







Experience of caries and tooth loss in rural citrus workers in Northeast Brazil

Experiência de cárie e perda dentária de trabalhadores rurais da citricultura no Nordeste brasileiro

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Abstract

Objective: To evaluate the experience of caries and tooth loss in rural citrus workers in Northeast Brazil. **Methods:** This was a cross-sectional, quantitative, and descriptive study carried out using a non-probabilistic sample of rural citrus workers linked to the Occupational Health Reference Center. Generalist and dental questionnaires were applied and clinical examinations were performed by two calibrated examiners on 619 participants in Basic Health Units to establish the sample DMFT index and to detail their characteristics of interest. **Results:** The sample was predominantly male (71%), with young adults between 20 and 40 years (50,9%), with low education (76%) and low income (59,3%). The mean DMFT index of the sample was 14.29 and the component regarding tooth loss (M) 9.97, corresponding to approximately 70% of this value. Moreover, 90,1% of the evaluated participants had losses of at least one dental element and 27,8% had a functional loss with less than 21 teeth in the oral cavity, while 86,3% said they had never attended an oral health service. Of the participants who have already attended, 83,6% were over six months ago, motivated by pain (43,8%) and caries (14,7%). **Conclusions:** The rural citrus workers evaluated had negative experiences with dental caries and a high rate of functional tooth loss, leading them vulnerable to stomatognathic system imbalances and showing the need for prevention and promotion of oral health.

Keywords: Dental Caries. Tooth Loss. Oral Health. Rural Health.

Resumo

Objetivo: Avaliar a experiência de cárie e perda dentária de trabalhadores rurais da citricultura no Nordeste brasileiro. **Métodos:** Trata-se de um estudo transversal, quantitativo e descritivo, realizado com amostra não probabilística de citricultores rurais vinculados ao Centro de Referência em Saúde do Trabalhador. Foram aplicados questionários (generalista e odontológico), e exames clínicos foram realizados por dois examinadores calibrados em 619 participantes em Unidades Básicas de Saúde, para estabelecer o índice CPO-D da amostra e detalhar suas características de interesse. **Resultados:** A amostra foi predominantemente masculina (71%), com adultos jovens entre 20 e 40 anos (50,9%), com baixa escolaridade (76%) e baixa renda (59,3%). O índice CPO-D médio da amostra foi de 14,29, e o componente relativo à perda dentária (P) de 9,97, correspondendo a aproximadamente 70% desse valor. Além disso, 90,1% dos participantes avaliados tiveram perdas de, pelo menos, um elemento dentário, e 27,8% tiveram perda funcional com menos de 21 dentes na cavidade oral, enquanto 86,3% afirmaram nunca ter frequentado um serviço de saúde bucal. Dos participantes que já frequentaram, 83,6% foram há mais de seis meses, motivados por dores (43,8%) e cárie (14,7%). **Conclusões:** Os citricultores rurais avaliados apresentaram experiências negativas com cárie dentária e alto índice de perda funcional dos dentes, tornando-os vulneráveis aos desequilíbrios do sistema estomatognático e evidenciando a necessidade de prevenção e promoção da saúde bucal.

Palavras-chave: Cárie Dentária. Perda de Dente. Saúde Bucal. Saúde da População Rural.

INTRODUCTION

A The prevalence and severity of oral diseases, such as dental caries, are related to the social, economic, and environmental contexts in which individuals are inserted. Dental caries are considered a chronic and progressive disease of high prevalence worldwide, causing demineralization and destruction of dental tissues, being the main reason for tooth loss and edentulism in adults. Several risk factors are related to individuals' caries experience, including eating habits, quality of oral hygiene, education, and access to oral health services^{1,2}.

When left untreated or uncontrolled, caries disease progresses and can cause, among other conditions, difficulties in chewing and eating properly. In addition, discomfort, pain, and tooth loss are consequences of caries lesions that affect individuals,

reducing their quality of life and negatively impacting their overall health^{2,3,4}.

Although there has been a tendency to decrease the prevalence of decayed, missing, and filled teeth (DMFT index) in several populations, the severity of caries disease remains strongly associated with low-income status and difficulties in accessing oral health services, affecting socioeconomically vulnerable populations. In addition, people who live in underdeveloped areas may have worse experiences with caries disease and tooth loss^{5,6}.

In Brazil, approximately 30 million individuals live in rural areas⁷. In this environmental context, diseases that can be prevented in

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urban areas may assume greater prevalence. Rural populations unassisted by oral health services, associated with other risk factors, may experience caries disease and edentulism differently from urban area populations^{8,9}.

Despite the growing worldwide interest in this topic, there are few national studies investigating the health conditions of rural populations, including oral health. Among other barriers to health care, the territorial distance makes it difficult to access specialized services and may contribute to the disparities of this population^{8,9}. Thus, the objective of this study is to evaluate the experience of caries and tooth loss in rural citrus workers in Northeast Brazil.

METHODS

This was a cross-sectional, quantitative, and descriptive epidemiological survey developed in two counties located in northeastern Brazil. Through a non-probabilistic sample, 619 rural workers of citriculture linked to the Occupational Health Reference Center (CEREST) were invited and agreed to participate in the research.

As inclusion criteria, only rural workers of citriculture, over 18 years old, who freely agreed to participate and who attended all stages of the research were selected and included. Rural workers who were unable to participate in all stages or who decided to abandon this research on their own were excluded. All stages of this study were developed in accordance with the recommendations for research with human beings and submitted for consideration and approval by the Research Ethics Committee of the Federal University of Sergipe (CAAE: 12988313.6.0000.5546).

Prior to data collection, the participants were gathered and informed of the research objectives, including risks and benefits of participation. All those who agreed to participate signed an informed consent form received oral hygiene instructions, and referred to oral health services after clinical examinations, according to individual needs. Data collection was carried out between July 2014 and December 2015 in Basic Health Units (BHU) in which the rural citrus workers participating in the research were linked.

Initially, a generalist questionnaire was applied to obtain the identification of the participants and allow the characterization of the sample according to socioeconomic aspects. Then, a basic dental questionnaire was applied to obtain data regarding participants' access to oral health services. Both questionnaires were constructed by the researchers but were not systematically validated before data collection. Subsequently, the clinical dental examination was performed at the BHU by two calibrated examiners. The Kappa coefficients for the intra-examiner agreement were 0.98 for both raters, and the Kappa coefficient for the inter-examiner agreement was 0.95.

The clinical dental examination was performed to obtain the

DMFT index value, according to the proper criteria¹⁰. This stage was carried out in a reserved dental office, with natural light and the aid of wooden spatulas and inactive explorer probes. Additionally, when the absence of any dental element was observed, the examiners questioned the participants why this was missing.

According to the adopted criteria, the missing dental elements that were not adequately justified by the participants were excluded from the statistical analyzes. After collecting data from the entire sample, data were tabulated and analyzed using Microsoft Excel® (2007) and SPSS Statistics 21.0 (Windows version 21.0, 2012, Armonk, New York: IBM Corporation) software, respectively. Descriptive statistics were performed on the collected data, including averages and frequencies (absolute, relative, and cumulative).

RESULTS

The sample of rural workers of citriculture evaluated was predominantly composed of young adults between 20 and 40 years old (50,9%), male (71%), with a low level of education (76%) and belonging to economic levels D and E (59,3%). Of the 619 participants, 86,3% said they had never attended an oral health service. Among participants who stated that they had access to a dentist, the time interval between the last consultation and the data collection of this research was greater than six months for 83,6%. The first motivation of the research participants who sought an oral health service was pain (43,8%), followed by the presence of caries (14,7%).

The mean DMFT index value of the sample was 14.29. The tooth loss component (M) represents approximately 70% of this value, with an average of 9.97 in the entire sample. In addition, the decayed teeth (D) and filled teeth (F) components presented averages of 3.61 and 0.75, respectively. Tooth loss of the sample was recorded according to the number of absences by teeth count during the clinical examination. Categorization was performed according to the frequency of missing teeth, stratifying the percentage and recording the percentage representing each degree of tooth loss (Table 1).

Table 1. Panorama of tooth losses in different degrees.

Degrees of missing teeth	Absolute frequency (N)	Relative frequency (%)	Cumulative frequency (%)
0	61	9,9	9,9
1 to 4	166	26,8	36,7
5 to 8	125	20,2	56,9
9 to 12	95	15,3	72,2
13 to 16	72	11,6	83,8
17 to 20	47	7,6	91,4
21 to 24	53	8,6	100,0
Total	619	100,0	100,00

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It's observed that only 9,9% of the entire population evaluated did not suffer from the loss of dental elements over time and their experience with the caries disease, while 47% of the population had between 1 to 8 missing teeth. Moreover, 90,1% of the participants had at least one tooth loss and 27,8% had a functional loss with less than 21 teeth in the oral cavity.

DISCUSSION

Comparing our findings with the results of Santillo et al.⁸ (2014), from a study of 568 rural residents, the results of the mean DMFT index and tooth loss are similar. In the study of these authors, the mean DMFT index value was 15.9 and if we observe the dental losses, the authors identified that 91,4% of their sample had already lost at least one dental element. All these results being superior to ours indicating a negative experience with caries disease in both rural populations.

Moreover, Santillo et al.⁸ (2014) identified that 58,4% of the participants reported pain as the motivation to visit a dental office and 55% reported that the last visit occurred more than a year ago. In addition, the authors observed an average tooth loss of 11.7 teeth per participant. Thus, these results corroborate our observations and reinforce the evidence about the experience of caries and tooth loss in rural populations.

In SB Brasil 2010, the last major Brazilian oral health survey, it was observed that 20% of adults between 35 and 44 years already had functional impairment due to severe tooth loss (less than 21 teeth in the oral cavity). In this survey, the average DMFT index for adults between 35 and 44 years old was 16.75 and the dental loss component corresponds to 44,7% of this percentage^{11,12}.

Comparing to our results, it can be seen that the tooth loss component was more significant in our rural worker population than SB Brasil participants. However, this is not an unexpected result, considering that the average of the filled component (F) was lower (0.75 versus 7.33) and the average of the decayed component (D) was higher (3.61 versus 1.48) in our sample than in SB Brasil participants, respectively. It is important to mention, however, that active and non-cavitated lesions may underestimate the real condition of the caries disease in this population^{11,12}.

Edentulism, mainly caused by the progression of untreated caries lesions, is a highly prevalent oral health problem in Brazil. Teeth losses reflect directly on the functions of the stomatognathic apparatus, compromising the quality of life of toothless people. When less than 21 dental elements are present in the oral cavity, significant function loss is expected. Nevertheless, tooth losses are poorly investigated in Brazil^{13,14}.

Scientific evidence supports that the prevalence and severity of dental losses reflect health disparities in contexts of socioeconomic inequality and vulnerability. When preventive measures offered by oral health services are flawed or non-

existent, individuals tend to experience urgent dental care, especially when there is pain, resulting in unfavorable oral health outcomes, such as the need for endodontic treatment or tooth extraction in advanced cases^{13,14}.

For individuals in rural areas, access to oral health services may be poor due to the need to travel to urban centers. In addition, the lack of epidemiological data on the health of this population may compromise decision-making by oral health managers and provide conditions that favor population illness. This context gets worse when there are no basic living conditions, such as sanitation and clean drinking water^{15,16}. Considering the results of the DMFT index and the fact that most participants have never accessed oral health services, we can infer that the assistance offered has been inefficient.

However, rural populations' access to oral health services that develop appropriate preventive and care approaches can modify the prevalence of caries and prevent tooth loss. In addition, the prevalence of untreated cavitated lesions may be an indicator that the coverage of dental services in rural areas is being inefficient^{15,16}.

Although caries disease is strongly associated with the phenomena of tooth loss in many populations worldwide, it can be understood as a cascade activator that leads to the extraction of a compromised tooth. Age, education, income, and a geographical component are behind the progression of this outcome, as well as lifestyle, habits, date of last dental visit, and availability of dental services can change it^{17,18}.

Similar to our findings, other studies in rural communities have reported pain as one of the main motivators for seeking dental services. The practice of seeking care only when there is dental pain should be avoided, prioritizing early interventions that can reduce the need for a dental extraction, keeping them in function. However, it should be noted that the perception of the need for dental treatment may be lower in people with low education, and the effect of health interventions can be underestimated in groups whose demand is not fully defined^{19,20}.

Efforts to reduce the impact of oral diseases, such as dental caries, can contribute to improving the quality of life of rural populations. However, it should be noted that approximately 80% of the world's population dealing with oral diseases are residents of developing countries and areas, reinforcing that socioeconomic status is strongly associated with caries experience in low-income people. In addition, persistent oral health disparities require more incisive policies to minimize the impacts of oral disease on disadvantaged communities, such as rural communities^{19,20}.

Despite worldwide attempts to control tooth decay and other oral health problems with policies to improve coverage of dental services, oral health has not seen significant global improvements in recent years. Caries disease in permanent teeth affected 2,5 billion people worldwide in 2015 and its

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complications are common in rural areas, reinforcing the fragility of dental services in primary care in this context since caries lesions are conditions that can be prevented and treated in basic health services^{15,21,22}.

Brazil presents a slightly different reality from the world context. Although caries disease is still frequently observed in several studies, there has been a significant reduction in tooth loss in adults, although there is a growing concentration of this phenomenon in this age group. In part, this advance can be attributed to the improved access to oral health services provided by the impacts of the national oral health policy. In addition, water fluoridation and access to fluoridated toothpastes contributed significantly to this process^{22,23}.

However, the biological aspects associated with the occurrence of caries lesions, such as access to fluoride compounds and oral hygiene habits, were not verified in our approach. For this reason, they were not discussed and this is another limitation of our results. In addition to what has already been presented, excluding the objective data from the clinical examination, the data regarding access to oral health services were subjected to a memory bias, and it is important to report it.

Although the World Health Organization aims to increase the

number of adults and older people worldwide with more than 21 teeth in the oral cavity in 2020, international studies in rural and urban populations still indicate that social, economic and environmental factors remain strongly associated with high prevalence of tooth loss around the world^{17,23,24,25}. However, in our perspective, it is interesting that these approaches take into account other factors that have not been investigated here, especially access to fluoridated products, allowing the experience with caries disease to be understood beyond the socioeconomic and environmental aspects explored here.

CONCLUSION

The rural citrus workers evaluated had negative experiences with dental caries and a high rate of functional tooth loss, leading them vulnerable to stomatognathic system imbalances. The oral health indicators raised may portray the weaknesses in access to oral health services in rural areas. The high prevalence of dental losses and dental caries, associated with the low prevalence of restored teeth, may indicate that preventive and curative measures have not been achieved by the oral health services that assist rural workers, leading to the progression of caries disease and their sequelae.

REFERÊNCIAS

1. Kahar P. Patterns of oral hygiene behaviors, daily habits, and caries prevalence in India and dominican republic: a comparative study. *Indian J Dent Res* 2019 Feb; 30(1): 87-93. doi: https://doi.org/10.4103/ijdr.IJDR_297_17.
2. Abbass MMS, Abubakr N, Radwan IA, Rady D, El Moshy S, Ramadan M, et al. The potential impact of age, gender, body mass index, socioeconomic status and dietary habits on the prevalence of dental caries among Egyptian adults: a cross-sectional study. *F1000Res*. 2019 Mar; 8:243. doi: <https://doi.org/10.12688/f1000research.17892.1>.
3. Verlinden DA, Reijneveld SA, Lanting CI, van Wouwe JP, Schuller AA. Socio-economic inequality in oral health in childhood to young adulthood, despite full dental coverage. *Eur J Oral Sci*. 2019 Jun; 127(3): 248-253. doi: <https://doi.org/10.1111/eos.12609>.
4. Nora ÂD, Rodrigues CS, Rocha RO, Soares FZM, Braga MM, Lenzi TL. Is Caries Associated with Negative Impact on Oral Health-Related Quality of Life of Pre-school Children? A Systematic Review and Meta-Analysis. *Pediatr Dent*. 2018 Nov; 40(7): 403-411.
5. Zhang S, Li Y, Liu J, Wang W, Ito L, Li SKY, Li Y. Dental caries status of Lisu preschool children in Yunnan Province, China: a cross-sectional study. *BMC Oral Health* 2019 Jan; 19(1): 17. doi: <https://dx.doi.org/10.1186/s12903-018-0708-y>.
6. Wang L, Cheng L, Yuan B, Hong X, Hu T. Association between socio-economic status and dental caries in elderly people in Sichuan Province, China: a cross-sectional study. *BMJ Open*. 2017 Sep; 7(9): e016557. doi: <https://doi.org/10.1136/bmjopen-2017-016557>.
7. Instituto Brasileiro de Geografia e Estatística. Censo Demográfico 2010. Rio de Janeiro: IBGE. doi: <https://censo2010.ibge.gov.br/resultados.html>.
8. Santillo PM, Gusmão ES, Moura C, Soares RSC, Cimões R. Factors associated with tooth loss among adults in rural areas in the state of Pernambuco, Brazil. *Cien Saude Colet* 2014 Feb; 19(2):581-90. doi: <http://dx.doi.org/10.1590/1413-81232014192.20752012>.
9. Moreira JP, Oliveira BL, Muzi CD, Cunha CL, Brito Ados S, Luiz RR. Rural workers' health in Brazil. *Cad Saude Publica* 2015 Aug; 31(8): 1698-708. doi: <https://doi.org/10.1590/0102-311X00105114>.
10. Pinto VG. Saúde bucal coletiva. 4th ed. São Paulo: Santos; 2000.
11. Ministério da Saúde (BR). SB Brasil 2010: Pesquisa Nacional de Saúde Bucal: Resultados Principais. Brasília: MEC; 2012. doi: http://bvsms.saude.gov.br/bvs/publicacoes/pesquisa_nacional_saude_bucal.pdf.
12. Chaves SCL, Almeida AMFL, Rossi TRA, Santana SF, Barros SG, Santos CML. Oral health policy in Brazil between 2003 and 2014: scenarios, proposals, actions, and outcomes. *Cien Saude Colet*. 2017 Jun; 22(6): 1791-1803. doi: <https://doi.org/10.1590/1413-81232017226.18782015>.
13. Barbato PR, Muller Nagano HC, Zanchet FN, Boing AF, Peres MA. Tooth loss and associated socioeconomic, demographic, and dental-care factors in Brazilian adults: an analysis of the Brazilian Oral Health Survey, 2002-2003. *Cad Saude Publica* 2007 Aug; 23(8): 1803-14. doi: <https://doi.org/10.1590/s0102-311x2007000800007>.
14. Peres MA, Barbato PR, Reis SCGB, Freitas CHSM, Antunes JLF. Perdas dentarias en Brasil: análisis de la Investigación Nacional de Salud Bucal 2010. *Rev. Saude Publica*. 2013 Dez; 47(Suppl 3): 78-89. Disponível em: <http://dx.doi.org/10.1590/S0034-8910.2013047004226>.
15. Saliba NA, Moimaz SA, Saliba O, Tiano AV. Dental loss in a rural population and the goals established for the World Health Organization. *Cien Saude Colet*. 2010 Jun; 15(Suppl 1): 1857-64. doi: <https://doi.org/10.1590/s1413-81232010000700099>.
16. Mello TRC, Antunes JLF, Waldman EA. Rural áreas: Do they present higher levels of dental disorders? *Arq Med* 2005 Jan; 19(1): 67-74. doi: http://www.scielo.mec.pt/scielo.php?script=sci_arttext&pid=S0871-34132005000100010&lng=pt.

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17. Tomar D, Menon I, Singh A, Tyagi U, Passi D, Goyal J. Comparative study of risk indicators associated with tooth loss among adult population in urban and rural areas of Muradnagar, Ghaziabad, Uttar Pradesh, India. *J Family Med Prim Care*. 2019 Feb; 8(2): 528-534. doi: https://doi.org/10.4103/jfmpc.jfmpc_409_18.
18. Batista MJ, Rihs LB, Sousa MLR. Risk indicators for tooth loss in adult workers. *Braz Oral Res* 2012 Sep-Oct; 26(5): 390-6. doi: <http://dx.doi.org/10.1590/S1806-83242012000500003>.
19. Salunke S, Shah V, Ostbye T, Gandhi A, Phalgune D, Ogundare MO, et al. Prevalence of dental caries, oral health awareness and treatment-seeking behavior of elderly population in rural Maharashtra. *Indian J Dent Res*. 2019 May-Jun; 30(3): 332-336. doi: https://doi.org/10.4103/ijdr.IJDR_356_17.
20. Chaffee BW, Rodrigues PH, Kramer PF, Vítolo MR, Feldens CA. Oral health-related quality-of-life scores differ by socioeconomic status and caries experience. *Community Dent Oral Epidemiol*. 2017 Jun; 45(3): 216-224. doi: <https://doi.org/10.1111/cdoe.12279>.
21. Simangwa LD, Åstrøm AN, Johansson A, Minja IK, Johansson AK. Oral diseases and socio-demographic factors in adolescents living in Maasai population areas of Tanzania: a cross-sectional study. *BMC Oral Health*. 2018 Dec; 18(1): 200. doi: <https://doi.org/10.1186/s12903-018-0664-6>.
22. Rwenyonyi CM, Muwazi LM, Buwembo W. Assessment of factors associated with dental caries in rural communities in Rakai District, Uganda. *Clin Oral Investig*. 2011 Feb; 15(1): 75-80. doi: <https://doi.org/10.1007/s00784-009-0363-4>.
23. Gomes VV Filho, Gondinho BVC, Silva-Junior MF, Cavalcante DFB, Bulgareli JV, Sousa MDLR, et al. Tooth loss in adults: factors associated with the position and number of lost teeth. *Rev Saude Publica*. 2019 Dec; 53: 105. doi: <https://doi.org/10.11606/S1518-8787.2019053001318>.
24. Tiwari T, Scarbro S, Bryant LL, Puma J. Factors Associated with Tooth Loss in Older Adults in Rural Colorado. *J Community Health* 2016 Jun; 41(3): 476-81. doi: <https://doi.org/10.1007/s10900-015-0117-y>.
25. Dye BA, Weatherspoon DJ, Lopez Mitnik G. Tooth loss among older adults according to poverty status in the United States from 1999 through 2004 and 2009 through 2014. *J Am Dent Assoc*. 2019 Jan; 150(1): 9-23. doi: <https://doi.org/10.1016/j.adaj.2018.09.010>.

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