

Dental caries experience and its relation to oral hygiene in Mexican children

Nelly Molina-Frechero^{1*}, Denisse Durán-Merino¹, Enrique Castañeda-Castaneira¹
and María Lilia Adriana Juárez-López²

¹Health Care Department, Universidad Autónoma Metropolitana (UAM) Xochimilco, México, D.F.; ²Faculty of Odontology, FES Zaragoza, Universidad Nacional Autónoma de México (UNAM), México, D.F., México

Introduction: Dental caries is public health problem in Mexico and there are few studies on preschool children. **Objective:** The aim of this study was to determine the caries experience in preschool children and its relation to oral hygiene in an underserved area of the state of Mexico. **Material and Methods:** A cross-sectional, descriptive, observational and analytical study in children aged four and five years of age enrolled in children's centers. The sociodemographic variables were obtained through a questionnaire. Clinical evaluation of each of the infants was performed using the CPOD index for primary teeth caries, the criteria of the World Health Organization, and the significant caries index was calculated and oral hygiene was assessed using the criteria of the O'Leary index. Calibration was $\kappa > 0.86$ for indexes. **Results:** The study population consisted of children of both genders: 69.5% had caries experience, and the index of decayed, missing, and filled teeth (DMFT) was 3.52 ± 3.7 ($d = 3.37 \pm 3.5$; $m = 0$; $f = 0.11 \pm 0.51$). The significant caries index was 8.95 ± 0.39 ($d = 8.68 \pm 0.41$; $f = 0.26 \pm 0.13$). In total, 98.2% of children with caries experience had poor oral hygiene (DMFT: 4.91; 95% CI: 3.99-5.84), whereas in children with good hygiene it was 0.17 (95% CI: -0.18-0.51); existing association between caries experience and oral hygiene RM 913 (95% CI: 864-962; $p < 0.01$). **Conclusions:** The caries experience of preschool children was high and was associated with poor oral hygiene affecting their dentition and usually is associated with caries in permanent dentition associated to social deprivation. Preventive programs are recommended from the first stage of life. (Gac Med Mex. 2015;151:455-9)

Corresponding author: Nelly Molina Frechero, nmolinaf@hotmail.com

KEY WORDS: Dental caries. Oral hygiene. Preschool children.

Introduction

Caries is a multifactorial infectious disease characterized by demineralization of organic portions of the tooth and subsequent deterioration of organic parts. This destructive process results from the actions of some microorganisms of the dental plaque on fermentable carbohydrates that generate the production of acids,

mainly lactic, as part of the bacterial metabolism. The progression of the caries lesion requires, in addition to the aforementioned factors, a susceptible tooth and exposition time enough to allow not only the production of acids by plaque bacteria, but also demineralization of the hard tissue of the tooth^{1,2}.

Dental plaque, or biofilm, is composed of bacterial clusters attached to the structure of the tooth; when salival pH is low due to frequent consumption of sugars,

Correspondence:

*Nelly Molina Frechero
Departamento de Atención a la Salud
Universidad Autónoma Metropolitana, Xochimilco
Calzada del Hueso, 1100
Col. Villa Quietud, Del. Coyoacán, C.P. 04960, México, D.F., México
E-mail: nmolinaf@hotmail.com

Date of modified version reception: 11-11-2014

Date of acceptance: 29-01-2015

local environmental conditions are modified and favor the predominance of cariogenic bacteria and a decrease of saliva^{3,4}. A cariogenic microorganisms' infectivity window of 19-31 months has been reported to exist, and there are studies that have even found it at earlier ages, which makes the child more likely to contract the disease sooner⁵.

Caries is a public health problem, with a high level of morbidity and an elevated prevalence in non-industrialized countries, in contrast with first world countries, where the prevalence of caries has considerably decreased, reducing the number of affected surfaces and increasing that of children free of caries⁴.

Since the decade of the 60's, a dramatic decrease in the prevalence of caries has been observed, both in fluorinated and non-fluorinated communities. This decrease was attributed to the spread of fluorides in different forms, especially in toothpastes and, to a lesser degree, to diet changes, including the use of sugar substitutes⁶⁻⁸. In addition to the effect of fluoride, which acts in different forms, even lowering dental plaque's aggressiveness, the reduction of dental caries may be the result of enhanced tooth brushing habits, especially to a brushing frequency increase⁹. This way, the prevalence of caries worldwide shows conflicting parameters: while in developed countries it has been considerably reduced thanks to adequate control and prevention programs at the massive level¹⁰, in countries such as Mexico, caries affects about 95% of children younger than 8 years of age and 99% of adults^{11,12}. The high incidence of caries in Mexican children is associated with multiple factors, among which the elevated consumption of sugar-rich and junk-food has been frequently mentioned, which is supported by disproportionate marketing and advertising, in addition to the lack of knowledge of society on the harms to dental health caused by the consumption of snacks between meals, which is often ignored by parents and teachers¹³.

Several years ago, fluorinated salt was implemented as a massive-wide prevention method, a program incorporated in the Mexican Republic¹⁴; there are other separately-applied preventive programs covering very reduced population percentages, especially in communities with large socioeconomic shortages that make them to be underserved in terms of preventive and curative dental care¹⁵.

Few studies have been conducted in early stages of life and, hence, the purpose of this work was to determine the experience, prevalence and severity of dental caries and oral hygiene in preschool children from an

underserved area of the Estado de México that used fluorinated salt as the only preventive measure.

Material and methods

The protocol was approved by the Divisional Board of the Biological and Health Sciences Division. Informed consent was obtained from the children's parents or legal guardians after authorization by the direction of the daycare centers.

A cross-sectional, descriptive, observational and analytical study was conducted in preschool children of 4 and 5 years of age from a deprived zone of San Agustín, municipality of Ecatepec, in the Estado de México. The study area had a low socioeconomic level according to data on environmental sanitation, type of housing, services, population level of education and family income (less than 6 minimum wages according to INEGI's criteria)¹⁶.

The study included children of 4 and 5 years of age, from both genders, with a letter accepting to participate. Children outside the required age range and not letting the oral exam to be carried out were excluded.

From a total of 105 children, 78.09% were selected, which corresponds to 82 children who met all the requirements to participate in the study. Sociodemographic variables were obtained using a questionnaire applied to the parents or legal guardians. Dental caries was assessed with the DMFT (decayed, missing, filled teeth) index, according to the 1997 WHO parameters¹⁷. Then, the significant caries (SIC) index was calculated in order to identify the seriousness of the most affected population¹⁸. To calculate and assess the SIC, the children were classified according to their DMFT; the third part of the population with the highest levels of caries presence was selected and the DFM index was calculated for this subgroup. Oral hygiene was assessed using the O'Leary index criteria¹⁹ by using plaque disclosing tablets and, according to the presence or absence of dental plaque, hygiene was established as being poor or bad. A calibrated odontologist with experience in epidemiologic indexes reviewed dental caries and oral hygiene ($\kappa > 0.86$). For clinical evaluation, an adapted physical space was used, with natural light and diagnostic instruments, such as a plain mirror and a WHO probe; dental surfaces were previously cleaned with sterile gauze.

The obtained data was recorded in an odontogram designed for this study and in a sheet where complementary data of the O'Leary index were collected.

The information was captured in an Excel database with clinical variables. Subsequently, data was analyzed

Table 1. DMFT index in preschool children aged 4 and 5 years

	DFT	DT	FT
Male	3.44 ± 3.6	3.4 ± 3.6	0.05 ± 0.31
Female	3.62 ± 3.8	3.3 ± 3.4	0.18 ± 0.31
Total	3.52 ± 3.7	3.37 ± 3.5	0.11 ± 0.51

D: decayed in temporary teeth; F: fillings in temporary teeth; T: tooth; ±: standard deviation.

Table 2. Severity of caries among the most affected preschool children according to the SIC index

Affected teeth	Severity of caries (SIC)		
	7-10	11-14	7-14
D	8.25 ± 0.36	11.0 ± 1.00	8.68 ± 0.41
F	0.19 ± 0.14	0.67 ± 0.33	0.26 ± 0.13
DFT	8.44 ± 0.31	11.67 ± 0.67	8.95 ± 0.39

D: decayed in temporary teeth; F: fillings in temporary teeth; T: tooth; ±: standard deviation.

with descriptive statistics using means, standard deviations and 95% confidence intervals (CI). For groups comparison, the chi-square test and analysis of variance (ANOVA) were used; Spearman correlation was used to estimate the correlation, which was considered to be significant when the p-value was lower than 0.05.

Results

All children in the present study used to consume fluorinated salt regularly in their diet as the only preventive measure, and concentration in water of the zone was lower than 0.5 ppm.

The sample was composed of 82 children with 4 or 5 years of age; 52.4% were male preschool children and, 47.6%, females; 30.5% were caries-free and 57 had caries presence. The DMFT index was 3.52; the most important factor was cavities (3.37), with more than 3 teeth involved; filled teeth were 0.11 and no child had missing teeth (Table 1).

Most affected children according to the SIC index were 9 of the male and 10 of the female gender, with

involvement ranging from 7 to 14, and only 4 children had fillings: one had two filled teeth and three had one.

Dental caries obtained with the SIC index was: DFT of 8.95 (95% CI: 8.12-9.77), distributed as D = 8.68 (95% CI: 7.83-9.54) and F = 0.26 (95% CI: -0.1-0.53). 60% had caries in 7-10 teeth and 40% in 11-14 teeth. Severity in this, the most affected group, was considerably high, with great shortages in terms of care (Table 2).

There was no significant relationship of SIC with gender; females had a DFT of 8.8 ± 1.55, and males, 9.11 ± 1.97 (p > 0.05).

29.3% had good oral hygiene, out of whom 41.7% were boys and 58.3% were girls (Table 3).

Of the preschool children who had good oral hygiene, 92% were caries-free, whereas among those with poor oral hygiene, only 8% were free of caries (Table 4).

Of the preschool children with poor oral hygiene, 98.2% had caries, whereas 1.8% of those with an adequate oral hygiene did, with a statistically significant correlation found between both groups (p < 0.05). In children with poor hygiene, the DMFT index was 4.91 (95% CI: 3.99-5.84) and in children with good hygiene, 0.17 (95% CI: -0.18-0.51) (p < 0.01).

Table 3. Distribution of the presence of caries and oral hygiene by gender in preschool children*

	Gender	
	Male	Female
Presence of caries	n (%)	n (%)
Without	12 (27.9)	13 (33.3%)
With	31 (72.1)	26 (66.7)
Oral hygiene	n (%)	n (%)
Good	10 (23.3%)	14 (35.9)
Poor	33 (76.7)	25 (64.1)
Severity of caries	DM ± SD	DM ± SD
SIC	8.8 ± 1.55	9.11 ± 1.97

*There is no significant relationship by gender (p > 0.05).

Table 4. Presence of caries in preschool children with good and poor oral hygiene*

	No caries experience	With caries experience
	n (%)	n (%)
Oral hygiene		
Good	23 (92.0)	1 (1.8)
Poor	2 (8.0)	56 (98.2)
Total	25 (100)	57 (100)

*The difference of proportions indicates differences between oral hygiene and presence of caries with the chi-square test (p < 0.01).

According to data collected in the questionnaire, 92% of the children without caries had good oral hygiene and mothers or legal guardians with higher level of education; the mothers of preschool children with poor oral hygiene had lower education ($p < 0.05$). Socioeconomic level of the studied area was low and, therefore, the children had no access to dental care services, and only a minimal proportion had dental care, 7.32%, which corresponded to children of mothers with higher education ($p < 0.001$).

Discussion

In the present work, 69.5% of preschool children were found to have caries. This figure is lower than the national mean (76.5%); i.e., in this study population, 7 percentage points less than in 2009 were obtained²⁰. The children had more than 3 involved teeth; the most common factor was dental caries, similar to reports by national epidemiologic surveillance, and filled teeth were minimal, thus revealing dental care shortages.

The values found in the present work are lower to those from the study by Juárez-López²¹, who reports a prevalence higher than 79% and caries involvement in more than six teeth.

These results are higher than those reported in other Latin American countries²², where values lower than one tooth have been found even considering those more affected of the population. Children of those studies belonged to a middle and high socioeconomic status, whereas those of the studied population belonged to an area with multiple shortages, little access to dental care and educational programs and scarce probabilities of care being provided by the families.

Relatives of children should know that temporary teeth are lost in order for permanent teeth to erupt at their moment, but until this occurs, the oral cavity must be good health conditions. Attitude and participation of adults that live with children are very important; they must motivate them with toothbrushes with characters for children and children's toothpaste. Adults should teach children adequate oral hygiene habits, health lessons that will allow for them to enjoy caries-free teeth at any age^{23,24}.

Poor oral hygiene produces dental bacterial plaque or biofilm, which constitutes one indicator of the presence of dental caries. In this work, we found that 92% of children with good oral health were free of caries, whereas only one child with good hygiene had caries and girls had better oral hygiene than boys (35.9 vs. 29.4%).

In the present study, boys were more affected than girls; this could be owing to the fact that at that age there is a gender identity development phase that implies for girls to be more poised when experiencing attitudes and behaviors established by culture and society²⁵, which can turn out being beneficial for oral hygiene and dental plaque-associated caries. At that age, tooth eruption in preschool children is similar in both genders, but attitudes with regard to hygiene are different, due to the above mentioned developmental phase: girls are more inclined to follow teeth cleaning hygienic indications.

The promotion of dental self-care is the most widely used preventive strategy to avoid this problem and foster primary dental health. One of the most important actions to preserve oral health is the mechanical removal of dental plaque by means of brushing; this is the main message that has to be instilled in children since the first stages of life, since brushing helps to eliminate dental plaque and facilitates contact of fluoride contained in toothpaste with the teeth²⁷.

In European countries, especially in Nordic nations, emphasis is placed on brushing as the only dental caries-prevention procedure; the use of toothpastes with fluor has been, through brushing, the best topical preventive measure²⁸.

Only a child with poor oral hygiene was free of dental caries, which might be due to the fact that caries has a multifactorial etiology. When oral hygiene was related to the severity of the occurrence of dental caries, we found all children to have poor oral hygiene and there were no significant differences between genders. The fact that the significance index in the group of studied children was higher than 8 involved teeth indicates a high level of severity with great care shortages, as the dental caries factor was predominant in the index; the presence of filled teeth was minimal, and these pieces, if left untreated, are likely to pass the "missing" group.

Early lesions have not been diagnosed in this study; thus, all caries must be treated with invasive procedures.

These results indicate substantial shortages in these population groups and the responsibility of health policies to attend to these priorities in this age group, which has not been able to be addressed since in spite of the existence of some programs these fail to cover the needs of the majorities.

It is essential for high-risk children-directed programs to be implemented, with policies ensuring follow-up of these groups. These children only have fluorinated salt as a preventive measure and we can appreciate that it is not sufficient, due to the oral health poor situation of these children; therefore, it is necessary for the

values of these indicators to be reduced from the very first stages of life.

These results are applicable to a part of the population from the Estado de México comprised by preschool children living in vulnerable zones; the Ecatepec municipality has the highest level of vulnerable children population in the state, with the following characteristics: conditions of poverty, poor education, lack of access to health services, a condition that hinders incorporation to development, as well as access to better wellbeing conditions and, therefore, the results are applicable to preschool children from these vulnerable zones lacking preventive programs.

Conclusions

Based on the obtained results we can conclude that the importance of the study lies in having identified the epidemiologic profile of this population, because most vulnerable zones from the Estado de México have these characteristics, with a high prevalence and severity of dental caries and predominance of the dental caries factor with few treated teeth. Oral hygiene found in this group of children was inadequate and there was a high percentage of children with poor hygiene. The studied zone had a very low socioeconomic level, and for this reason, the studied population constituted a very vulnerable group, and a relationship was found between hygiene and caries. Prevention is fundamental in the first stages of life and, therefore, implementation of oral health programs that include brushing technique, dentobacterial plaque control and removal, and accessibility to dental services that offer preventive programs and carry out curative activities when necessary is recommended.

References

- Palomer L. Dental caries in children: a contagious disease. *Rev Chil Pediatr.* 2006;77(1):56-60.
- Matos MA, Melgar RA. Riesgo de caries dental. *Rev Estomatol Herediana.* 2004;4(12):101-6.
- Baños F, Aranda R. Placa dentobacteriana. *Rev ADM.* 2002;60(1):34-6.
- Dumas SA, Weaver KE, Park SY, Polk DE, Weyant RJ, Bogen DL. Accuracy of visible plaque identification by pediatric clinicians during well-child care. *Clin Pediatr.* 2013;52(7):645-51.
- Pérez LAG. Susceptibilidad Caries dental: nuevos paradigmas. *Odontología Pediátrica.* 2006;5(2):7-12.
- Molina N, Irigoyen M, Castañeda E, Sánchez G, Bologna R. Caries dental en escolares de distinto nivel socioeconómico. *Rev Mex Pediatr.* 2002;69(2):53-6.
- Carvalho JC, D'Hoore W, Van Nieuwenhuysen JP. Caries decline in the primary dentition of Belgian children over 15 years. *Community Dent Oral Epidemiol.* 2004;32(4):277-82.
- Cury JA, Tenuta LM. Evidence-based recommendation on toothpaste use. *Braz Oral Res.* 2014;28 Spec:1-7.
- Bratthall D, Hansel G, Sundberg H. Reasons for the caries decline: what do the experts believe? *Eur J Oral Sci.* 1996;104(4 (Pt 2)):416-22; discussion 423-5, 430-2.
- Von der F, Haugejorden O. The start of caries decline and related fluoride use in Norway. *Eur J Oral Sci.* 1997;105(1):21-6.
- Resultados del Sistema de Vigilancia Epidemiológica de Patologías Bucales (SIVEPAB). 2009. [Internet] Consultado el 5 de mayo de 2014. Disponible en: <http://www.epidemiologia.salud.gob.mx>.
- Molina Frechero N, Castañeda Castaneira E, Gaona E, Mendoza Roaf P, González Montemayor T. Consumo de productos azucarados y caries dental en escolares. *Rev Mex Pediatr.* 2004;71(1):14-6.
- Pérez Salgado D, Rivera Márquez JA, Ortiz Hernández L. Publicidad de alimentos en la programación de la televisión mexicana: ¿los niños están más expuestos? *Salud Publica Mex* 2010;52:119-26.
- De la Cruz Cardozo D, Pinelo Bolaños P, Lira Marín ME, Mazariego Cuervo L, Vera Hermosillo H. Análisis de la prevalencia y riesgo de caries dental en dientes temporales sujetos al régimen de fluoruro sistémico y tópico. *Rev ADM.* 2007;64(5):192-6.
- Secretaría de Salud. Manual para el uso de fluoruros dentales en la República Mexicana en apoyo a la Norma Oficial Mexicana NOM-013-SSA2. 2006.
- INEGI, XII Censo General de Población y Vivienda 2005. [Internet] Consultado el 18 de octubre de 2010. Disponible en: <http://www.inegi.org.mx/sistema/inter2005/default.aspx?c=103968>.
- World Health Organization. Oral Health Surveys: Basic methods 3rd. Ginebra: WHO; 1997.
- Nishi M, Bratthall D, Stjernsward J. How to Calculate the Significant Caries Index (SiC Index). [Internet] Consultado el 8 de abril de 2014. Disponible en: <https://www.mah.se/.../MetodsIndices/SIC/.../signific>.
- O'Leary T, Drake R, Naylor. The plaque control record. *J Periodontol.* 1972;43:38-9.
- Resultados del Sistema de Vigilancia Epidemiológica de Patologías Bucales (SIVEPAB) 2009. Septiembre de 2010. [Internet] Disponible en: <http://www.spps.salud.gob.mx/>.
- Juárez-López ML, Villa-Ramos A. [Caries prevalence in preschool children with overweight and obesity]. *Rev Invest Clin.* 2010;62(2): 115-20.
- Ramírez Puerta, Ramírez B, Franco A, Ibarquén A. Experiencia de caries en dentición permanente en los escolares de instituciones educativas privadas de Medellín, Colombia. *Rev Nacional de Odontología.* 2010; 6:10:9-17.
- Álvarez M, Navas P, Rojas de M. Componente educativo-recreativo-asociativo en estrategias promotoras de salud bucal en preescolares. *Rev Cubana Estomatol.* 2006;43(2):1-7.
- Cuartas C, Alvar S, Maya M, Cárdenas M, Arias I, Jaramillo A. Relación entre percepción de los padres sobre el tratamiento odontológico y sus hábitos de higiene oral con la historia de caries dental en sus hijos entre 3 y 5 años de edad. *Rev CES Odontología.* 2002; 15(1):14-8.
- Brophy-Herb HE, Lee RE, Nievar Ma, Stollak G. Preschoolers' social competence: Relations to family characteristics, teacher behaviors and classroom climate. *Journal of Applied Developmental Psychology.* 2007;28:134-48.
- Mora L, Martínez O. Prevalencia de caries y factores asociados en niños de 2-5 años de los Centros de Salud Almanjáyar y Cartuja de Granada capital. *Rev Salud Pública.* 2000;26(6):98-404.
- Soria A, Molina N, Rodríguez R. Hábitos de higiene bucal y su influencia sobre la frecuencia de caries. *Acta Pediatr Mex.* 2008;29(1):21-4.
- Marthaler TM. Changes in dental caries 1953-2003. *Caries Res.* 2004; 38(3):173-81.