

ORIGINAL ARTICLE

Prevalence of gingivitis in preschool-age children living on the east side of Mexico City

Olga Taboada Aranza¹ and Ismael Talavera Peña²

ABSTRACT

Background. Gingivitis is an inflammatory process that is the precursor to periodontal disease. This process generally begins from 6 years of age. However, there are studies that show a prevalence of 18 to 38% in 3-year-old children.

After reviewing the scientific literature, we noticed insufficient research in preschool populations in order to prevent gingivitis. The purpose of this study was to describe the frequency and distribution of a population of preschool children.

Methods. An observational, descriptive, cross-sectional study was developed in 77 preschool children with an average age of 4.6 years (± 0.4). There were 40 males (52%) and 37 females (48%).

Results. The prevalence of gingivitis was 39%. The O'Leary buccal hygiene index value was 75.4% (95% CI: 74-77). Seventy five (97.4%) children presented $\geq 20\%$ of their dental surfaces covered with dental plaque. The risk factors analyzed showed that the individual risks are the same in children exposed to this problem or those who are not exposed, although the presence of $\geq 20\%$ of surfaces covered with dental bacterial plaque was clinically significant (odds ratio = 1.6; 95% CI: 1.3-2.0; $p > 0.05$).

Conclusions. Results showed a prevalence of 39% of gingivitis, which was higher than expected. Severity of gingivitis increases with age. These results confirm the necessity of studies among this population in order to limit the consequences of the evolution of periodontal disease.

Key words: prevalence, gingivitis, preschool-age children.

INTRODUCTION

Gingivitis associated with dental bacterial plaque (DBP)¹ is the most common form of periodontal diseases^{2,3} and is considered the initial stage of periodontal disease⁴ caused by the accumulation of supragingival plaque at the gingival margin.⁵

Plaque-induced gingivitis is characterized by the inflammation of the gums, without loss of clinical implant.⁶ Among the most common signs are redness and swelling of the gums, bleeding upon stimulation, changes in the consistency and contour, presence of plaque and/or calculus without radiographic evidence of crestal bone loss.⁷

Gum disease is considered to be the second alteration in oral disease affecting $> 75\%$ of the population.⁸ Gingivitis is an inflammatory process that begins in early childhood.⁹ The prevalence and severity of gingivitis indicates that this disease begins at the age of 5 years (the highest point occurs during puberty¹⁰), with a prevalence of 2 to 34% in children of 2 years of age and 18 to 38% in children 3 years of age.¹¹

It has been shown that bacterial plaque found on the tooth surface is responsible for the development of gingivitis, which is the first stage of most forms of periodontal disease.¹² The presence of this has been assessed through oral hygiene indexes that measure the amount of dental plaque.¹³

Among the published studies that describe the frequency and distribution of DBP is that conducted in 48 school-age children (4 to 8 years old) in Tijuana, Baja California, Mexico, which found that 78% of the total of teeth reviewed ($n = 987$) had plaque. Male students had a higher percentage of plaque at 5 years of age, whereas the higher frequency of plaque in female students was found at 6 years of age. There were no statistically significant differences according to gender.¹⁴ In another study of

¹ Facultad de Estudios Superiores Zaragoza, Universidad Nacional Autónoma de México, Mexico, D.F., Mexico

² Cirujano Dentista, México, D.F., México

Correspondence: M. Olga Taboada Aranza
Facultad de Estudios Superiores Zaragoza
Universidad Nacional Autónoma de México
Mexico, D.F., Mexico
E-mail: taao@puma2.zaragoza.unam.mx

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school-age children (8 to 12 years of age) in the eastern area of Mexico City, researchers reported that 48.8% of the population showed poor oral hygiene.¹⁵

In regard to gum disease, in the scientific literature many references exist on the prevalence of gingivitis in the adolescent and adult population, which demonstrate the evolution of gingivitis. Among the published reports is that of De la Teja et al. in school-age children of low socioeconomic status. The hypothesis that was considered in the study was that the older the person was, the higher the rate of gingivitis. Researchers concluded that, at 7 years of age, the school children presented a gum index by Löe and Silness of 0.67 (± 0.2), measured clinically as mild gingivitis, whereas at 12 years of age the index value was 1.10 (± 0.4), rated as moderate gingivitis.¹⁶

In the study conducted by Hernández et al. in children 6 to 14 years of age and whose purpose was to determine the presence of periodontal disease and oral hygiene in 2,140 subjects, the authors found that the prevalence of periodontal disease for the entire group was 61%. For females it was 59.8% and for males it was 62.3%, with a value of Russell's periodontal index of 0.2. In male patients it was higher than in female patients with results of 0.21 vs. 0.18. The average value of the Simplified Oral Hygiene Index (SOHI) for the entire group was 1.4 and they found no statistically significant differences according to gender.¹⁷

However, a study by Mendoza et al. showed an association of periodontal disease with socioeconomic status and patient age. These authors reported that the combination of low socioeconomic status and increasing age shows a higher proportion of gum disease and reported that, among the low socioeconomic levels, 31.6% of 6-year-old children and 60.9% of 12-year-old children had gingivitis.⁵

In another study of the prevalence of gingivitis in a group of school-age children and their relationship with the level of oral hygiene, researchers found that the prevalence of gingivitis assessed by the gingival index of Löe and Silness was 20.6% without statistically significant differences observed according to area and location of gingival mucosa. As for the quality of oral hygiene, the authors showed that it was good in 51.1%. This factor is considered as protective for development of the disease and provides that the population ratio is almost 1:1 with risk of having gingivitis.¹⁵

Epidemiological studies indicate that gingivitis occurs at a rate of 1-9% in a childhood population of 5-11 years

of age and from 1-46% in the population between 12 and 15 years of age.¹⁸ Other reports show that in children 3- to 11-years of age, the rates vary from 14-85%.¹⁹

As can be seen, the scientific literature shows a wide variation in regard to the prevalence of gingivitis. These studies have been conducted in school-age and adolescent populations and younger preschoolers; therefore, it was considered necessary to develop a research study that would describe the prevalence of gingivitis in a preschool-age population for a better screening in the design of intervention programs to limit the healthcare problem represented by periodontal disease.

SUBJECTS AND METHODS

We performed an observational, cross-sectional and descriptive study in a population of 77 preschoolers officially enrolled in the Antonia Nava de Catalán Preschool located in the area of east Iztapalapa. Of the total population, 52% of the students ($n = 40$) were males and 48% ($n = 37$) were females. Average age was 4.6 years (± 0.4). According to age group, the population was comprised of 25 4-year-old children and 52 children 5 years of age.

The investigation began with the standardization and calibration of the clinical criteria for gingivitis and DBP of the principal examiner to obtain a reliability of diagnostic criteria, according to the parameters from WHO ($\kappa = 0.77$, 95% CI: 0.62 to 0.81). We then proceeded to perform clinical examination of gingivitis and DBP prior to informed consent of the parent or guardian.

Clinical assessment of gingivitis was categorized by the clinical presence or absence of inflammation of the gums and, collaterally, we used the Massler and Schooner index that assesses three vestibular areas of the gums: papillary, marginal and attached (PMA)⁶ to observe the areas of the gums that showed inflammation. When none of the areas presented any signs of disease, the tooth was given the value of 0. If inflammatory changes were observed in the papillary gum area, it was given the value of 1. If there was inflammation in the marginal area of the gum it was given a value of 2 and, if the inflammation included the attached gum area, it was recorded with a value of 3. We only registered the inflammation and it was detected with the naked eye, using only a mirror.²⁰

The O'Leary index was used to evaluate the presence of dental plaque. This index records the presence or absence

of plaque in four zones of each tooth.²¹ Obtained data were processed using the SPSS v.11.0 statistical program for Windows. Descriptive statistics were obtained for the study variables, and testing statistical significance for quantitative variables was done with Student t-test. For qualitative variables, χ^2 test was used with a 95% confidence interval (CI). Likewise, risk estimates were calculated as odds ratio (OR) with 95% CI established as a risk when OR was >1 and CI did not include the 1 ($p <0.05$).

RESULTS

The PMA index value for the total population of the study was 1.6 (moderate gingivitis): 2.1 (severe gingivitis) for males and 1.0 (mild gingivitis) for females. For 4-year-old subjects, the index value was 2.1 (intense) and for 5-year-old subjects it was 1.3 (moderate). There were no statistically significant differences according to gender and age.

Of the 77 preschool children, only 30 (39%) had inflammation in any of the three gum areas. Of these, 18 were males and 12 were females. When analyzing by age, we observed that 11/25 children 4 years of age and 19/52 children of 5 years of age showed inflammation. The gum area most affected was the papillary area followed by the marginal area (Table 1).

The O'Leary index value for the total of the preschool-age children was 75.4% (95% CI: 74-77) (Table 2). It is known that $\geq 20\%$ of the tooth surfaces covered with dental plaque is an indicator of risk and presented by 97.4% ($n = 75$) of the children (Table 3). In assessing the

Table 1. Preschool-age children with presence of inflammation according to gum area

Variable	n	Gum area			Total
		Papillary	Marginal	Attached	
Gender					
Male	40	8	9	1	18
Female	37	7	5	0	12
Age (years)					
4	25	6	5	0	11
5	52	9	9	1	19

Table 2. Percentage of distribution of oral hygiene in the studied population

Variable	O'Leary Index	95% CI
Gender		
Male	73.8	72-75
Female	77.0	75-78
Age (years)		
4	70.1	68-72
5	77.9	76-79
Total	75.4	74-77

Table 3. Preschool-age children at risk for presenting $\geq 20\%$ of tooth surfaces covered with DBP

Gender	DBP		Total
	No risk (<20%)	Risk ($\geq 20\%$)	
Male			
4 years	1	10	11
5 years	0	29	29
Female			
4 years	0	14	14
5 years	1	22	23
Total	2	75	77

DBP, dental bacterial plaque.

presence of $\geq 20\%$ of the tooth surfaces covered with DBP and the presence of gingivitis, the calculated value for χ^2 evidence, in this case, does not distinguish between them ($p >0.05$) despite the fact that 45 preschool-age children with this risk still have not developed gingivitis (Table 4).

Analysis of the indicators showed that the individual risks in exposed and unexposed subjects are equal. In other words, the entire study population is found to be at risk for the presentation of gingivitis. However, the value of the CI of $\geq 20\%$ of the surfaces with DBP ranges from 1.3-2.0 with a 95% CI. With an interval that does not include 1, the risk is clinically significant even when the differences are not statistically significant (OR = 1.6, 95% CI: 1.3 to 2.0; $p >0.05$) (Table 5).

Table 4. Preschool-age children at risk of gingivitis for presenting with $\geq 20\%$ of tooth surface covered with DBP

Surfaces covered with DBP	Gingivitis		
	Absent	Present	Total
No risk $<20\%$	2	0	2
Risk $\geq 20\%$	45	30	75
Total	47	30	77

DBP, dental bacterial plaque.

Table 5. Risk factors associated with gingivitis in preschool-age children

Risk factors	OR	95% CI	p*
Age 4 years	0.7	0.2-1.9	0.5
Gender Male	0.6	0.2-1.4	0.2
DBP $\geq 20\%$ of surface covered	1.6	1.3-2.0	0.5

 χ^2 test.

DBP, dental bacterial plaque.

DISCUSSION

In our study we found a prevalence of gingivitis of 39% among preschool children of 4 and 5 years old, a higher prevalence than that reported by Piazzini showing a prevalence of 2-34% in children 2 years of age and 18 to 38% in children 3 years of age.¹¹ Studies performed in European populations show that gingivitis is present in 52% of schoolchildren.²² In Mexico, children from 8 to 12 years of age show a prevalence of 20.6%.¹⁵ In adolescents, the prevalence of gingivitis is 44%; of whom 80.9% have mild gingivitis, 16.5% have moderate gingivitis and 2.5% have severe gingivitis.¹⁰ In Mexican children 6 to 14 years old, the prevalence of gingivitis is 91.3% and for periodontitis it is 3.1%.²³ As noted, the prevalence of gingivitis, as assessed by different techniques and in school-age and adolescent populations, presents a variability ranging from 2-91%.

Considering that the quality of oral hygiene plays a primary role in the onset of gingivitis, it was noted that the O'Leary hygiene index value for our total study population was 75.4%. Of the 77 preschoolers, 75 had $>20\%$ of the tooth surfaces covered with DBP, i.e., 97.4% of preschool children are found to be at risk of developing gingivitis. This figure is higher and particularly alarming when compared with the data reported from a study of Argentine adolescents in which the Löe and Silness gingival index was 1.6, with an O'Leary index of oral hygiene at the age of 15 to be 50% in males and 70% in females.²⁴

The risk indicators analyzed in this study were 4-year-olds (OR = 0.7, 95% CI: 0.2 to 1.9; $p > 0.05$), males (OR = 0.6, 95% CI: 0.2 to 1.4, $p > 0.05$) and $\geq 20\%$ of the surfaces covered with DBP (OR = 1.6, 95% CI: 1.3-2.0; $p > 0.05$). It was noted that the indicators are equal for this population, in other words all preschool children in this study were found to be at risk for presentation of gingivitis. However, school-age children with $>20\%$ of the dental surfaces covered with DBP showed a clinically significant risk.

Our results show that gingivitis begins at a very early age and promotes a severe pathological process according to increasing age as shown in the studies by Orozco et al.,¹⁰ Tello de Hernandez et al.²³ and results of the present study.

REFERENCES

1. American Academy of Periodontology. 1999 International Workshop for a Classification of Periodontal Diseases and Conditions. Papers. Oak Brook, IL, October 30-November 2, 1999. Ann Periodontol 1999;4:1-112.
2. Zerón A. Nueva clasificación de las enfermedades periodontales. ADM 2001;58:16-20.
3. American Academy of Periodontology. Position paper. Periodontal diseases of children and adolescents. J Periodontol 2003;74:1696-1704.
4. Zerón A. Principios de la terapia periodontal. ADM 1990;47:315-320.
5. Mendoza RP, Balcazar PN, Pozos RE, Molina FN, Panda MM. Estado periodontal, nivel socioeconómico y sexo en escolares de 6 y 12 años de edad en Guadalajara. Práctica Odontológica 2001;22:25-30.
6. Massler M. Utilidad del índice PMA en la evaluación de gingivitis. ADM 1969;26:21-33.
7. American Academy of Periodontology. Parameters of care. J Periodontol 2000;71(suppl 5):847-883.
8. Jenkins WM, Papapanou PM. Epidemiology of periodontal disease in children and adolescents. Periodontol 2000 2001;26:16-32.

9. Kinoshita S, Wen R, Sueda T. *Atlas a Color de Periodoncia*. Spain: Espaxs, 1998. pp. 1-10
10. Orozco JRE, Peralta LH, Palma MGG, Pérez RE, Arroniz PS, Llamosas HE. Prevalencia de gingivitis en adolescentes en el municipio de Tlalnepantla. *ADM* 2002;59:16-21.
11. Piazzini LF. Periodontal screening & recording (PSR) application in children and adolescent. *J Clin Pediatr Dent* 1994;18:165-171.
12. Newbrun E. *Cariología*. México: Ed. Limusa, 1994. pp. 191-257.
13. Lang NP, Attstrom R, Loe H. *Proceedings of the European Workshops on Mechanical Plaque Control*. Germany: Quintessence; 1998. pp. 35-36.
14. Verdugo IA, Aguilera FM. Índice de placa dentobacteriana en niños. *Dentista Paciente* 2000;8:21-27.
15. Murrieta PJF, Juárez LLA, Linares VC, Zurita MV. Prevalencia de gingivitis en un grupo de escolares y su relación con el grado de higiene oral y el nivel de conocimientos sobre salud bucal demostrado por sus madres. *Bol Med Hosp Infant Mex* 2004;61: 44-54.
16. De la Teja AE, García-Dehesa DM, López-Morteo VM, Gutiérrez-Castrellón P, Motoro-Soto M. Gingivitis en escolares de nivel socioeconómico pobre. *Acta Pediatr Mex* 1999;20:280-283.
17. Hernández PJ, Tello LT, Hernández TF, Rosette MR. Enfermedad periodontal: prevalencia y algunos factores asociados en escolares de una región mexicana. *ADM* 2000;57:222-230.
18. Stein G E. Enfermedad periodontal en niños y adolescentes. *Práctica Odontológica* 1997;18:33-36.
19. García BM. Gingivitis y periodontitis. Revisión y conceptos actuales. *ADM* 1990;47:343-349.
20. Rubio CJ, Hernández ZS. *Epidemiología bucal*. México: FES Zaragoza UNAM, 1998. pp.225-227.
21. Piovano S. Examen y diagnóstico en cariología. In: Barrancos MJ, eds. *Operatoria Dental*. Argentina: Ed. Médica Panamericana; 1999. pp. 288-289.
22. Arabska-Przedpelska B, Boltacz-Rzepkowska E, Danilewicz-Styslak Z, Starniewska-Glowacka M, Wochna-Sobanska M. Comparison of the status of the periodontium and oral hygiene among children 8-9 and 13-14 years of age in Poland and in other countries. *Przegl Epidemiol* 1988;42:279-285.
23. Tello de Hernández TJ, Hernández PJ, Gutiérrez GN. Epidemiología oral de tejidos duros y blandos en escolares del estado de Yucatán, México. *Rev Biomed* 1997;8:65-79.
24. Vila VG, Lockett MO. Evaluación de placa bacteriana y gingivitis en adolescentes. Facultad de Odontología, Universidad Nacional del Nordeste; 2003. Available at: <http://www.unne.edu.ar/cyt/2003/comunicaciones/03-medicas/M-030/pdf>.