (94.8) | 90.8 - 98.5 |
| Total                      | 134 (100)  |             |

**DISCUSSION**

Very few studies on tongue alterations and their possible associated factors have been conducted up to the present date, when compared to studies assessing caries or gingival health. It is therefore pertinent to compare these findings with those of other authors. Among limitations of the present study we can count the use of surveys to assess expositions. This can generate a certain amount of bias which we tried to attenuate with different validation processes. Nevertheless our analysis was only restricted to exploration of certain indicators related to tongue alterations. This could be considered to be an approximation of the model which determines these diseases.

**Table II.** Factors related to tongue alterations in children. Data gathered through survey and medical clinical history revision.

| Related factors          | Fr (%)     | CI = 95%     |
|--------------------------|------------|--------------|
| Brushing frequency       |            |              |
| $\leq$ 2 times a day     | 89 (66.4)  | 58.3 - 74.5  |
| $\geq$ 3 times a day     | 45 (33.6)  | 25.4 - 41.6  |
| Tongue cleansing         |            |              |
| Almost always            | 95 (70.9)  | 63.1 - 78.6  |
| Sometimes/never          | 39 (29.1)  | 21.3 - 36.9  |
| Use of dental mouthwash  |            |              |
| Always                   | 6 (4.5)    | 0.9 - 8.0    |
| Almost always            | 6 (4.5)    | 0.9 - 8.0    |
| Sometimes                | 22 (16.4)  | 10.1 - 22.8  |
| Never                    | 100 (74.6) | 67.1 - 82.1  |
| Drug intake              |            |              |
| Yes                      | 31 (23.1)  | 15.9 - 30.4  |
| No                       | 103 (76.9) | 69.6 - 84.1  |
| Anemia                   |            |              |
| Present                  | 17 (12.7)  | 6.9 - 18.4   |
| Abasent                  | 117 (87.3) | 81.6 - 93.0  |
| Size and weight problems |            |              |
| Present                  | 36 (26.9)  | 19.2 - 34.5  |
| Absent                   | 98 (73.1)  | 65.5 - 80.7  |
| Vitamin B deficiencies   |            |              |
| Present                  | 11 (8.2)   | 3.5 - 12.9   |
| Absent                   | 123 (91.8) | 87.1 - 96.5  |
| Stress                   |            |              |
| Present                  | 6 (4.5)    | 0.9 - 8.0    |
| Absent                   | 128 (95.5) | 92 - 99.1    |
| Psoriasis                |            |              |
| Present                  | 1 (0.8)    | - 0.07 - 2.2 |
| Absent                   | 133 (99.2) | 97.8 - 100   |
| Allergies                |            |              |
| Present                  | 17 (12.7)  | 6.9 - 18.4   |
| Absent                   | 117 (87.3) | 81.6 - 93    |
| Total                    | 134 (100)  |              |

**Table III.** Statistical test values associating tongue alterations in children with related factors.

| Related factors          | Value of P |
|--------------------------|------------|
| Brushing frequency       | 0.378      |
| Tongue cleansing         | 0.946      |
| Use of oral rinse        | 0.521      |
| Drug intake              | 0.524      |
| Anemia                   | 0.783      |
| Weight and size problems | 0.274      |
| Vitamin B deficiencies   | 0.865      |
| Stress                   | 0.828      |
| Psoriasis                | 0.614      |
| Allergies                | 0.783      |

The present study indicated presence of high incidence of tongue alterations in children. The most frequent one being coated tongue. This could be considered a new finding, since other authors have failed to mention it<sup>15-17</sup> in similar studies. This could be due to the fact that some schools do not consider coated tongue as a tongue alteration proper, but rather a pseudo-pathological condition. Nevertheless, we deemed necessary to include this alteration, because, in addition to be an indicator of oral hygiene, authors such as Garcia & al<sup>14</sup> have reported statistically significant relationships between its presence and dento-alveolar fistulae. This could lead to suppose that the development of a coated tongue might be enhanced by the colonization of most aggressive germs originating from dento-alveolar fistulae. The high prevalence of coated tongue found in this children's population could be attributed to low levels of oral hygiene exhibited by children belonging to this age rank and socio-economic level. These children belonged to the lower socio-economic strata of our city, which can be characterized by restricted access to health services as well as lacking motivation with respect to oral hygiene. These would all be factors to enhance residue accumulation and bacterial colonization in the dorsal surface of the tongue.

In spite of differences and peculiarities exhibited by our sample. Results were comparable to those obtained by Guzman<sup>1</sup> in the city of Cali (Colombia). In this same perspective we could mention a study conducted in Oviedo (Spain) where results indicated the fact that coated tongue was the most frequent oral mucosa lesion found in a population of 6 year old children.<sup>14</sup> Other authors reported the fact that the most prevalent alteration was a fissured tongue. They varied its frequency from 5.2% up to 21.1%.<sup>18-22</sup> Pelaez,<sup>23</sup> in Madrid (Spain) as well as Shulman<sup>11</sup> and

Ugar<sup>24</sup> reported that geographical tongue was the most frequent tongue alteration.

When relating tongue alterations to socio-demographic variables, no statistically significant differences were found. This concurs with results reported by Shulman<sup>11</sup> who states there is no type of association among these conditions with age and sex. Contrary to these affirmations, some authors found differences among age groups. Highest prevalence was found to exist among earlier ages, as Bessa<sup>25</sup> reported in his study. A significantly higher prevalence was found in children with ages ranking 0 to 4 years. Avcu<sup>26</sup> maintains they are more frequent at more advanced ages. Branoczy<sup>19</sup> reports the fact that tongue alterations affect more frequently females. Benavides,<sup>27</sup> on the other hand, states they are more frequent in males. In spite of all the aforementioned studies, we cannot clearly establish whether age, gender and socio-economic status are related to increases in the prevalence of tongue alterations.

With respect to possible related factors, no statistical significance could be established with any of the assessed factors. Nevertheless, authors such as Miloğlu<sup>28</sup> sustain the idea that geographical tongue is more frequent in young subjects and allergic individuals. Zargari<sup>29</sup> and Costa<sup>30</sup> state the fact that these types of alterations are most frequent in subjects afflicted with psoriasis. Although coated tongue was the most frequent alteration found in the present study, it could not be established whether there was a relationship between it and oral hygiene habits. Contrary to this affirmation Fernandez<sup>31</sup> reports a relationship between thickness of coated tongue and frequency of cleansing and brushing habits. This would be consistent with this type of alteration, which is characterized by the accumulation of remains and epithelial cells on the dorsum of the tongue, which can be removed by brushing.

## CONCLUSION

Tongue alterations were highly prevalent among children who sought treatment at the dental clinics of the University of Cartagena. The most frequent alteration was coated tongue. Although no relationship could be established with assessed factors, it is recommended to implement handling protocols to encourage, in children and parents, healthy oral hygiene habits. Brushing of the dorsal surface of the tongue should be stimulated. Other research should be conducted so as to establish with a certain degree of certainty the causing agents for these alterations and thus decrease their prevalence through the control of related factors.



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