



BRIEF COMMUNICATION

Dental fluorosis in children 5-9 years old from the Illahua Chico community, Quisapincha parish, Tungurahua, Ecuador

Fluorosis dental en niños de 5-9 años de la comunidad Illahua Chico, parroquia Quisapincha, Tungurahua

Elvia María Paucar-Cepeda ¹✉ , María de los Ángeles Salinas-Arcos ¹ , Roberto Rolando López-López ¹ 

¹Regional Autonomous University of the Andes (UNIANDES). Ecuador.

Received: January 25, 2023

Accepted: March 08, 2023

Published: March 19, 2023

Cite as: Paucar-Cepeda EM, Salinas-Arcos MdA, López López RR. Dental fluorosis in children aged 5-9 years in the Illahua Chico community, Quisapincha parish, Tungurahua. Rev Medical Sciences [Internet]. 2023 [cited: date of access]; 27(S1):e. Available at: <http://revcmpinar.sld.cu/index.php/publicaciones/article/view/>

ABSTRACT

Introduction: Dental fluorosis is an alteration as a result of excessive intake of fluoride that occurs during dental formation, especially in children between five to nine years of age. Excess fluoride causes demineralization of dental enamel, which can present itself in three stages: mild, moderate and severe.

Objective: To characterize the levels of dental fluorosis in children between five to nine years of age in the Illagua Chico community of the Quisapincha parish, Tungurahua, Ecuador; in the period from October 2021 to November 2022.

Methods: An observational, descriptive, cross-sectional, descriptive study was carried out with the purpose of characterizing the levels of dental fluorosis in children between five to nine years of age in this community in the period from October 2021 to November 2022. The study is the first phase of an oral health program implemented in this community. The sample was taken in a simple random way and consisted of 35 patients who met the inclusion and exclusion criteria of a universe made up of the 1080 inhabitants of the community.

Results: It was found that 54,29 % of the patients were female. With respect to age, patients aged seven to six years predominated (25,71 % and 22,86 % respectively). The analysis of fluorosis identified that 40 % did not present fluorosis and 31 % presented moderate fluorosis.

Conclusions: It is essential to implement an oral health program that seeks to prevent this problem with the application of fluoride in established doses and at times determined by manufacturers and national and international governmental agencies.

Keywords: Prevention; Fluorosis; Pathology; Analysis.

RESUMEN

Introducción: la fluorosis dental es una alteración como resultado de la ingesta excesiva de flúor que se presenta durante la formación dentaria especialmente en los niños en edades comprendidas entre cinco a nueve años. El exceso de flúor provoca la desmineralización del esmalte dental, la misma puede presentarse en tres etapas: leve, moderada y grave.

Objetivo: caracterizar los niveles de fluorosis dental en niños de cinco a nueve años de edad de la comunidad Illagua Chico de la parroquia Quisapincha, Tungurahua, Ecuador; en el período comprendido entre octubre de 2021 a noviembre de 2022.

Métodos: se realizó un estudio observacional, descriptivo, de corte transversal con el propósito de caracterizar los niveles de fluorosis dental en niños de cinco a nueve años de edad en dicha comunidad en el período comprendido entre octubre de 2021 a noviembre de 2022. El estudio es la primera fase de un programa de salud oral aplicado en esta comunidad. La muestra se tomó de forma aleatoria simple y quedó conformada por 35 pacientes que cumplieron los criterios de inclusión y exclusión de un universo conformado por los 1080 habitantes de la comunidad.

Resultados: Se encontró que el 54,29 % de los pacientes fue del sexo femenino. Con respecto a la edad, predominaron los pacientes de siete y seis años (25,71 % y 22,86 % respectivamente). El análisis de fluorosis permitió identificar que el 40 % no presentó fluorosis y el 31 % la presentó de forma moderada.

Conclusiones: es imprescindible la implementación de un programa de salud oral que busque prevenir este problema con la aplicación de flúor en dosis establecidas y en tiempos determinados por los fabricantes y organismos gubernamentales nacionales e internacionales.

Palabras clave: Prevención; Fluorosis; Patología; Análisis.

INTRODUCTION

Fluoride ion, halogen, electronegative, has been supplied and recommended as a public health measure in the prevention of caries by the WHO (World Health Organization) since the 20th century; its intake should be oral to ensure the prevention of dental caries; it is excreted in the urine. The effect of fluoride depends on: the general state of health, dose, exposure time and degree of malnutrition, among others.⁽¹⁾

Dental fluorosis appears as a consequence of excessive intake of fluoride during the process of tooth development, characterized by lesions ranging from minimal alterations in the translucency of normal enamel to the presence of opaque white or brown pigmented areas on the surfaces of the teeth.⁽²⁾

The absence of population-based studies on oral health conditions in the last four years in Ecuador was evident. However, in his article on oral health in 12 year old children in schools in Quito-Ecuador, in which 1100 children participated and six examinations were carried out, among which fluorosis was found, he indicates that 63,7 % presented dental fluorosis.⁽³⁾

Dental fluorosis can be understood as the qualitative damage in the enamel, due to the high concentration of fluoride in the microenvironment of the ameloblasts during the development of the teeth. This causes an affection in the enamel and calcium matrix of the tooth.

Fluoride ingestion before the age of two to three years is critical for fluorosis to develop permanently in the teeth. However, in posterior teeth, such as canines and premolars, this limit of damage can be extended two to three years. Clinically, fluorosis begins with the appearance of whitish to dark brown stains and even the loss of continuity of tooth enamel.⁽³⁾

In the investigations of this oral health problem, the most used index is the one developed by Dean,⁽⁴⁾ which comprises different degrees according to the severity of the affectation of the dental surface. The criteria for classifying the findings according to the clinical appearance of the dental enamel and the percentage of dental involvement defined by Dean include five levels of severity.⁽⁵⁾

In the unaffected tooth, defined as normal by Dean, the enamel is translucent, the tooth surface is smooth and shiny, and has a pale creamy white color. In the doubtful or questionable grade, the enamel shows slight changes in translucency ranging from a few white spots to occasional white spots; this classification is used when the milder form of fluorosis does not warrant consideration and a classification of unaffected is also not adequate. In this sense, based on Dean's index, the cases identified as doubtful are excluded in the calculation of the prevalence of dental fluorosis.⁽⁵⁾

In Ecuador there are very few records and studies on the problem of fluorosis in spite of the fact that there are innumerable parishes with this problem in different provinces.

Therefore, this research aims to characterize the levels of dental fluorosis in children from 5 to 9 years of age in the Illagua Chico community of the Quisapincha parish, Tungurahua, Ecuador; in the period from October 2021 to November 2022.

METHODS

An observational, descriptive, cross-sectional, descriptive study was carried out with the purpose of characterizing the levels of dental fluorosis in children two to three years of age in the Illagua Chico community of the Quisapincha parish, Tungurahua, Ecuador; in the period from October 2021 to November 2022.

The study is the first phase of an oral health program applied in this community. The sample was taken in a simple random way and consisted of 35 patients who met the inclusion and exclusion criteria of a universe made up of the 1080 inhabitants of the community.

For the sample calculation, the formula was used:

$$n = (N * Z * p * q) / (d^2 * (N - 1) + (Z^2 * p * q))$$

Where:

- n = Sample size.
- M = Total population (1080).
- Z = 1.96 (95 % certainty).
- p = 0.05 (expected proportion 5 %)
- q = 1 - p (1 - 0,05 = 0,95)
- d = precision (5 % used)

Patients aged two to three years attending voluntarily and whose guardians signed the informed consent were included. Patients who were not in full use of their faculties were excluded.

Variables such as age, sex, skin color and type of fluorescence were studied.

All the research work was carried out under the dialectical materialistic approach as a general method of the sciences. On the basis of this approach and for the development of scientific tasks, different theoretical, empirical and statistical methods of scientific research were combined. On the theoretical level, the historical-logical one, which allowed deepening in the background and in the current tendencies of the object under investigation, by pointing out the current approaches of such object.

Documentary analysis was used as empirical methods: to obtain information contained in guiding documents (clinical histories of hospitalized patients). At the statistical level: in order to describe the study phenomenon, descriptive statistics were used by calculating absolute and relative percentage frequencies.

A technical sheet was designed with the patients' data and a clinical examination with the application of 1,23 % acidulated fluoride phosphate (APF), which is equivalent to 12,300ppm or 12,3mg/ml of gel. According to the oral pH, the application of fluoride will be every 3 months, during which time the changes noted will be recorded.

The principles of medical ethics and the aspects established in the Declaration of Helsinki were complied with.

RESULTS

It was found that 54,29 % of the patients were female. With respect to age, patients aged seven to six years predominated (25,71 % and 22,86 % respectively) (Table 1).

Table 1. Characteristics of the patients and level of fluorosis, Illahua Chico community, Quisapincha parish, Province of Tungurahua.

Characteristic	No.	%
Sex		
Male	16	45,71
Female	19	54,29
Age		
5	6	17,14
6	8	22,86
7	9	25,71
8	7	20
9	5	14,29

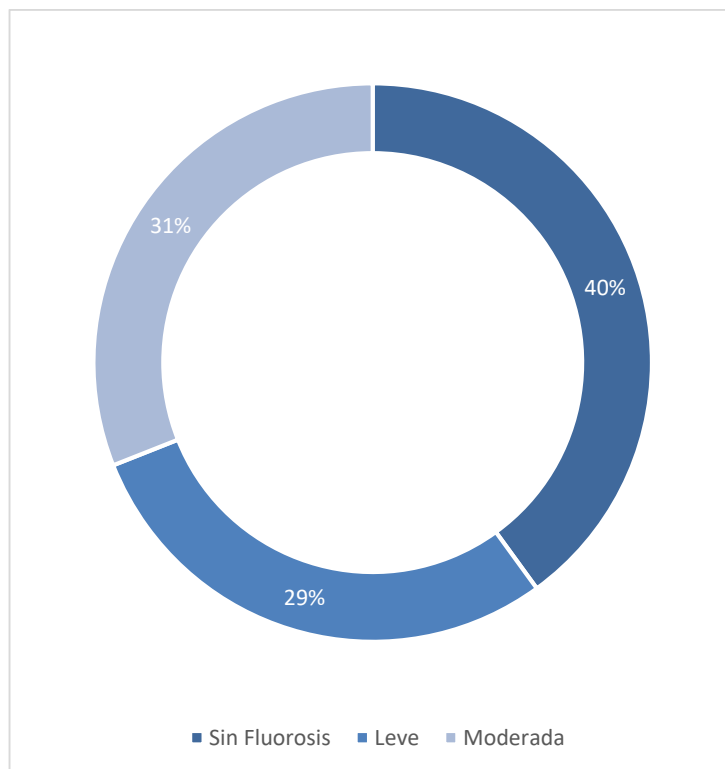


Fig. 1 Distribution of patients according to type and presence of fluorosis.

The analysis of fluorosis identified that 40 % did not present fluorosis, and 31 % presented moderate fluorosis (Fig. 1).

DISCUSSION

The excessive consumption of fluoride in children to increase height and weight throughout the years of their dental development can occur in various ways:

- By excess fluoride in water. A child can get fluorosis if he or she regularly drinks water with excess fluoride (more than 1.5 ppm) over the years (from birth to eight years of age) or if the mother consumes it during pregnancy.^(6,7,8)
- Excessive intake of fluoride from other sources. Consumption of vitamin supplements containing fluoride in doses higher than recommended. It can also be due to the consumption of fluoride toothpaste; in this case, some toothpastes taste so good to the child that he/she uses it in large quantities and does not spit correctly after brushing.

The hypothesis that dental fluorosis is the only pathology caused by excessive fluoride consumption in humans has been disproved in several recent studies. What has been proven is that in addition to the structure of the teeth, other organs and systems can also be affected to a greater or lesser degree: the skeletal, digestive, biological, reproductive, urinary, digestive, immune, endocrine and central nervous systems.

It is important to understand the whole process of absorption and deposition of this mineral in the body, to reach a broader understanding of the effects on other organs and systems of the body. It is also important to evaluate the actions taken in terms of dehydration of water for human use, and the high costs that can be derived from the realization of this process, which often justify the non-implementation of these actions.^(9,10,11)

From the diagnostic study carried out, it is evident that 60 % of the children in the community of Illahua present worrying levels of fluorosis, a value that coincides with the results obtained in other investigations consulted and that require the design and follow-up of oral health programs such as the one implemented in the first phase described in this article.⁽¹²⁾

On the other hand, exposure to fluoride through toothpastes has been reported in numerous international studies as a risk for fluorosis.⁽¹³⁾ Tabari,⁽¹⁴⁾ reported that children who use fluoride toothpastes (>1,200 ppm of fluoride) have between 1,6 and 1,83 times higher risk compared to children who use toothpastes with low fluoride concentration.

It is clear that at these ages there is little control in the expectoration of toothpaste residues during brushing, likewise it has been shown that children between 1,5 and 2,5 years of age ingest between 64,3 % and 83,9 % of the toothpaste they use, and even at five years of age around 30 % is ingested during this activity.⁽¹⁵⁾

In the community of Illahua Chico there are aquifers that come from the subsoil and this water is used for all daily activities; it is used to prepare food, to drink, to give water to the animals without previous filtration, that is why it contains a high concentration of fluoride which in excess produces Fluorosis.

Of the population, the most affected are children between two to six years of age, since the excess of fluoride in them can cause multiple damages in their teeth starting with a yellowish color that with the passing of the years can cause the loss of teeth in early ages, affecting also the motor skills that do not allow them to develop in a comfortable environment.

CONCLUSIONS

When there is an excessive intake of fluoride, the first thing that is observed is a progressive color change in the teeth, starting with a whitish color, then brown and finally a brown color. The levels of fluorosis determined in this research, in the community of Illahua Chico in children from 5 to 9 years of age is related to the consumption of water without previous treatment process, for this reason samples were taken to later carry out the treatment and avoid an increase in the risk of coloration in the permanent dentition.

Conflict of interest

The authors declare that there is no conflict of interest.

Authors' contribution

All authors participated in the conceptualization, formal analysis, project management, writing - original draft, writing - revision, editing and approval of the final manuscript.

Funding

The authors did not receive funding for the development of this research.

BIBLIOGRAPHIC REFERENCES

1. Armas-Vega A del C, González-Martínez FD, Rivera-Martínez MS, Mayorga-Solórzano MF, Banderas-Benítez VE, Guevara-Cabrera OF. Factors associated with dental fluorosis in three zones of Ecuador. *J Clin Exp Dent* [Internet]. 2019 [citado 27/11/2022]; 11(1):e42-8. Disponible en: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6343983/>
2. Shahroom N, Mani G, Ramakrishnan M. Interventions in management of dental fluorosis, an endemic disease: A systematic review. *Journal Of Family Medicine And Primary Care* [Internet]. 2019 [citado 27/11/2022]; 8(10): 3108. Disponible en: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6857403/>
3. Michel-Crosato E, Raggio DP, Coloma-Valverde AN de J, Lopez EF, Alvarez-Velasco PL, Medina MV, et al. Oral health of 12-year-old children in Quito, Ecuador: a population-based epidemiological survey. *BMC Oral Health* [Internet]. 2019 [citado 27/11/2022]; 19(1):184. Disponible en: <https://pubmed.ncbi.nlm.nih.gov/31412847/>
4. Dean HT, Arnold FA, Elvolve E. Domestic water and dental caries. Additional studies of the relation of fluoride domestic waters to dental caries in 4425 white children, age 12-14 years of 13 cities in 4 states. *Public Health Rep* [Internet]. 1942 [citado 27/11/2022]; 57(32): 1155-1179. Disponible en: http://www.scielo.org.co/scielo.php?script=sci_nlinks&ref=4672418&pid=S0120-971X201600010000500001&lng=en
5. Fejerskov O, Baelum V, Manji F, Møller IJ. Dental fluorosis. A handbook for health care workers [Internet]. Copenhagen: Munksgaard; 1988 [citado 27/11/2022]. p.44-50. Disponible en: <https://www.worldcat.org/es/title/dental-fluorosis-a-handbook-for-health-workers/oclc/466636905?referer=di&ht=edition>
6. Di Giovanni T, Eliades T, Papageorgiou SN. Interventions for dental fluorosis: A systematic review. *J Esthet Restor Dent* [Internet]. 2018 [citado 27/11/2022]; 30(6): 502-8. Disponible en: <https://pubmed.ncbi.nlm.nih.gov/30194793/>
7. Ji M, Xiao L, Xu L, Huang S, Zhang D. How pH is regulated during amelogenesis in dental fluorosis. *Exp Ther Med* [Internet]. 2018 [citado 19/10/2022]; 16(5): 3759-65. Disponible en: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6201052/>
8. Kanduti D, Sterbenk P, Artnik B. FLUORIDE: A REVIEW OF USE AND EFFECTS ON HEALTH. *Mater Sociomed* [Internet]. 2016 [citado 27/11/2022]; 28(2): 133-7. Disponible en: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4851520/>
9. Do LG, Ha DH, Roberts-Thomson KF, Spencer AJ. Dental fluorosis in the Australian adult population. *Aust Dent J* [Internet]. 2020 [citado 27/11/2022]; 65 (Suppl. 1): S47-51. Disponible en: <https://pubmed.ncbi.nlm.nih.gov/32583583/>
10. Mendoza Curi YF. Informe final de las actividades realizadas en la sede "C.S Santa Rosa de Pachacutec" durante el periodo de octubre - febrero del 2017 [Internet]. 2017 [citado 27/11/2022]; Disponible en: <https://repositorio.upch.edu.pe/handle/20.500.12866/728>

11. Mesa Ruiz VE. Exposición inadvertida al ion flúor y su impacto sobre la fluorosis como problema de salud pública. Montería, 2019 [Internet]. Montevideo, Uruguay: Universidad de la República; 2021 [citado 27/11/2022]. Disponible en: <https://repositorio.unicordoba.edu.co/handle/ucordoba/4026>
12. Wei W, Shujuan P, and Dianjun S. The pathogenesis of endemic fluorosis: Research progress in the last 5 years. Journal of cellular and molecular medicine [Internet]. 2019 [citado 27/11/2022]; 23(4): 2333-2342. Disponible en: <https://onlinelibrary.wiley.com/doi/full/10.1111/jcmm.14185>
13. Akuno M H, Nocella G, Milia EP, Gutierrez L. Factors influencing the relationship between fluoride in drinking water and dental fluorosis: a ten-year systematic review and meta-analysis. J Water Health [Internet]. 2019 [citado 27/11/2022]; 17(6):845–862. Disponible en: <https://doi.org/10.2166/wh.2019.300>
14. Tabari ED, Ellwood R, Rugg-Gunn AJ, Evans DJ, Davies RM. Dental fluorosis in permanent incisor teeth in relation to water fluoridation, social deprivation and toothpaste use in infancy. Br Dent J [Internet]. 2000 [citado 27/11/2022]; 189(4): 216-20. Disponible en: <https://pubmed.ncbi.nlm.nih.gov/11036750/>
15. Neurath C, Limeback H. Dental Fluorosis Trends in US Oral Health Surveys: 1986 to 2012. JDR Clin Trans Res [Internet]. 2019 [citado 27/11/2022]; 4(4): 298–308. Disponible en: <https://pubmed.ncbi.nlm.nih.gov/30931722/>