

Prevalence of premature loss of deciduous teeth and its relationship with gender among children from Acapulco, Guerrero: a cross-sectional study

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Abstract

Background: Premature loss of deciduous teeth is the exfoliation or extraction before physiological replacement with < 50% or < 75% of the root of the substitute tooth formed or if there is > 1 mm of alveolar bone covering the permanent successor tooth organ. This study aimed to estimate the prevalence of premature tooth loss in children and identify associated factors in a health center in Acapulco, Guerrero. **Methods:** We conducted a cross-sectional study in which we collected information from 109 clinical records of children examined from January 2019 to August 2021. Sociodemographic data of the children and parents were collected: socioeconomic level, non-pathological personal history, and the history of premature deciduous tooth loss. Multivariate analysis to identify factors associated with premature deciduous tooth loss was performed with CIETmap statistical software. Odds ratio (OR) and 95% confidence interval (CI) were calculated to estimate the strength of the association. **Results:** The prevalence of premature loss of primary teeth was 40% (43/109). The leading cause was caries (84%, 36/43). The tooth organ with the highest loss occurrence was the lower right second molar (33%, 14/43). Gender was identified as an associated factor, with males having a higher risk of loss (ORa = 2.97; CI95% = 1.33-6.65). **Conclusions:** Our results were similar to those reported in other studies. Strategies aimed at health promotion directed at parents and children should be reinforced.

Keywords: Deciduous tooth. Tooth loss. Dental records. Dental clinics. Dental care. Mexico.

Prevalencia de pérdida prematura de dientes deciduos y su relación con el género en niños de Acapulco, Guerrero: estudio transversal

Resumen

Introducción: Se considera como pérdida prematura de dientes deciduos a la exfoliación o extracción antes del recambio fisiológico con < 50% o < 75% de la raíz del diente sustituto formado, o si existe > 1 mm de hueso alveolar cubriendo al órgano dentario sucesor permanente. El objetivo de este trabajo fue estimar la prevalencia de pérdida prematura dental en niños e identificar factores asociados en un centro de salud de Acapulco, Guerrero. **Métodos:** Se llevó a cabo un estudio

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transversal en el que se recopiló información de 109 expedientes clínicos de niños atendidos de enero de 2019 a agosto de 2021. Se recolectaron datos sociodemográficos de los niños y los padres: nivel socioeconómico, antecedentes personales no patológicos y el antecedente de la pérdida prematura del diente deciduo. Se realizó un análisis multivariado para identificar factores asociados con la pérdida prematura de dientes deciduos con el software estadístico CIETmap. Se calcularon la razón de momios (OR) y el intervalo de confianza (IC) del 95% para estimar el grado de la asociación. **Resultados:** La prevalencia de pérdida prematura de dientes primarios fue del 40% (43/109). La principal causa fue por caries (84%, 36/43). El órgano dentario con más ocurrencia de pérdida fue el segundo molar inferior derecho (33%, 14/43). Se identificó el sexo como factor asociado, y se observó que el sexo masculino presenta mayor riesgo de pérdida (ORa = 2.97; IC95% = 1.33-6.65). **Conclusiones:** Nuestros resultados fueron similares a lo reportado en otros estudios. Deben reforzarse las estrategias de promoción de la salud dirigidas a los padres de familia y a sus hijos.

Palabras clave: Diente deciduo. Pérdida de diente. Registros dentales. Clínicas dentales. Atención odontológica. México.

Introduction

The deciduous dentition fulfills morphological characteristics during the first years of life with two essential functions: phonation and mastication. A third exclusive function is that the deciduous dental organs ensure the functional stimulus for the complete development of dental arches, preserving the space and physiologically delimiting the path along which their substitutes should erupt¹. Premature loss is considered when deciduous teeth are exfoliated or extracted before the physiological replacement time with less than three-quarters or half of the root of the substitute tooth formed or if there is > 1 mm of alveolar bone covering the successor permanent tooth².

Multiple studies have shown evidence of premature loss of deciduous dentition organs. In African countries, Senegal and Yemen report a loss of permanent and deciduous teeth of 1% and 40%, respectively^{3,4}. In Asia and the Middle East, India registered a mean loss rate of 11%^{5,6}, Indonesia 36%⁷, and Saudi Arabia 51%⁸. A meta-analysis reported 85,817 dental organs lost in different age groups from 1981 to 2015 in Europe⁹.

In South America, reported rates of premature loss of deciduous teeth are from 9% in schools to 43% in university clinics^{10,11}. Paraguay reported a prevalence of 27%¹². In Central America, Costa Rica reported 6% of premature loss in schoolchildren¹³. In Mexico, epidemiology ranges from 25% in primary schools to 75% in university clinics^{14,15}.

The primary condition causing the premature loss is dental caries³⁻¹⁵. Some research documents that malocclusions⁷, changes in nutrition⁹, parental influence, low economic resources¹⁰, oral hygiene, consumption of soft drinks, dental care, and previous experience of caries¹⁴ are factors associated with the loss of primary teeth. As for biological variables, males have the most significant history of tooth loss^{5,10}. The first molar^{13,15} and the lower

left second primary molar^{4,5,11} are the dental organs with the highest record of premature extraction.

Early loss of primary teeth causes occlusal alterations and space loss in children⁶. One study documented an average of 50% (-1.2 mm) space deficiency with premature loss of primary anterior teeth¹⁶. Among the therapeutic alternatives for premature tooth loss, planned maintainers help preserve spaces^{17,18}.

Although caries prevention measures aim to prevent premature loss of primary molars, this loss still occurs and has great relevance for the development of occlusion¹⁹. Improved strategies for preventing and treating early childhood oral conditions are needed to reduce premature loss of deciduous organs^{3,4,8,12,14}. Parental knowledge of the function of deciduous dental organs is essential to minimize their loss at an early age¹⁹.

In our region, the prevalence of premature loss in primary dentition has not been studied, nor are known the factors related to this loss. Therefore, this research aimed to estimate the prevalence of premature loss of deciduous teeth and identify associated factors among children attending a healthcare center in Acapulco, Guerrero.

Methods

We conducted a cross-sectional study in which information was collected from clinical records of children examined in the dental office of a primary healthcare center in Acapulco, Guerrero. Due to data restriction, a convenience sample was chosen in which 117 dental records were collected from children treated from January 2019 to August 2021.

As eligibility criteria, we considered the medical records of children treated in the dental office with the sections duly completed. We excluded those records of children identified with congenital or acquired alterations that hindered efficient oral health and diagnoses of genetic loss determined by the operator on duty. The

elimination criteria included records with missing data on parental information.

The clinical record served as a measurement instrument since it indirectly provided sociodemographic data, such as gender, age, and area of residence of the child, and information on the parents' level of schooling and employment status. In addition, housing information was considered. Non-pathological personal history included frequency of toothbrushing, parental support during the child's brushing, brushing time, use of fluoride toothpaste, and frequency of consumption of snacks between meals.

The outcome variable was the premature loss of a deciduous tooth, evaluated by the operator on duty during the first consultation and registered in the section corresponding to diagnosis. The diagnosis recorded in the dental records was considered the antecedent of loss. The dental organ was recorded based on the nomenclature of the World Dental Federation (FDI, for its Spanish acronym)²⁰, with the description of the cause, which followed two nominal categories: caries and trauma.

In terms of socioeconomic level, scores were established according to the material of the dwelling walls, number of bedrooms, and type of flooring. For wall material, three points were given for cement and brick, two points for adobe, and one point for wood, mud, or sheet metal. For the number of bedrooms (not including recreation areas), three points were given for four or more rooms, two for three rooms, and one for one or two rooms. For the material of the house floor, two points for cement, tile, wood, or ceramic and one point for a dirt floor. The score was calculated from the responses collected to obtain the parameter. The responses followed three ordinal categories: seven to eight points were considered high socioeconomic status; six points, middle class; and three to five points, low class.

The variable frequency of snacks between meals per day followed two nominal criteria: frequency ≥ 3 was considered the worst condition, and < 3 was the best condition. As for the oral hygiene index, we considered the last record of the medical note of biofilm lifting with O'Leary parameters. The number of pigmented faces was divided by the total number of deciduous teeth faces present and multiplied by a constant (100%) to obtain the following nominal parameters: oral biofilm $\leq 29\%$, proper hygiene, and oral biofilm $\geq 30\%$, poor hygiene²¹.

Data were double-entered and validated using the EpiData V3.1 software²² to minimize typo mistakes.

CIETmap software was used for statistical analysis²³. Univariate analysis was performed to obtain simple frequencies of the variables. A bivariate analysis of the factors potentially associated with the outcome of premature loss of deciduous teeth was performed, calculating for each association the odds ratio (OR) and 95% confidence interval (95% CI) with the Miettinen proposal²⁴, using contingency tables as a contrast.

The purpose of the multivariate analysis was to create an initial saturated explanatory model by simultaneous analysis of the Mantel-Haenszel procedure²⁵, including the significantly associated factors in the bivariate analysis. However, only one factor (gender) was significantly associated with the outcome in the bivariate analysis. Therefore, we fitted with a stepwise model with three variables: two by biological plausibility criterion (age, biofilm) and one by dose-response criterion (frequency of snacking between meals).

The research protocol was approved by the Coordination of Teaching and Social Service of the Municipal Health Jurisdiction of Acapulco, Guerrero. The research data only considered the primary records already established in the clinical files. The confidentiality and anonymity of the patients were protected.

Results

A total of 117 clinical records of children treated in the last two years were collected. We excluded two records with a history of Down syndrome and one with a diagnosis of true partial anodontia and we eliminated five more due to lack of parental information.

The 109 files included showed that 53% (58/109) were female. Age ranged from 2 to 11 years, with a mean of 6.4 years (standard deviation (SD) 1.9). Regarding the area of residence, 54% (59/109) of the children lived in rural areas.

Regarding schooling, 40% (44/109) of fathers had primary education, 36% (39/109) had completed high school, 12% (13/109) had no studies, and the rest had higher education. Regarding mothers, 49% (53/109) had primary education, 24% (26/109) had no studies, 20% (22/109) had completed high school, and the rest had higher education. We also addressed the employment status of fathers (70% (76/109) had informal jobs, 25% (27/109) had formal jobs, and the rest were unemployed) and mothers (59% (64/109) worked exclusively at home, 31% (34/109) worked informally, and the rest were formally employed). Regarding socioeconomic status, 72% (78/109) were classified as low class and 28% (31/109) as middle class.

Regarding dental care, 62% (67/109) of the children had never had a check-up, 28% (31/109) had a check-up two or more years before, and the rest within the last year. As for brushing, 47% (51/109) brushed their teeth three times a day. The frequency of brushing ranged from 1 to 7 times, with a mean of 3.1 (SD 1.2). Only 34% (39/109) of the children received parental assistance during tooth brushing. Regarding tooth brushing, 42% (46/109) took three to five minutes to brush their teeth, and 55% (60/109) used fluoride toothpaste.

The frequency of snacking between meals per day ranged from 1 to 8 times, with a mean of 2.9 (SD 1.6). The O'Leary oral hygiene index ranged from 11% to 88%, with a mean of 44% (SD 19.2).

The prevalence of premature loss of deciduous dental organs was 40% (43/109). The leading cause was caries, with 84% (36/43). The dental organ with the highest incidence of loss was the lower right second molar, with 33% (14/43).

The bivariate analysis identified gender as a factor associated with premature loss of primary teeth (Table 1). Gender was fitted by an initial saturated model in the multivariate analysis with three variables. The model included two factors considered for biological plausibility: age and biofilm and the frequency of snacking between meals by dose-response criterion. Table 2 shows the gender-adjusted strength of association with its 95% CI. The results exclude the distractor effect (confounder), and the X^2 test for heterogeneity was > 0.05 for the association in the final model, which excludes the existence of effect modification.

Discussion

The prevalence of deciduous dental organ loss in the study was 40%. According to FDI nomenclature, the organ with the highest loss occurrence was number 85. The leading cause of loss was dental caries. An associated factor was identified, as males showed approximately three times the risk of losing a primary tooth prematurely (ORa = 2.97; 95%CI = 1.33 - 6.65).

One of the limitations of this study was the cross-sectional design, which makes it challenging to establish the temporality criteria, especially regarding modifiable factors. Another important consideration was that the information was obtained from clinical records, which restricts the collection of data of interest, resulting in underreporting bias. In addition, as these were retrospective reviews, some of the data described may have changed after the dental care was received, leading to a possible retrospective judgment bias. A cohort study

following the pediatric population after completion of primary dentition development will help to denote the causality criterion with less bias.

One of the main disadvantages of choosing convenience sampling is that it compromises the study's external validity, thereby preventing the extrapolation of the results. The reason for this was the difficulty of accessing information in the unit. However, the study provides valuable initial information on the region, especially when no fundamental reasons differentiated it from the total population.

The prevalence found in our study was similar to that reported by Murshid et al. among Yemeni children treated in university clinics⁴. Our results also agree with Herawati et al. in their Indonesian schoolchildren research, although they only associated tooth loss with malocclusion⁷. Compared with other studies in Mexico, our findings are within the rate of premature loss of primary teeth (25-75%)^{14,15}.

The dental organ with the highest incidence of premature loss was the lower right second molar. Other studies have reported the first^{13,15} and second lower molars in the left sector^{4,5,11}. Consistent with the literature³⁻¹⁵, the leading cause of loss was caries. One study documented that the carious process is more frequent in the molars of the lower right hemiarch region²⁶, with the primary second molar being the most susceptible to lesions on the occlusal and mesial surfaces due to its circumscribed anatomy²⁷. Also, caries is more frequent in these organs due to the difficulty of visualization at the time of toothbrushing; for this reason, parents should assist children in this habit up to the age of eight years²⁸.

As for the associated factor, gender, we found that males have a greater risk of losing a tooth prematurely. These results were similar to those by Mukhopadhyay and Roy among Indian children and those by Cornejo and Moya among Peruvian children^{5,10}. In the final multivariate model, we adjusted for gender with three variables that were not statistically significant. Still, we considered them for plausibility criteria (age and biofilm count) and dose-response (frequency of snack consumption). Other variables in the bivariate analysis had a strength of association but did not reach significance due to the sample size.

Interestingly, males showed a higher risk of premature loss of deciduous teeth. This result may be influenced by social determinants, as parents may assume a passive role in the oral health of their sons²⁹. Another theory is related to self-care since males practice less oral hygiene prevention than females³⁰, and this type

Table 1. Bivariate analysis of factors associated with premature loss of deciduous teeth among children in a health center from Acapulco, Guerrero

Variables	Premature loss (n = 43)		No loss (n = 66)		Total (n = 019)		ORua	CI 95%
	n	%	n	%	n	%		
<i>Sociodemographic</i>								
Gender								
Male	28	26	23	21	51	47	3.49	1.58 - 7.73*
Female	15	14	43	39	58	53		
Age								
2 - 6 years	25	23	31	28	56	51	1.57	0.72 - 3.41
7 - 11 years	18	17	35	32	53	49		
Housing area								
Rural	26	24	33	30	59	54	1.53	0.70 - 3.34
Urban	17	16	33	30	50	46		
Total	43	40	66	60	109	100		
<i>Parental or guardian information</i>								
Father's education level								
No education and basic level	24	22	33	30	57	52	1.26	0.58 - 2.74
Upper middle and high school level	19	18	33	30	52	48		
Mother's education level								
No education and basic level	35	32	44	40	79	72	2.19	0.88 - 5.47
Upper middle and high school level	8	8	22	20	30	28		
Father's employment status								
Unemployment or informal labor	32	29	50	46	82	75	0.93	0.38 - 2.27
Formal employment	11	10	16	15	27	25		
Mother's employment status								
Housekeeping or informal labor	41	38	57	52	98	90	3.24	0.71 - 14.79
Formal employment	2	2	9	8	11	10		
Total	43	40	66	60	109	100		
<i>Socioeconomic level</i>								
Status								
Low - class	31	28	47	43	78	71	1.04	0.44 - 2.46
Middle - class	12	12	19	17	31	29		
Total	43	40	66	60	109	100		
<i>Oral health</i>								
Dental care								
Never received	28	26	39	36	67	62	1.29	0.58 - 2.87
Last two years	15	13	27	25	42	38		
Toothbrushing frequency								
< 3 times per day	11	11	20	18	31	29	0.79	0.33 - 1.88
≥ 3 times per day	32	29	46	42	78	71		
Toothbrushing assistance								
NO	28	26	44	40	72	66	0.93	0.41 - 2.10
YES	15	14	22	20	37	34		
Toothbrushing time								
< 3 minutes	26	24	37	34	63	58	1.20	0.55 - 2.63
≥ 3 minutes	17	15	29	27	46	42		
Type of toothpaste								
Fluoride - free	24	22	36	33	60	55	1.05	0.48 - 2.29
With fluoride	19	18	30	27	49	45		
Frequency of snacking between meals								
≥ 3 times per day	25	23	32	29	57	52	1.48	0.68 - 3.21
< 3 times per day	18	17	34	31	52	48		
O'Leary index								
Biofilm ≥ 30%	28	26	42	38	70	64	1.07	0.48 - 2.39
Biofilm ≤ 29%	15	14	24	22	39	36		
Total	43	40	66	60	109	100		

ORua: unadjusted odds ratio; CI 95%: confidence interval of 95%.

*The table provides the information from the children's clinical records, including the event's dichotomization.

Table 2. The final model of the multivariate analysis of factors associated with premature loss of deciduous teeth among children in a health center from Acapulco, Guerrero

Factor	ORa	CI 95%	χ^2 het	p - value
Male gender	2.97	1.33 - 6.65	3.988	0.781

ORa: adjusted odds ratio; CI 95%: confidence interval of 95%; χ^2 het: Ji - square test of heterogeneity to identify effect modifier; p-value: the p-value of the χ^2 het. *The gender variable was adjusted for age, biofilm count, and frequency of snacks between meals.

of attitude is reasonably acquired from childhood; if this assumption is valid, then gender precedes the effect.

The premature loss of a deciduous dental organ produces loss of function and occlusal alterations due to the mobilization of adjacent teeth⁶. Some studies have documented changes in the perimeter of the dental arch when deciduous teeth are extracted, with loss of space occurring in 50% and minimum conservation in 17% of cases¹⁶. Therefore, when faced with the premature loss of a deciduous tooth, the recommendation is to maintain the space with therapeutic alternatives recommended by specialists in pediatric dentistry^{17,18}.

Based on the data obtained in the present study, parents should be educated as primarily responsible for their children's oral health. Some studies suggest that the level of parental knowledge influences the characterization of children's oral health¹⁹. It should be mandatory for public health services to reinforce strategies aimed at developing preventive activities and oral health education at the community level. Although dental losses due to trauma were minimal, the recommendation is that parents should monitor their children's environment and know how to act quickly in such situations.

Although it is located in the municipal capital, the healthcare center where the information was collected is on the city's outskirts and serves a primarily rural population at the primary care level. The data obtained cannot be compared with public healthcare centers in an urban area or private sector clinics due to ethnic and demographic differences and the procedures performed. Although the sample is not representative of the population, it provides valuable information that identifies initial trends for possible results that will nurture the development of future studies in the region.

In conclusion, the prevalence of premature loss of deciduous teeth was similar to that reported in other

studies. On this basis, strategies to develop preventive activities and oral health education for parents and children should be reinforced.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. This study involved a retrospective review of medical records, for which approval was obtained from a formally constituted review board (Institutional Review Board or Institutional Ethics Committee).

Conflicts of interest

The authors declare no conflict of interest.

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