Prevalence and Severity of Dental Caries in Foster-Care Children and Adolescents

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Aim: *The aim of this study was to determine the prevalence and severity of dental caries among institutionalized children and adolescents in San José, Costa Rica.* ***Study design:*** *This cross-sectional descriptive study included 201 children and adolescents between the ages of 2 and 17 years. Participants were selected by following pre-established criteria from 33 shelters located in the province of San José, Costa Rica. The International Caries Detection Assessment System (ICDAS) method was used for caries assessment. ANOVA and Student's T-test were used for statistical analysis.* ***Results:*** *Caries prevalence was estimated at 96.35% among participants in the study. No significant difference was found for sex (p=0.653) or age group (p=0.349). Regarding caries severity, it was found that early enamel lesions were the most frequent pathology, representing 79.2% of decayed surfaces.* ***Conclusions:*** *This study found that different risk factors (social, psychological, economic, and personal) may be related to the high prevalence of dental caries in foster-care children and adolescents. Special strategies may need to be developed to prevent and treat dental caries in this vulnerable population.*

Key words*: foster care, institutionalized children, dental caries, ICDAS,.*

INTRODUCTION

Dental caries (DC) is a multifactorial bacterial disease associated with different risk factors such as diet, oral hygiene habits, socioeconomic status, as well as genetic, cultural, and environmental factors.[1-3] This heterogeneous etiology has a direct impact on oral and general health[4,5] and explains the difficulty of achieving its control. DC has high worldwide prevalence and is one of the most common chronic childhood diseases.[6-10] The consequences of DC include pain, local abscesses, systemic infection[11] and other serious health conditions that can lead to school absence, restricted activity,[12,13] emergency room visits, hospitalization,[14] a diminished ability to learn[15] or even delayed or insufficient physical development (especially in a child's height and weight).[16,17] In developing countries, the prevalence of DC has been reported in up to 70% of children[6] and in more than 84.4% of the 12-year-old population in Costa Rica.[18]

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More than 26 million children and adolescents in developing countries are orphans, with 6 million of them living in Latin America and the Caribbean.[19] Foster care is considered a temporary situation; however, it can become permanent for those whose parents are not qualified to take sufficient care of them or are absent. In most cases, adolescents and children in foster care have suffered some kind of abuse and/or neglect and are therefore considered a special healthcare need population[20-22] that requires more intensive and complex approaches compared to their peers.[23,24] Studies have shown that the overall healthcare of infants who have spent more than 6 months in a foster care facility is significantly worse than those living with their biological parents.[25]

Abused or neglected children are prone to having more untreated DC[26] and worse oral hygiene compared to children who have not experienced abuse or neglect.[27-29] According to previous studies, an abusive background is strongly associated with poor oral health status and tooth decay, with an odds ratio of 8.0 of experiencing untreated permanently decayed teeth compared to children under proper care.[30] An understanding of these children's oral health status can help meet the needs of this vulnerable population. Thus, the aim of this study was to determine the DC prevalence and severity in foster-care children and adolescents in San José, Costa Rica.

MATERIALS AND METHOD

This cross-sectional descriptive study was approved by the Institutional Science and Ethics Committee (VI-2486-2014) and was conducted in full accordance with the Declaration of Helsinki, 2008. PANI (National Association for Children), the organization responsible for Costa Rican foster-care children, authorized and supervised

all dental examinations and provided the socio-demographic information. Caregivers and participants (if over the age of 12) read and signed the informed consent form prior to their involvement in the study. Voluntary abstention by the caregiver or the patient was considered an immediate reason for exclusion.

Participants were recruited from 13 state shelters and 20 non-governmental organization (NGO) shelters in the province of San José; both the state and NGO shelters receive economic aid from PANI. The final study population consisted of 617 subjects (445 from the NGO and 172 from state shelters). Participants were screened following the pre-established criteria. Inclusion criteria included the following: children and adolescents, aged between 2 and 17 years, with complete primary dentition or mixed and permanent dentition. Exclusion criteria were as follows: minors who were under another type of protection (voluntary partial shelters), under direct recommendation for exclusion by social workers due to personal issues (*i.e.,* recent drug abuse or sexual abuse rehabilitation processes), and specific dental reasons, such as the presence of fixed orthodontic treatment. The estimated parameters and the standard errors were used to calculate the 95% confidence intervals (CI).

Data were collected using a customized questionnaire that was completed by the child's caregiver or the social worker. Questions regarding demographic and social information (such as sex, age, geographic origin, presence/absence of disability, uninterrupted period spent under PANI's custody, and the main reason for foster care admission) were recorded.

Clinical examinations were performed by a single examiner calibrated in the International Caries Detection Assessment System (ICDAS). Before the calibration, the examiner underwent a three-stage training process, which was supervised by an international gold standard authority in ICDAS. First, the examiner received a lecture that focused on the theoretical basis followed by an analysis of clinical cases. Second, the examiner underwent a laboratory practice session using 100 previously diagnosed extracted teeth in order to validate the data presented in stage 1. The third stage consisted of clinical training using 17 patients previously diagnosed with DC. The actual calibration process was performed during the following 4 days using 43 patients. Each clinical examination lasted 20 minutes, leaving a 5-minute period between each patient. The data was analyzed, and the Kappa index was 0.77 and 0.86 for extra-examiner and intra-examiner, respectively.

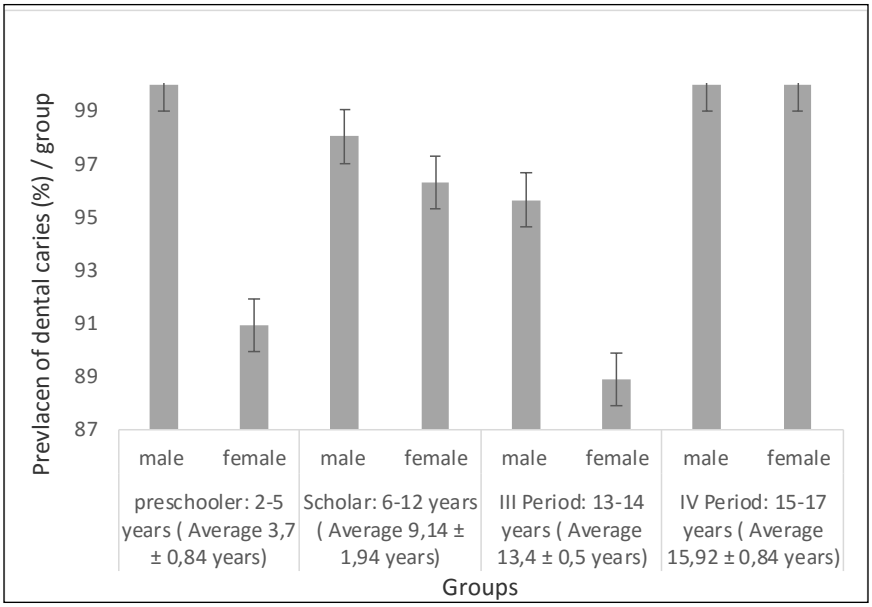
Two trained assistants assisted the principal investigator in data management. The clinical test was performed in a portable dental chair using a headlamp with a white LED light with an intensity between 15,000 and 30,000 lux (Nanjing Keweisi Medial Lighting Technology Co., Jiangsu, China). Before the intraoral examination, the patients were asked to brush their teeth under supervision by one of the assistants. After a second inspection, the clinical evaluation was conducted under relative isolation with cotton rolls in the maxillary vestibule and mandibular lingual side. Excess saliva was dried with monofilament sterile gauze. Instrumental aids included an intraoral mirror (Hu-Friedy Mfg. Co. Chicago, IL, USA), cotton tweezers (Hu-Friedy Mfg. Co. Chicago, IL, USA), and an 11.5 WHO probe (Hu-Friedy Mfg. Co. Chicago, IL, USA). For the registration of DC, an instrument designed for the ICDAS system was used. Following ICDAS Committee recommendations for epidemiologic studies, codes 1 and 2 (incipient lesions, dry and wet enamel) were merged and recorded as code 2. Because compressed air was not used, mesial and distal surfaces were not recorded. In addition, the activity of the lesion was not recorded.

Data are presented as frequency distribution, crossing-variables, and percentages. ANOVA and Student's t-tests were used for statistical analysis in SPSS 17.0 statistical software package (SPSS Inc., Chicago, IL, USA).

RESULTS

The sample included 201 randomly selected individuals. Fifty-six individuals (27.8%) resided in state shelters and 145 individuals (72.1%) resided in an NGO facility. There were 107 boys

Figure 1. Distribution of dental caries prevalence of dental caries according to age and sex of the patients



and 94 girls, aged between 2 and 17 years [mean age 9.5 years (95% CI 8.9 to 10.0)]. A total of 128 participants (63.6%) had been institutionalized for at least one year. Of all participants, 40.9% were living in a foster-care institution due to neglect, 29.9% due to abandonment, 15.9% due to sexual abuse, and 13.4% due to physical or psychological abuse (non-sexual). A total of 23.8% (n=48) of the individuals presented with some form of disability (mean age 12 years). The reason for foster-care admission of this group was statistically significant (p=0.0001), where abandonment was the main cause.

DC was present in 96.35% of the sample (Figure 1). DC prevalence according to sex (p=0.653), age group (p=0.34), and reason for foster-care admission (p=0.999) was not statistically significant. Figure 2 shows the severity of DC in the examined surfaces. Of the 1635 surfaces with DC, the majority corresponded to codes 1/2 (1296 surfaces), followed by codes 3/4 and 5/6 (228 and 111 surfaces, respectively). There was no significant difference in age in relation to healthy (p=0.378) or carious surfaces (p=0.377).

DISCUSSION

San José is the most populated province of Costa Rica, with more than 390,000 people under the age of 18. It is also the province with the highest number of child aggression complaints, with more than 41,000 reports received by PANI in 2012 (PANI, 2013). Furthermore, 80% of the country's child protection service facilities are located in the San José area. Although San José was the study location for this investigation, the study population included participants from different areas of Costa Rica and foreign countries.

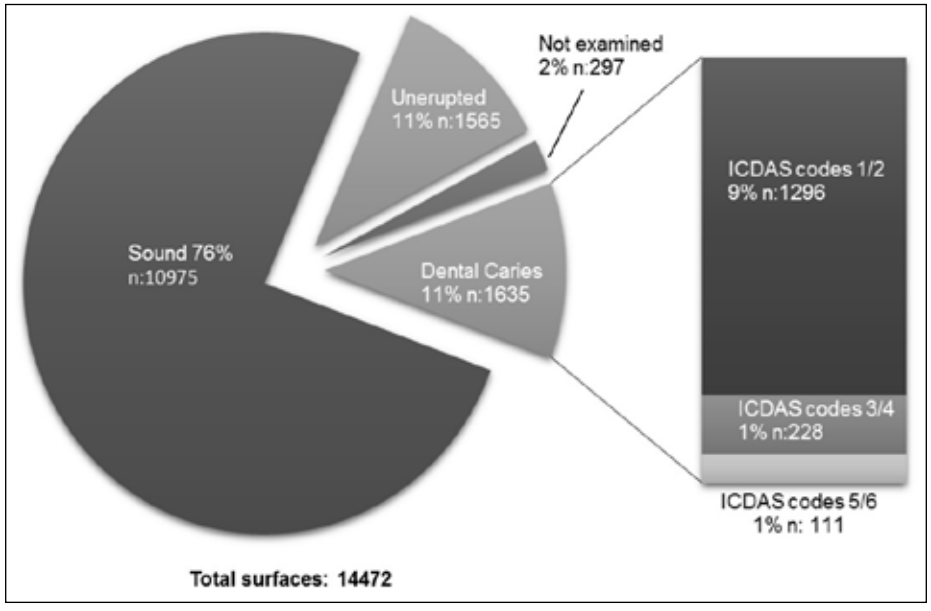
The high prevalence of DC (96.35%) is indicative of the increased vulnerability of this population. The 111 surfaces with non-treated cavitated dentinal lesions indicate a lack of oral health support for these patients. This scenario is partially explained by Alm *et al* 's study, which shows that the oral health status of children from early childhood to mid-teens reflects the conditions in which the child has lived.[31] World-renowned experts on childhood and adolescence classify this group as needing more specialized healthcare than the general pediatric population. Moreover, as noted by a United Nations International Children's Emergency Fund (UNICEF) report in 2013, the institutionalization process itself has been shown to cause significant damage to the children's physical condition.[19] DC prevalence in children and adolescents in foster-care programs has been reported in different countries. Studies have shown a DC prevalence of 90.7% in Mexico[29] and 49.6% (primary dentition) and 41.0% (permanent dentition) in India.[32]

Another study performed in India showed that male adolescents had better oral conditions than females;[28] however, in a different study, males showed a higher prevalence of DC than females.[32] Although the present study shows no prevalence differences for sex, Montero et al.[18] found that girls had a 22% higher risk of developing DC in Costa Rica compared to males, indicating that abandonment factors may affect both genders equally.

In relation to the severity of DC, this study found that non-cavitated lesions (code 2) were the most frequent (Figure 2) type of lesion. This aspect is especially important, since current treatment protocols for this type of decay suggests the use of minimally invasive procedures.[33] Dental care of the foster care population in Costa Rica is mostly provided by the Social Security System (Caja Costarricense del Seguro Social, CCSS), which lacks the protocols and materials necessary to diagnose and treat these kinds of lesions.

No significant difference was found between reasons for foster-care admission and caries prevalence. There are many individual factors that may contribute to children being institutionalized in foster-care shelters, but these reasons are complex and multifactorial. In our study, 24% of the studied population showed some form of disability. This may be explained by the UNICEF[19] data, which indicates that children and adolescents who have a disabling condition are more likely to remain in institutions throughout their lifetime.

Figure 2. Tooth surface distribution by caries severity according to ICDAS scores.



CONCLUSIONS

The prevalence of DC in Costa Rican foster-care children was 96.35%. No significant differences for gender or age group were found. The lower molars showed a higher prevalence of caries (both permanent and deciduous teeth). Within affected tooth surfaces, the most common caries were early enamel lesions (code 2), followed by codes 3/4 and 5/6. Special strategies must be developed to prevent, diagnose, and treat DC in this vulnerable population.

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