

**Skeletal fluorosis: knowledge about the disease in a population**  
**Fluorose óssea: conhecimento de uma população acerca da doença**  
**Fluorosis ósea: conocimiento de una población sobre la enfermedad**

Received: 03/05/2016  
Approved: 19/09/2016  
Published: 15/02/2017

Maria Soraya Pereira Franco Adriano <sup>1</sup>  
Consuelo Fernanda Macedo de Souza <sup>2</sup>  
Denise Campos Menezes <sup>3</sup>  
José Ferreira de Lima Junior <sup>4</sup>  
Fábio Correia Sampaio <sup>5</sup>

This study aims to evaluate the profile of individuals with skeletal fluorosis, showing their perception about the issue. It was conducted at the municipality of São João do Rio do Peixe-PB, Brazil, where the concentration of fluoride on the drinking water is 5.12 ppm, leading to 100% of the population showing signs of dental fluorosis. This was an observational, cross-sectional, descriptive and exploratory study, based on qualitative and quantitative data. The sample consisted of 27 people, aged 20 years or more. Some respondents have shown to be aware that the fluoride excess caused teeth and bone changes. It was observed that this disease is still unknown to the lay population.

**Descriptors:** Public Health; Water supply; Fluorosis dental.

Este estudo tem como objetivo conhecer o perfil de indivíduos com fluorose óssea no município de São João do Rio do Peixe - PB, evidenciando a percepção dos mesmos acerca dessa problemática. Essa região foi escolhida uma vez que a água de consumo apresenta uma concentração de 5,12 ppm de flúor, levando a um acometimento de toda a população pela fluorose dentária. Trata-se de um estudo observacional, transversal, descritivo e exploratório, baseado em dados quanti-qualitativos. A amostra foi composta por 27 pessoas, com idades acima de 20 anos. Observou-se que alguns entrevistados têm consciência de que o excesso do fluoreto pode afetar os dentes e ocasionar alterações ósseas. Observou-se que essa morbidade ainda é pouco conhecida.

**Descritores:** Saúde Pública; Abastecimento de água; Fluorose dentária.

Este estudio tiene como objetivo conocer el perfil de individuos con fluorosis ósea, evidenciando la percepción de los mismos acerca de esta problemática y fue realizado en el municipio de São José do Rio do Peixe - PB, Brasil. Esta región fue elegida por el hecho del agua de consumo presentar una concentración de 5,12 ppm de flúor, provocando una afectación de toda la población, por la fluorosis dental. Se trata de un estudio observacional, transversal, descriptivo y exploratorio, basado en datos cuanti-cualitativos. La muestra estuvo compuesta por 27 personas, con edades encima de los 20 años. Se observó que algunos entrevistados tienen conciencia de que el exceso del fluoruro puede afectar los dientes y ocasionar alteraciones óseas. Se observó que esta morbilidad aún es poco conocida.

**Descriptores:** Salud Pública; Abastecimiento de Água; Fluorosis dental.

1. Dental Surgeon. Specialist in Endodontics. Specialist in Family Health. Specialist in Health Services Administration. Master's degree in Odontology. Doctor's degree in Health Biotechnology. Professor at the Technical Health School at the Paraíba Federal University (UFPB), PB/Brazil. ORCID - 0000-0001-7888-4430 E-mail: msorayapf@hotmail.com. Brazil.

2. Dental Surgeon. Master's degree in Odontology. Ongoing Doctor's Degree in Medicine Technological Innovation and Development at Rio Grande do Norte Federal University (UFRN), RN/Brazil. ORCID - 0000.0003.3671.1106 E-mail: consuelofernanda79@hotmail.com. Brazil.

3. Nurse. Specialist in Family Health, PB/Brazil. ORCID: 0000-0002-1464-7425. E-mail: denisinha89@hotmail.com. Brazil.

4. Dental Surgeon. Doctor's Degree in Biotechnology. Professor at the Technical Health School at the Campina Grande Federal University (UFCG), PB/Brazil. ORCID: 0000-0002-5571-4989. E-mail: jflimajunior@gmail.com . Brazil.

5. Dental Surgeon. Graduated in Chemistry. Master's degree in Odontology. Doctor's Degree in Cariology. Post-Doctorate degree in Odontology. Associate Professor IV at UFPB, PB/Brazil. Research Productivity Level 2 in the CNPQ. ORCID - 0000-0003-2870-5742 E-mail: fabio.sampaio@uol.com.br. Brazil.

## INTRODUCTION

Fluoride is the thirtieth most common element in nature. It is present in the air, in the soil and in the water<sup>1</sup>. In Brazil, there are reports of endemic fluorosis due to the presence of high natural levels of fluoride in the States of São Paulo, Minas Gerais, Santa Catarina, Paraíba (in the cities of Catolé do Rocha and São João do Rio do Peixe) and Rio Grande do Sul (in the city of Santa Tereza)<sup>2</sup>.

The regions where the concentrations of fluorine in the water are too high, the exposed population can develop dental and skeletal changes. Dental fluorosis is a dental enamel disturbance that clinically presents itself as opaque or darkened white spots. It is a disturbance that can influence masticatory and aesthetic functions<sup>3</sup>. Skeletal fluorosis happens when individuals ingest daily water with high concentrations of fluorine (above 3.0-3.5 mg/L)<sup>4-8</sup>.

Considering the context of scarce hydrological resources in the semi-arid northeast regions, the population resorts to groundwater to satisfy their basic needs. The hydrogeological context of this territory presents fluorine in its composition, a mineral that can appear in several different geological environments. Fluorine occurrences are due, in part, to the abnormal fluoride concentration in the groundwater of São Francisco-MG, but other fluoride bearing minerals, unidentifiable whether macroscopically or through conventional optic microscopy, could be present<sup>5</sup>.

Therefore, considering the high temperatures of the Brazilian northeast, as well as the frequent consumption of water with high concentrations of fluoride, individuals from the region might have their renal functioning compromised, as well as present fluorosis. Hence, this study in the region is justified, aiming at understanding this change, provoked by the excess of fluoride ingestion in high concentrations. Furthermore, this study **will provide others with a research strategy**, since most works conducted in Brazil about total daily fluoride ingestion and the risk of fluorosis have been conducted in the urban zones of the southeast region<sup>2,10-12</sup>.

Given this, the need for more comprehensive studies in Paraíba is clear, due to the scarcity of literature that approach the real situation of the morbidity in the county. Therefore, this study aims to know the epidemiological profile of individuals with skeletal fluorosis in a specific region of the State of Paraíba, where the presence of dental fluorosis was verified, as well as to identify the perception of the population regarding this problem.

## METHOD

This is an observational, cross-sectional, descriptive and exploratory study, based in qualitative and quantitative data, conducted in the rural community of Brejo das Freiras, in the city of São João do Rio do Peixe - PB, about 500km far from the city of João Pessoa/PB.

This location presents high concentrations of fluoride in its wells, and thus concentrates a great number of the dental fluorosis cases in children and adults in the State of Paraíba.

As inclusion criteria, the study considered individuals 20 years old or older, who were born and have always lived in Brejo das Freiras. Individuals under 20 years old and/or who were living in the city for little time were excluded from the research.

The City Council of Health authorized the research through the Institutional Authorization Term, so it could access the Information System of Primary Health (SIAB) of the regional area and micro-area. After that, an initial contact with the researched population happened, in order to explain the steps of the research, and explain the Free Consent Form, which was sign by all participants.

By means of a semi-structured questionnaire, the profile of the participants was identified (gender, age, educational level, marital status, among other information) and through interviews, information about the issue studied were found. The narratives were transcribed to maintain the anonymity of participants. The participants and their narratives were categorized as interviewee 1 (E1), interviewee 2 (E2) and so on, according to the size of the sample.

Quantitative data was tabulated with the software SPSS Statistic for Windows - version 19, and analyzed with the help of descriptive statistics. The results are expressed in charts and tables. The qualitative data were explored through the content analysis technique of Bardin<sup>13</sup>, after which a pre-analysis was conducted, including codification categorization.

To conduct this study, the bioethical guidelines of the Resolution 466/2012 from the National Council of Health were followed, as this organ determines the norms for the researches that involve human beings.

The project was submitted to the appreciation of the Research Ethics Committee of the Paraíba Federal University, and was approved under the protocol n° 0038. After approval, data collection started. The study was conducted in the year 2015.

## RESULTS

From the 79 families which live in this area and were registered at the SIAB, 27 individuals were interviewed, 85.1% women and 14.8% men. Regarding their age group, 11.1% were from 21 to 30 years old, 25.9% from 31 to 40, 14.8% from 41 to 50, 7.4% from 51 to 60, and 40.7% were 61 years old or older. Therefore, it was noted that most interviewed people were elders.

Previous researches have shown that the accumulation of fluoride in the body is usually a long term process<sup>1</sup>. Thus, fluorosis manifests itself only after years of exposition, which explains the higher incidence of the disease in elders. In other studies, there is also a notable prevalence of elders affected by skeletal fluorosis, though in the variable gender, males tend to be more prevalent<sup>5</sup>.

Regarding color/race, most of the samples were constituted of people who were brown (81.4%). It was also noted that most participants (48.1%) were lived with their partners. 37% of the individuals were single, only 11.1% were widowers, and 3.7% were divorced. 7.4% of participants were illiterate, 7.5% were, 37% had and incomplete Elementary School, 14.8% had completed Elementary School, 29.6% had completed

High School and 3.7% had completed a higher education course, that is, most participants are of a low educational level. Regarding their monthly income, 3.7% do not have one, 14.8% receive less than 1 minimum wage, and 81.4% said they receive from 1 to 2 minimum wages, as Table 1 shows.

The narratives that follow include the perceptions of participants regarding fluorosis, the quality of the water for human consumption, as well as what should be done to solve that problem. Initially, the participants were inquired about how they evaluated the quality of the water that arrives at their residences.

As shown (table 2), 74% of the population evaluates as being good quality drinking water that arrives at their homes, thus demonstrating that the population is satisfied with the treatment at the local level, however is mister point out that 74% of the water in this region comes from artesian wells, leading to the need for a more effective quality surveillance to correspond to the standards of the Ministry of Health of Brazil.

## DISCUSSION

Overseeing the quality of water for human consumption depends on a series of actions to be continuously performed by public health organs<sup>5</sup>, to identify if the water the population consumes meets the Ministerial standards and evaluate the risks brought by alternative systems and solutions for its supply<sup>7</sup>.

However, a great challenge is to assure the quality of underground water sources in rural areas, that it meets the adequate standards, satisfies the users, do not pose risks to their health, and consequently do not increase costs in the treatment of diseases, guaranteeing regional sustainable development.

Regarding the participants, they were asked: "Where does the water for your consumption come from?". Most of the population, it was found consumes water from the well of the community or from the Water Treatment Facility (ETA), which was implemented to diminish the level of fluoride in the water of the area<sup>1</sup>.

**Table 1** - Distribution of the sample of the study according to gender, age, color, marital status, educational level and monthly income. Cajazeiras/PB, 2015.

<b>Variables</b>	<b>N</b>	<b>%</b>
<b>Gender</b>		
Male	4	14.8
Female	23	85.1
<b>Age range</b>		
21-30 years	3	11.1
31-40 years	7	25.9
41-50 years	4	14.8
51-60 years	2	7.4
61 or more	11	40.7
<b>Color/Race</b>		
White	3	11.1
Black	2	7.4
Brown	22	81.4
<b>Marital status</b>		
Married	13	48.1
Divorced	1	3.7
Widower	3	11.1
Single	10	37.0
<b>Educational level</b>		
Illiterate	2	7.4
Literate	2	7.5
Incomplete Elementary School	10	37.0
Complete Elementary School	4	14.8
Complete High School	8	29.6
Complete Higher Education	1	3.7
<b>Monthly Income</b>		
No income	1	3.7
Less than 1 minimum wage	4	14.8
From 1 to 2 minimum wages	22	81.4
<b>Total</b>	27	-

**Table 2.** Evaluation of the water quality according to the perception of people interviewed. Cajazeiras/PB, 2015.

<b>CATEGORIES</b>	<b>N</b>	<b>%</b>
<b>Excellent</b>	1	3.7
<b>Good</b>	20	74.0
<b>Regular</b>	6	22.2
<b>TOTAL</b>	27	100.0

The participants, when questioned regarding what generates the concentration of fluoride in the water, have stated:

*"For me I didn't ever felt no health problem, but who lives near there says that the kid has a problem, complains about water, says they're sick, but I think the water's real good there" (E22).*

*"We'll be prejudiced because of that, these waters that have a lot of fluoride and we can't be drinking mineral*

*water, we can't afford it, and so we drink this anyway" (E4).*

When questioned about which problems can be generated to the population which is subjected to water with high levels of fluoride, they stated:

*"A lot of people say they're having problems because of the water, but I don't feel nothing because of the water, I*

1. Dental Surgeon. Specialist in Endodontics. Specialist in Family Health. Specialist in Health Services Administration. Master's degree in Odontology. Doctor's degree in Health Biotechnology. Professor at the Technical Health School at the Paraíba Federal University (UFPB), PB/Brazil. ORCID - 0000-0001-7888-4430 E-mail: msorayapf@hotmail.com. Brazil.

2. Dental Surgeon. Master's degree in Odontology. Ongoing Doctor's Degree in Medicine Technological Innovation and Development at Rio Grande do Norte Federal University (UFRN), RN/Brazil. ORCID - 0000.0003.3671.1106 E-mail: consuelofernanda79@hotmail.com. Brazil.

3. Nurse. Specialist in Family Health, PB/Brazil. ORCID: 0000-0002-1464-7425. E-mail: denisinha89@hotmail.com. Brazil.

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*just feel pain in my legs and in my back but I don't think it's anything to do with the water" (E2).*

*"Dental fluorosis is the pain in our bones, the teeth get yellow, there it's known as rusty teeth, in the bones it's the pain in the bones, because it also affects the bones" (E27).*

Thus, it can be noted that some interviewees are aware that the excess of fluoride can affect the teeth and bring about skeletal changes, while other do not state that its excess can cause bone and metabolic problems, and believe the pain they feel is just a consequence of work and physical effort. That denotes the insufficient knowledge and the vulnerability of the participants of the study.

As for possible solutions to the problem in the community, they reply:

*"I think that there's a treatment that can take the excess fluoride, can even make the water reach a normal degree, and that's what we're needing" (E13).*

*"The excess fluoride of them there water, this problem was detected, the project to solve it was already done, and it's a problem that really needs to be controlled, because it's affecting the teeth and the bones of people" (E6).*

Such statements show a restriction of concepts and can indicate how superficial are the answers of the participants, indicating that the people victimized by fluorosis are still not completely aware of the problem, which makes it much more difficult to develop strategies to solve the problem side by side with the governmental organs and institutions that can help to generate a positive impact in the situation.

## CONCLUSION

This study has verified that the profile of the individuals which are more affected by skeletal fluorosis shows more females, 61 year old or older, brown skinned, married, with a low educational level and a monthly income of between 1 and 2 minimum wages. It was also noted that more investigations are needed, as well as more information regarding this morbidity.

This work is expected to instigate molecular studies, as to elucidate relevant aspects of how fluoride influences in the development of skeletal fluorosis and osteoporosis.

Similarly, an expansion in clinical and radiological studies is expected, that can

contribute in the precocious detection of the disease, thereby improving the quality of life of this population.

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#### CONTRIBUTIONS

**All authors** contributed equally to the design of the research, data collection, data analysis, writing and critical analysis.

#### How to cite this article (Vancouver)

Adriano MSPF, Souza CFM, Menezes DC, Junior JFL, Sampaio FC. Skeletal fluorosis: knowledge about the disease in a population. REFACS [Internet]. 2017 [cited in: *insert day, month and year of access*]; 5 (Suppl. 1): 125-130. Available in: *access link*. DOI: <http://dx.doi.org/10.18554/refacs.v5i0.1975>

#### How to cite this article (ABNT)

ADRIANO, M. S. P. F. et al. Skeletal fluorosis: knowledge about the disease in a population. REFACS, Uberaba, MG, v. 5, p. 125-130, 2017. Supl. 1. Available in: *access link*. Access in: *insert day, month and year of access*. DOI: <http://dx.doi.org/10.18554/refacs.v5i0.1975>

#### How to cite this article (APA)

Adriano, M. S. P. F, Souza, C. F. M, Menezes, D. C, Junior, J. F. L & Sampaio, F. C. (2017) Skeletal fluorosis: knowledge about the disease in a population. REFACS, 5(Supl. 1), 125-130. Recovered in: *insert day, month and year of access*. *Insert access link*. DOI: <http://dx.doi.org/10.18554/refacs.v5i0.1975>