



RESEARCH BRIEF



Prevalence of oral fluorosis in Luangwa district of Lusaka Province, Zambia

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Received 04 December 2018;

Accepted 20 December 2018

doi: 10.15713/ins.ijcdmr.133

How to cite the article:

Mpundu G, Makasa M, Phiri C, Aluckal E, Kunnilathu A. Prevalence of oral fluorosis in Luangwa district of Lusaka Province, Zambia. Int J Contemp Dent Med Rev vol.2018, Article ID: 031218, 2018. doi: 10.15713/ins.ijcdmr.133

Abstract

Background: A fluorosis is a chronic form of hypoplasia of the dental enamel initiated by consumption water with high fluoride content during the time of tooth formation. Excessive ingestion of fluoride can result in fluorosis (mottling) of enamel which presents as opaque or white areas, lines, or flecks in the enamel surface. These teeth are more prone to dental caries and can be cosmetically disfiguring when they occur on anterior teeth. In spite of this fact, no study has been conducted to measure the prevalence of fluorosis in Luangwa district of the Eastern Province of Zambia. **Aim:** The study was to determine the prevalence of fluorosis and its treatment needs among the population affected in Luangwa district in the Eastern Province of Zambia. **Methodology:** A cross-sectional study was conducted with outreach descriptive survey and was conducted on patients that attended dental care during the mobile hospital outreach that was conducted in Luangwa district of Lusaka Province of Zambia. **Results:** Out of the total of 195 subjects examined, 56 (28.8%) patients were seen in Luangwa district clinic, out of which 1 (1.78%) had fluorosis. In Mwavi, at the secondary school, 71 (36.4%) were seen and 29 (40.84%) had fluorosis. At Luangwa Secondary School, a total of 68 (34.87% of the total subjects) were examined and out of that 7 (10.29%) had fluorosis. An aggregated total of 37 (18.97%) subjects of the 195 seen had fluorosis. **Conclusion:** The survey could elicit the presence of fluorosis in the Luangwa district of Lusaka Province. The baseline data suggest that the subjects who were seen from the clinic in the cannabidiol exhibited low levels (1.78%) of fluorosis because the water they consumed was treated by the local authority as compared to high prevalence of fluorosis in other sites outside the district where the water source was primarily river and wells which lacked treatment. **Clinical Significance:** This pilot study suggests the need to conduct a larger research study on the prevalence and impact of fluorosis in the population. This would help to plan future upstream dental public health programs.

Keywords: Dental patients, dental public health, oral fluorosis, outreach camp, preventive dentistry, public health, survey

Introduction

A problem of practice that evolved was little focus on population health with a considerable number of persons presenting with tooth discoloration, tooth fracture, tooth caries, loss of tooth, and loss of function related to fluorosis. There have been no detailed studies looking into the prevalence of fluorosis and the subsequent treatment needs analysis in many parts of The

Republic of Zambia. This initiated the researchers in both public health and dental public health fields of multiple universities and colleges to Concorde and conduct a pilot study in the Luangwa district of the Eastern Province of Zambia. Luangwa district is in the Eastern Province of Zambia. Luangwa is located at the confluence of the Luangwa River and the Zambezi River, neighboring with Zimbabwe and Mozambique with an estimated population of 18,948.

A fluorosis is a chronic form of hypoplasia of the dental enamel caused by drinking water with a high fluorine content during the time of tooth formation and is characterized by defective calcification that gives a chalky white appearance, which gradually undergoes brown discoloration^[1] [Figures 1 and 2]. Fluoride has also been shown to inhibit cariogenic bacteria. This is postulated to occur mainly through inhibition of enzyme-mediated glycolysis in cariogenic microorganisms such as *Streptococcus mutans*. Fluoride is thought to adversely affect polysaccharide metabolism in bacterial cells, reduces the ability of such cells to maintain pH homeostasis, and inhibits enolase as well as other ATPase enzyme systems.^[2,3]

Methodology

This research was initiated with the approval of respective Research Ethics Boards and voluntary consent taken from subjects. The research was in strict adherence with Good Clinical Practice guidelines and international standards consulting with international researchers. This was a cross-sectional study providing a snapshot of the prevalence of fluorosis in the population. A mobile hospital outreach descriptive survey was conducted on a target population in the Luangwa district of Lusaka Province from June 21, 2015, to June 29, 2015. The three sites which conducted the outreach were Luangwa district clinic, and Mwavi Secondary and Luangwa Secondary School. A total of 195 people visited all the three campsites and were examined using disposable dental mirror and probes.

Dental examination procedures were done on all the subjects that passed through the dental unit using probes and mirrors, under natural light. Further, the subjects were interviewed on the source of water and lifestyle. They were also asked on the duration of stay in the area. Limitations of this method were that did not match each fluorosis positive patient with a quantity of water consumed and exact sources of exposures. These could act as the confounding factors in the study. Lack of data on the current levels of fluorides in the well and river water sources could act as an effect modifier. Lack of sample analysis based on migration pattern (rural to city and vice versa), population age, and dietary habits have the potential of skewing final results. There is a possibility of sampling bias as this pilot study was focused on only one district of Zambia, and hence, generalizability of the study should be confirmed with larger nationwide studies. As cross-sectional studies have inherent inability to determine cause and effect and present with non-representativeness through the snapshot timing, a stronger research methodology may be used in future studies.

Results

Out of the total of 195 subjects examined, 56 (28.8%) patients were seen in Luangwa district clinic, out of which 1 (1.78%) had fluorosis. In Mwavi, at the secondary school, 71 (36.4%) were seen and 29 (40.84%) had fluorosis. At Luangwa Secondary

School, a total of 68 (34.87% of the total subjects) were examined and out of that 7 (10.29%) had fluorosis. An aggregated total of 37 (18.97%) subjects out of the 195 seen had fluorosis. Figures 1 and 3 exhibit typical fluorosis presentation in the population and Figure 3 represents Figure 1 patient after secondary prevention of oral prophylaxis program to prevent severe periodontitis teeth loss, abscess, and oral cancer [Appendix A-D].

Discussion

Accurately identifying population needs are essential in designing a comprehensive oral health program. As self-reported measures derived findings in epidemiological surveys could possibly bias the true estimates of clinical treatment needs of the population, the needs analysis must be done carefully and accurately.^[4] This possible development of a future dental public health program reflecting community needs and characteristics could establish community bonding, leading to a positive developmental pathway



Figure 1: Before treatment. Clinical findings from the picture are fluorosis, periodontitis, gingival hyperplasia, stains, and calculus



Figure 2: After treatment



Figure 3: Young patient presenting with fluorosis

resulting in preventing the occurrence of public health problems.^[5] Furthermore, these dental screening programs should use consistent terminology and clear definitions to accurately evaluate disease risks prevalent in the population.^[6] Moreover, it is advisable to include water fluoridation in any future preventive program the equation as it provides better health outcome and higher cost-effectiveness, cost savings, and cost benefit to the community.^[7-9] Oral public health and promotion programs contextually designed in a system level approach considering both individual and population-level risk factors and protective factors could effectively enhance the success rate of programs. Social and political environment together with community and individual resources and goals should be considered in the design of future projects.^[10] Considering affordability issues in the target population for accessing dental care are another important component in the design phase of a program.^[11] Furthermore, to make access to oral health-care equitable, there should be an adequate supply of dental materials and equipment to all stationary and mobile health facilities.^[12] Health education has been also identified as an essential positive component in improving the health of the population with evident need for population awareness of the causes of dental diseases and how to prevent oral diseases.^[13,14] Health education has proved to be an evidence-based approach in preventing plaque accumulation, gingivitis, and dental caries in pediatric population too.^[15] In addition, it would be important to have future programs designed incorporating oral health education component as they have demonstrated to improve population-level knowledge and subsequently impacting on adherence rates and program success.^[16-18] Even though this study has a great potential of correctly identifying the prevalence of fluorosis in Luangwa, external validity may be confirmed with Zambia wide studies.

Conclusion

The survey could elicit the presence of fluorosis in the Luangwa district of Lusaka Province. The subject seen from the clinic in the cannabidiol exhibited low levels (1.78%) of fluorosis because water consumed is treated by the local authority. Furthermore, the population is cosmopolitan with an influx of people from

other towns around the country. In Mwavi, where the population is almost wholly indigenous, an increased prevalence was noticed with a 40.84% rate. The water source in this site is primarily a river and well. A borehole is also available, but the water is not treated. These data suggest the need to do a large outreach and research project on the prevalence and impact of fluorosis in this population is justified and plan future dental public health programs.

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Appendixes

Appendix A

Luangwa Boma district dental outreach clinic campsite (June 22, 2015–June 24, 2015)		
#	Procedures done on patients	Number of patients
1	Carious teeth extracted	56
2	Retained roots extracted	2
3	Dental abscess management	2
4	Mobile teeth extracted	0
5	Malocclusion	0
6	Persons with fluorosis	1
7	Persons with gingival hyperplasia	0
8	Total number of procedures done	56

Population characteristics based on gender		Number of persons presented for camp
Male		23
Female		33

Appendix B

Mwavi Secondary School dental outreach campsite (June 25, 2015–June 26, 2015)		
#	Procedures done on patients	Number of patients
1	Carious teeth extracted	53
2	Retained roots extracted	7
3	Dental abscess management	0
4	Mobile teeth extracted	0
5	Malocclusion	0
6	Persons with fluorosis	29
7	Persons with gingival hyperplasia	0
8	Total number of procedures done	71

Population characteristics based on gender		Number of persons presented for camp
Male		21
Female		50

Appendix C

Luangwa Secondary School dental outreach campsite (June 27, 2015–June 28, 2015)		
#	Procedures done on patients	Number of patients
1	Carious teeth extracted	37
2	Retained roots extracted	7
3	Dental abscess management	0
4	Mobile teeth extracted	4
5	Malocclusion interception	2
6	Persons with fluorosis	7
7	Persons with gingival hyperplasia	0
8	Total of procedures done	68

Population characteristics based on gender		Number of persons presented for camp
Male		33
Female		35

Appendix D

The procedures done in the outreach program at all the three dental outreach campsites

A total of 195 patients were seen at all the three dental outreach campsites

#	Procedures done on patients	Number of patients
1	Carious teeth extracted	146
2	Retained roots extracted	16
3	Dental abscess management	2
4	Mobile teeth extracted	11
5	Malocclusion interception	2
6	Persons with fluorosis	37
7	Persons with gingival hyperplasia	1
8	Grand total of procedures done	195

Population total from all three camps segregated based on gender		Number of persons presented for camp
Male		77
Female		118