

Predisposing factors for dental caries in girls at an orphanage of Mexico City

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RESUMEN

Antecedentes: La caries dental es una enfermedad microbiológica que compromete la integración y mineralización del diente. El objetivo del trabajo fue determinar la prevalencia de caries dental en niñas de un orfanato y detectar los factores predisponentes.

Métodos: Se estudiaron 86 niñas (6 a 11 años de edad). Se valoró la higiene bucal y se identificaron los índices ceod y CPOD, de dientes con caries, perdidos y obturados.

Resultados: El 90.7% presentó caries en ambas denticiones. El índice ceod fue de 5.65 ± 3.35 y el CPOD fue de 0.51 ± 0.82 . El 62.8% se cepilla sus dientes una vez al día; 44.19% consume más de 10 dulces por día; el 1.16% no los consume. La higiene oral mala, el cepillado dental sólo una vez al día y el consumo de más de 6 alimentos dulces por día son factores predisponentes de caries.

Conclusiones: Se debe implementar un programa preventivo abordando en estos tres factores, para tener conciencia de que la caries es un problema de salud pública. Es importante en nuestro país el desarrollo de programas de limpieza dental y atención oportuna de las caries.

Palabras clave: Caries dental, higiene oral, consumo de dulces, cepillado dental.

ABSTRACT

Introduction: Caries is a microbial disease in which teeth mineralization and integrity are compromised. The purpose of the study was to determine the prevalence and associated predisposing factors for dental caries in a population living in a government-operated girl orphanage.

Methods: Dental examination was performed in eighty-six girls 6 to 11 years of age and a questionnaire was applied to assess oral hygienic habits of the girls. The sum of decayed, missing and filled teeth in the primary (deft) and permanent (DMFT) teeth was also assessed.

Results: A total of 90.7 % of the girls had caries in both dentitions. The deft was 5.65 ± 3.35 and the DMFT was 0.51 ± 0.82 . Most of the girls (62.8 %) showed poor oral hygiene, with a toothbrushing frequency of once per day. To the question: "How many times do you eat something sweet between meals?" 44.19 % answered more than 10 times per day. The present study found that defective oral hygiene, toothbrushing once per day and consumption of more than 6 sweets per day are predisposing factors for the presence of dental caries.

Conclusions: A preventive program especially focused on these 3 factors should be implemented, creating awareness that caries is an important public health problem in our country. Programs for dental cleaning and prompt attention of caries should be included.

Key words: Dental caries, oral hygiene, sweet consumption, tooth brushing.

Caries is a microbial disease in which teeth mineralization and integrity are compromised. It is the most frequent dental disease, affecting a large number of people, and

therefore a worldwide public health problem, affecting 90 % of Latin American people ¹and also numerous urban and rural communities throughout the rest of the world.²⁻⁴

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The main aetiological agents that could lead to caries are: frequent sucrose consumption,⁵⁻⁷ excessive growth of microorganisms normally present in the oral cavity, such as *Streptococcus mutans*,⁸ defective oral hygiene, low tooth brushing frequency,⁹⁻¹¹ poor fluoride use;¹² social, family and emotional factors.¹³⁻¹⁴

In Mexico, during the 80s, prevalence of dental caries was 95.9% among children ages 6 to 14 years;¹⁵ in 90s the prevalence was 90.5 % in children 5 to 12 years of age.¹⁶ The prevalence of caries is high in urban areas (91.6%) compared to rural communities (54.4%)¹⁷; prevalence of dental caries in schoolchildren is high.¹⁸⁻¹⁹

Developed countries have registered an important decrease in their dental caries frequency of up to 75 % due to the use of fluoride, among other factors.²⁰⁻²²

Based on the results of caries prevention by fluoride in other countries in Mexico it was decided to add fluoride to the salt for daily consumption at a concentration of 250 mg F/kg of salt (Ministry of Health, 1988). The state of Mexico was the first to implement the salt fluoridation program in 1988.

In the same state, a comparative study was done in 12 year-old children in 1988, who were examined again in 1997. The salt fluoridation program had reduced caries prevalence in these children. However, their oral health was still not optimal.¹² Fluoride was then added to drinking water (0.21 ppm, General Office of Water Services, 1994) in Mexico City to prevent dental caries. However, in spite of these efforts and others such as the use of fluoride in toothpaste and mouth washing, excessive consumption of sweets shows that dental health in Mexico is still defective²³ and the goal proposed by the World Health Organization (WHO) and the International Dental Federation (IDF) of having 50% of children without caries by the year 2000 has not yet been reached.²⁴

There are 4 government-operated orphanages in Mexico City, 2 for children from 0 to 6 years of age and other two, one for boys and one for girls, for children from 6 to 18 years of age. These orphanages care for abandoned or orphan children, physically or psychologically battered, all from very low income families subject to the social assistance programs (National System for the Integral Development of the Family - [DIF, Spanish acronym]). Social assistance provided by these orphanages is based on the guidelines by the Mexican Official Standard (NOM

167-SS-A1-1997, Official Gazette of the Federation, Nov 17, 1999).

In Mexico, caries is still an important public health problem among young people, which may lead to severe consequences in adult oral health. For this reason we decided to undertake this investigation, to determine caries prevalence in a population of a government-operated female orphanage in Mexico City. In these orphanages, children have problems of physical and psychological development, affective disorders, social abandonment and low economic resources for their maintenance. We considered important to detect the predisposing factors for caries development in this population. Similar studies concerning oral health conditions of institutionalized populations have not been done to date, and related literature worldwide is actually scarce.²⁵⁻²⁶

METHODS

Subjects

The study was conducted in the government-operated girl orphanage "Graciela Subirán Villa Real" in Mexico City. At the time of the study, this orphanage had a population of 130 girls, abandoned by their parents approximately at the age of 6 months.

The Institution was informed of the objectives and design of the study in the preparatory phase.

The girls of the orphanage were also informed of the study and only 86 girls of 6 to 11 years of age agreed to participate. This study was approved by the Ethics Committee of the Mexican National Institute of Pediatrics. The girls were asked to sign the informed consent to participate in the study and, the person in charge of the institution was also asked to sign the consent.

Oral Examination

Dental examination was performed by 3 previously standardized examiners following the recommendation of the WHO.²⁷

The girls were examined in a dentist's office in the orphanage in a dentist's chair with artificial light using a No. 5 flat mirror, explorer, dressing forceps and cotton rolls to clean the teeth surface. No radiographic studies were performed.

Oral hygiene was assessed by the presence of bacterial plaque using Oral B® disclosing tablets (Gillette Manufactura® S.A. de CV) and the criteria established by

Löe and Silness¹⁶ were applied for their classification as follows: 1) Good hygiene / Absence of plaque; 2) Regular hygiene / Moderately visible amount of plaque in less than one third of the teeth surface; 3) Deficient hygiene / A great amount of plaque covering more than one third of the teeth surface.

The sum of decayed, missing and filled teeth in the primary (dft) and permanent (DMFT) teeth was assessed in both dentitions.

Data Collection

A standardized questionnaire was used for data collection, which included name, weight, height, date of admission to the institution, school level, tooth brushing frequency, use of fluoride toothpaste, visits to the dentist for a period of 6 months, and the question "How many times do you eat something sweet between meals?" was asked.

Tooth brushing frequency was classified into two categories: once daily or \geq twice daily.

To determine the consumption of sweet food 4 categories were considered: never; sometimes but not every day; 1-5 times per day; 6-10 times per day. Both classifications were based on the study by Kalsbeek *et al.*⁵.

Statistical Analysis

A kappa test was applied to determine the general concordance among examiners and a kappa value of 0.80 or higher was considered as good concordance.

The odds ratio (OR) was used as association measure between studied factors and dental caries frequency with a 95 % of confidence interval (CI) and p value was adjusted to a Pearson's chi-square test. Additionally, the relationship between these factors and caries frequency was confirmed and analyzed with a logistic regression analysis (LR) considering $p < 0.05$ as statistically significant in both cases. The software Paquest V2, was used for the statistical analysis.

RESULTS

The mean age of the studied girls was 9.27 ± 1.62 years; mean weight 31.16 ± 8.33 kg; and mean height 129.44 ± 11.98 cm.

Table 1 shows the results of the kappa analysis with the results of the 3 examiners, reliable with a kappa value from 0.80 to 0.83.

Table 1. Kappa test for inter-examiners reproducibility.

Examiners	Kappa
1 vs. 2	0.83
1 vs. 3	0.80
2 vs. 3	0.83

About 90.7 % of the studied population presented caries either in the deciduous or the permanent dentition. The dft index was 5.65 ± 3.35 and DMFT index was 0.51 ± 0.82 .

Girls at the orphanage do not receive appropriate dental services; therefore, they visit the dentist only when they have pain or some serious dental problem.

Most girls (62.8 %) have poor oral hygiene, i.e., abundant dental plaque; only 9.3% of the girls presented no dental plaque revealing good oral hygiene.

All the girls used fluorinated toothpaste. The analysis of toothbrushing frequency showed that most of the girls brushed their teeth once a day (62.8 %); 37.2 % of the girls brushed their teeth twice or more times a day. When they are asked: "How many times do you eat sweets between meals?" 44.19 % of them ate more than 10 sweets per day; 29.07 % from 1 to 5 times per day and 1.16 % consumed no sweets between meals.

The odds ratio test was applied to predict which of the studied phenomena (oral hygiene, tooth brushing frequency and sweet consumption) is responsible for the presence of caries. We found that the 3 factors presented $p < 0.05$, which means that any of the factors, alone or jointly, can cause caries in the girls under study. This was confirmed by applying the logistic regression analysis, which also showed a $p < 0.05$ for the 3 factors (Table 2).

The statistically significant association of each factor was: oral hygiene ($p = 0.00096$), toothbrushing frequency ($p = 0.00067$) and consumption of sweets ($p = 0.00056$).

Figure 1 shows the distribution of the studied factors in relation to the presence or absence of caries. It is clear that poor oral hygiene, toothbrushing only once per day and consumption of more than 6 sweets per day predispose dental caries.

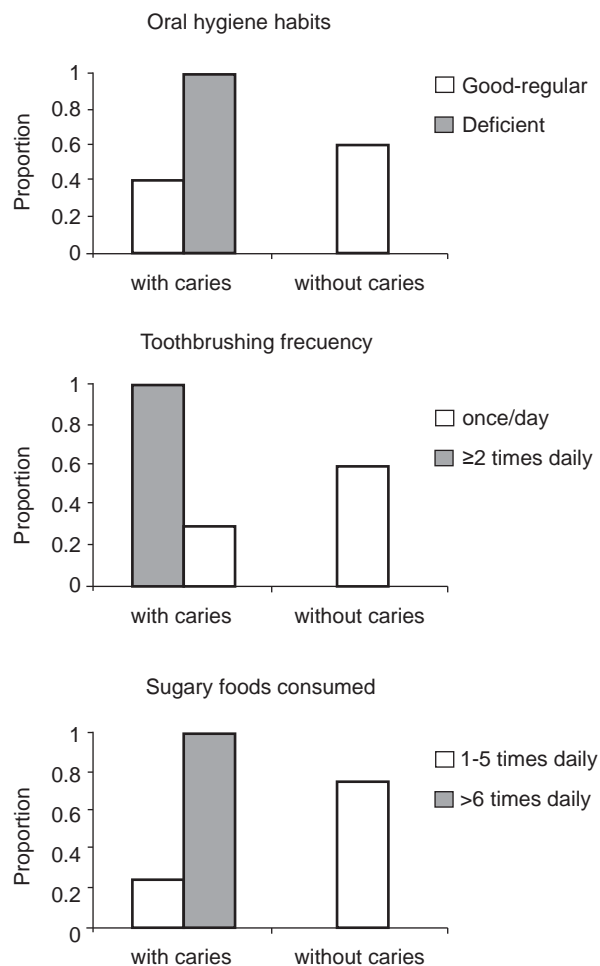
DISCUSSION

It is a well known fact that colonization of *Streptococci mutants* occurs early in children²⁸ and dental plaque is present on the tooth surfaces.²⁹

Table 2. Results of logistic regression analysis with categories of oral hygiene habits, toothbrushing frequency and sweet foods consumed in the studied girls.

Predisposing Factor	Classification	Caries		LR	p	Significance*
		with	without			
Oral hygiene habits	Good-Regular	10	18	0-0.087	0.00096	s
	Deficient	58	0			
Toothbrushing frequency	≥ 2 times daily	6	14	0-0.063	0.00067	s
	once/day	66	0			
Sweet foods consumed	1-5	8	24	0-0.057	0.00056	s
	>6	54	0			

*s=statistically significant

**Figure 1.** Caries prevalence in relation to studied factors.

Results in the present study reveal that this disease has high prevalence deft and DMFT indexes, in spite of the efforts made in our country to decrease the caries index in the child population: only 9.3% of the girls under study had no caries. Incidence of Camacho-Vieyra A caries in deciduous teeth was 90% and 97.7% in permanent teeth. These results are similar to other studies in Mexico City by Moreno *et al.*¹⁵ and Irigoyen *et al.*^{16,17} which showed the high prevalence of caries in Mexican children ages 5 to 12 years, and far from the goal set in 2000 by the WHO and IDF, with the purpose of decreasing caries prevalence by 50%.²⁴

Likewise, it has also been shown that low-income has a strong association with caries development, since frequency and quality of consumed meals, as well as parents' school level and occupation is an important cause for development of the disease.¹¹⁻¹³

Limitations of this study

The socio-economic status of government-operated orphanages in our country is low, with limited money granted for their maintenance. This results in a very low budget for food, medical and odontological attention. These orphanages are sponsored to a large extent by donations and these, are generally candy, chocolates, cakes, sweet beverages, etc. Another negative factor is that their diet contains a high amount of carbohydrates.

These girls have no parents to care for their health. The few employees who take care of them change shifts, morning, evening and night, resulting in a significant rotation of staff which hinders the girls from establishing

affective links or trust relationships with them and vice versa. Consequently, there is no one who supervises tooth brushing frequency and technique, nor the use of fluoride toothpaste, which results in the formation of dental plaque and lead to caries.

Our results agree with those obtained by Pienihakkinen *et al.*³⁰ who developed a model to predict predisposing factors for the development of caries: the presence of *Streptococcus mutans*, toothpaste type and sweet consumption are significant factors for the development of caries. We concluded that the presence of dental plaque, a deficient brushing technique and low tooth brushing frequency, as well as high consumption of sweet food are factors which induce the formation of dental caries in this population.

Our results also agree with those of a study in children from an orphanage in Brazil, in which the researchers implemented an oral hygiene program with individual motivation as a main factor.³¹

Main findings of this study

Based on our results we propose that a preventive program can be planned and implemented on these 3 factors: 1) a consciousness-raising campaign with persons responsible for children living in orphanages focusing caries as an important public health issue; 2) another campaign with the dieticians to restrict or limit the consumption of sweet snacks, sweet beverages and encouraging them to improve properly balanced diets; 3) to improve oral hygiene habits, surveillance of tooth brushing frequency and technique using fluoride toothpaste to promote a regular control of the plaque in order to avoid caries formation. A preventive program must include regular odontological attention. This can be accomplished by pressuring the authorities to provide more financial aid in order for orphanages to acquire the required equipment and material to attend caries and subsequently to implement dental cleaning and caries prevention programs.

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REFERENCES

1. Cuéllar GMA, Hernández GI, Mondragón MM, Martínez HE, Rodríguez LA. Prevalencia de caries y factores asociados en niños de estancias infantiles. *Gac Med Mex* 2000;136(4):391-7.
2. De Abreu MH, Pordeus IA, Modena CM. Dental caries in schoolchildren from rural communities in Itauna (MG), Brazil. *Rev Panam Salud Pública* 2004;16(5):334-44.
3. Jamieson LM, Thomson WM, McGee R. Caries prevalence and severity in urban Fijian school children. *Int J Paediatr Dent* 2004;14(1):34-40.
4. Jose A, Joseph MR. Prevalence of dental health problems among school-going children in rural Kerala. *J Indian Soc Pedod Prev Dent* 2003;21(4):147-51.
5. Kalsbeek H, Verrips G.H. Consumption of sweet snacks and caries experience of primary school children. *Caries Res* 1994;28:477-83.
6. Arcella D, Ottolenghi L, Polimeni A, Leclercq C. The relationship between frequency of carbohydrates intake and dental caries: a cross-sectional study in Italian teenagers. *Public Health Nutr* 2002;5(4):553-60.
7. Routtinen S, Karjalainen S, Pienihakkinen K, Lagström H, Nii-nikoski H, Salminen M, et al. Sucrose intake since infancy and dental health in 10-year-old children. *Caries Res* 2004;38:142-48.
8. Poulsen S, Holm A, Rölla G. Caries Dental: Etiología Características Clínicas y Epidemiología. In: Koch G, Modeér T, Poulsen S, Rasmussen P, eds. *Odontopediatría. Enfoque Clínico*. Buenos Aires Argentina: Editorial Panamericana; 1994. p. 73-80.
9. Stecksén BC, Borssén E. Dental caries, sugar-eating habits and toothbrushing in groups of 4-year-old children 1967-1997 in the City of Umea, Sweden. *Caries Res* 1999;33:409-14.
10. Efe E, Sarvan S, Kukulu K. Self-reported knowledge and behaviors related to oral and dental health in Turkish children. *Issues Compr Pediatr Nurs* 2007;30(4):133-46.
11. Gibson S, Williams S. Dental caries in pre-school children: associations with social class, toothbrushing habit and consumption of sugars and sugar-containing foods. *Caries Res* 1999;33:101-12.
12. Irigoyen ME, Sánchez HG. Changes in dental caries prevalence in 12 year-old students in the State of Mexico after 9 years of salt fluoridation. *Caries Res* 2000;34:303-07.
13. G. Campus, A. Lumbau, S. Lai, G. Solinas, P. Castiglia. Socio-economic and behavioural factors related to caries in twelve-year-old Sardinian children. *Caries Res* 2001;35:427-34.
14. Mattila ML, Rautava P, Aromaa M, Ojanlatva A, Paunio P, Hyssala L et al Behavioural and demographic factors during early childhood and poor dental health at 10 years of age. *Caries Res* 2005;39(2):85-91.
15. Moreno AA, Carreón GJ, Alvear GG, López MS, Vega FL. Riesgo de caries en escolares de escuelas oficiales de la ciudad de México. *Rev Mex Pediatr* 2001;68(6):228-33.
16. Irigoyen CME. Caries dental en escolares del Distrito Federal. *Salud Pub Mex* 1997;39(2):133-6.
17. Casanova RA, Medina SC, Casanova RJ, Vallejos SA, Maupomé G, Avila BL. Dental caries and associated factors in Mexican schoolchildren aged 6-13 years. *Acta Odontol Scand* 2005;63(4):245-51.
18. Segovia VA, Estrella RR, Medina SCE, Maupomé G. Dental caries experience and factors among preschoolers in southeastern Mexico: a brief communication. *J Public Health Dent* 2006;66(2):88-91.

19. Irigoyen ME, Luengas IF, Yashine A, Mejía AM, Maupomé G. Dental caries experience in Mexican schoolchildren from rural and urban communities. *Int Dent J* 2000;50(1):41-5.
20. Marthaler TM. Increasing the public health effectiveness of fluoridated salt. *Schweiz Monatsschr Zahnmed* 2005;115(9):785-92.
21. Seppä L. Fluoride varnishes in caries prevention. *Med Princ Pract* 2004;13(6):307-11.
22. Lee M, Dennison PJ. Water fluoridation and dental caries in 5- and 12-year-old children from Canterbury and Wellington. *N Z Dent J* 2004;100(1):10-15.
23. Juárez LM, Hernández GJ, Jiménez FD, Ledesma MC. Prevalencia de fluorosis dental y caries en escolares de la Ciudad de México. *Gac Med Mex* 2003;139(3):221-5.
24. Herrera MS, Medina SC, Rosado VG, Minaya SM, Vallejos SA, Casanova RJ. Prevalencia, severidad de caries y necesidades de tratamiento en preescolares de una comunidad suburbana de Campeche-2001. *Bol Med Hosp Infant Mex* 2003;60:189-96.
25. Fil'kina OM, Vorob'eva EA, Konova SR, Abrosimova TS. Modern aspects of health of children brought up at children's homes. *Probl Sotsialnoi Gig Istor Med* 2004;Sep-Oct;(5):23-4.
26. Ellis BH, Fisher PA, Zaharie S. Predictors of disruptive behavior, developmental delays, anxiety, and affective symptomatology among institutionally-reared Romanian children. *J Am Acad Child Adolesc Psychiatry* 2004;43(10):1283-92.
27. WHO. Oral Health Surveys. Basic Methods. Fourth Ed. Geneva: 1997. p. 61-2
28. Teanpaisan R, Thitasomakul S, Piwat S, Thearmontree A, Pithpornchaiyakul W, Chankanka O. Longitudinal study of the presence of mutants streptococci and lactobacilli in relation to dental caries development in 3-24 month old Thai children. *Int Dent J* 2007;57(6):445-51.
29. Franco E, Franco TC, Amoroso P, Marin JM, Avila FA. Detection of *Streptococcus* mutants and *Streptococcus sobrinus* in dental plaque samples from Brazilian preschool children by polymerase chain reaction. *Braz Dent J* 2007;18(4):329-33.
30. Pienihäkkinen K, Jokela J, Alanen P. Assessment of caries risk in preschool children. *Caries Res* 2004;38(2):156-62.
31. Freitas FL, Novaes AB Jr, Rodríguez FA, Novaes AB. Effectiveness of an oral hygiene program in Brazilian orphans. *Braz Dent J* 2002;13(1):44-8.