

## INVESTIGATION

# Preschoolers' dental caries: a cross-sectional-population-based study in Montevideo, Uruguay

*Caries dental en preescolares: estudio transversal de base poblacional en Montevideo, Uruguay*

*Cárie dentária em pré-escolares: estudo transversal de base populacional em Montevideú, Uruguai*

Graciela García Righetti<sup>1</sup>  0000-0003-4546-2404

Inés Caviglia Acosta y Lara<sup>1</sup>  0000-0003-2734-8878

Susana Lorenzo Erro<sup>2</sup>  0000-0003-4801-0761

Franklin Massa Mandagarán<sup>3</sup>  0000-0002-2922-4097

Licet Álvarez Loureiro<sup>1</sup>  0000-0001-9659-6045

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## Abstract

Prevalence/extent/severity of caries, registered according to ICDAS, in 5-year-old children from Montevideo-Uruguay. Population-based cross-sectional study of 614 children from public/private schools. The association between predictor variables, prevalence/extent of caries was evaluated using Poisson regression. Prevalence 70.9%(95%CI=66.40-75.50) and extension 10.0(95%CI=8.70-11.30) surfaces. The prevalence showed significant differences between categories of schools, SEC, educational level of the mother (NEM) and diet, and the extension between the type of schools, SEC, NEM, frequency of brushing and consumption of soft drinks. Children with low/medium ECS (PR=1.55;95%CI=1.15-2.08 and PR=1.50;95%CI=1.12-2.01 respectively), primary MEN (PR=1,35;CI95%=1.11-1.65), from public school (RP=1.21;95%CI=1.08-1.36) and who consumed soda daily (PR=1.20;95% CI=1.01-1.43) showed significance in the unadjusted model. Preschoolers with low/medium SEC (RR=1.78; 95%CI=1.01-3.11 and RR=1.66; 95%CI=0.99-2.79 respectively), primary MEN (RR=1,86; 95%CI=1.21-2.87); low SEC (RR=1.78;95%CI=1.01-3.11) and daily soft drink consumption (RR=1.79;95%CI=1.20-2.68) had a higher probability of caries in the adjusted analysis. The prevalence/extent of caries was high, associated with sociodemographic/behavioral variables.

**Keywords:** Dental caries, epidemiology, preschool children, prevalence, ICDAS.

1 Pediatric Dentistry Department, School of Dentistry, Universidad de la República, Uruguay. dragracielagarcia@gmail.com

2 Social and Preventive Dentistry Department, School of Dentistry, Universidad de la República, Uruguay.

3 Statistics Institute, Department of Quantitative Methods, School of Economic Sciences and Administration, Universidad de la República, Uruguay.

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## Resumen

Prevalencia/extensión/severidad de caries, registrada según ICDAS, en niños de 5 años de Montevideo-Uruguay. Estudio transversal de base poblacional de 614 niños de escuelas públicas/privadas. Se evaluó la asociación entre variables predictoras, prevalencia/extensión de caries mediante regresión de Poisson. Prevalencia 70,9%(95%IC=66,40-75,50) y extensión 10,0(95%IC=8,70-11,30) superficies. La prevalencia mostró diferencias significativas entre categorías de escuelas, SEC, nivel educativo de la madre (NEM) y alimentación, y la extensión entre el tipo de escuelas, SEC, NEM, frecuencia de cepillado y de consumo de refrescos. Niños con SEC bajo/medio (RP=1,55;IC95%=1,15-2,08 y PR=1,50;IC95%=1,12-2,01 respectivamente), NEM primario (RP=1,35;IC95%=1,11-1,65), de escuela pública (RP=1,21;95%IC=1,08-1,36) y que consumían gaseosa diariamente (RP=1,20;95%IC=1,01-1,43) mostraron significancia en el modelo no ajustado. Preescolares con SEC bajo/medio (RR=1,78;IC95%=1,01-3,11 y RR=1,66;IC95%=0,99-2,79 respectivamente), NEM primario (RR=1,86; IC95%=1,21-2,87); bajo SEC (RR=1,78;IC95%=1,01-3,11) y consumo diario de refrescos (RR=1,79; IC95%=1,20-2,68) tenían mayor probabilidad de caries en el análisis ajustado. La prevalencia/extensión de caries fue alta, asociándose con variables sociodemográficas/comportamentales.

**Palabras clave:** Caries dental, epidemiología, preescolares, prevalencia, ICDAS

## Resumo

Prevalência/extensão/severidade da cárie, registrada de acordo com ICDAS, em crianças de 5 anos de idade de Montevideo-Uruguai. Estudo transversal de base populacional com 614 crianças de escolas públicas/privadas. A associação entre as variáveis predictoras, prevalência/extensão da cárie foi avaliada por meio da regressão de Poisson. Prevalência 70,9%(IC95%=66,40-75,50) e extensão 10,0(IC95%=8,70-11,30) superfícies. A prevalência apresentou diferenças significativas entre as categorias de escolas, SEC, escolaridade da mãe (NEM) e alimentação, e a extensão entre o tipo de escolas, SEC, NEM, frequência de escovação e consumo de refrigerantes. Crianças com ECS baixo/médio (RP=1,55;IC95%=1,15-2,08 e PR=1,50;IC95%=1,12-2,01 respectivamente), NEM primário (RP=1,35;IC95%=1,11-1,65), de escola pública (RP=1,21;IC95%=1,08-1,36) e que consumia refrigerante diariamente (RP=1,20;IC95%=1,01-1,43) apresentaram significância no modelo não ajustado. Pré-escolares com SEC baixo/médio (RR=1,78; IC 95%=1,01-3,11 e RR=1,66; IC95%=0,99-2,79 respectivamente), NEM primário (RR=1,86; IC 95%=1,21-2,87); baixo SEC (RR=1,78;IC95%=1,01-3,11) e consumo diário de refrigerantes (RR=1,79;IC95%=1,20-2,68) apresentaram maior probabilidade de cárie na análise ajustada. A prevalência/extensão de cárie foi alta, associada a variáveis sociodemográficas/comportamentais.

**Palavras-chave:** Cárie dentária, epidemiologia, pré-escolares, prevalência, ICDAS.

## Introduction

Early childhood caries (ECC) is one of the most prevalent diseases in childhood, directly impacting the quality of life of children and their families.<sup>(1)</sup> The World Health Organization (WHO) established five as the index age to determine the health status of primary dentition.<sup>(2)</sup> Caries prevalence in 5-year-old children globally ranges from 22.5% to 90%. Two thirds of the studies conducted in South America reported a prevalence >50%; caries is the most frequent untreated condition.<sup>(3)</sup> Its population distribution is unequal, with a polarization that affects the most vulnerable population to a greater extent. This entails a public health challenge.<sup>(4)</sup>

Dental caries is a multifactorial, noncommunicable, and dynamic disease determined by biological, behavioral, psychosocial, and environmental factors.<sup>(5)</sup> Current data indicate that caries is a sugar-dependent disease that causes dysbiosis in the dental biofilm.<sup>(6)</sup> In recent decades, sugar-sweetened beverages (SSBs) have been a major component of total sugar intake, especially in children and adolescents in several countries. Frequent consumption of SSBs substantially increases the risk of developing caries in children and has a strong association with dental caries disease.<sup>(7)</sup> Some studies evaluating the relationship between sex and dental caries have reported a higher prevalence among women.<sup>(8)</sup> Despite these results, most authors found no statistically significant differences between the sexes.<sup>(9,10)</sup>

Uruguay ranks 55th out of 189 countries, with a Human Development Index (HDI) of 0.81, considered a very high HDI by the United Nations Development Program.<sup>(11)</sup> The country has had a fluoridated salt program since 1991 (implemented through Decree-Laws No. 375/990 and 247/991).

Available from <https://www.impo.com.uy/bases/decretos/247-1991/3>.

The program is limited to table salt, as recommended by the WHO. The benefits of community fluoride use in controlling the onset and rate of progression of dental caries disease are recognized even with a cariogenic diet and the widespread use of fluoride toothpaste.<sup>(12)</sup>

Montevideo, the capital city, includes approximately 50% of the population. According to the last national census (2011), children aged 4-5 comprise 2.76% of the total population (90,722 people).<sup>(13)</sup>

We hypothesize that the prevalence of caries in children at age 5 in Uruguay is similar to that of the rest of Latin America ( $\geq 50\%$ ).

This work is the result of the master's thesis entitled "Relevamiento de caries y paradenciopatías en preescolares de 5 años de Montevideo y factores de riesgo asociados: Estudio transversal" (Survey of caries and gum disease in 5-year-old preschoolers in Montevideo and associated risk factors: A cross-sectional study). It was the first representative study evaluating dental caries disease status in preschoolers (<https://www.colibri.udelar.edu.uy/jspui/handle/20.500.12008/31249>). The objective was to assess the prevalence, extent, and severity of dental caries in 5-year-old children in Montevideo, Uruguay.

## Participants and method

A cross-sectional survey was conducted in Montevideo-Uruguay, from May to November 2017, to assess the oral health status of 5-year-old schoolchildren attending public and private schools.

Ethical aspects. The study protocol was approved by the Ethics Committee of the School of Dentistry of Universidad de la República (Uruguay) (resolution no. 200/16). The health and education boards were contacted and provided with the necessary information and authorization. All participants and their parents/legal guardians signed written informed consent.

### *Sample size calculation and sampling strategy.*

We used a prevalence of 66.3%,<sup>(8)</sup> a precision level of  $\pm 4\%$ , and a design effect of 1.3 to calculate the sample. This yielded a group of  $n = 538$  individuals. A non-response rate of 30% was considered, resulting in a sample size of 699 individuals.

A two-stage stratified self-weighted cluster sampling strategy was implemented. The primary sampling unit included 20 public and 18 private schools in Montevideo, randomly selected from 270 schools. Twenty children (secondary sampling units) attending these schools were randomly selected and invited to participate in the study.

### *Data Collection*

Data were collected through a structured questionnaire and a clinical oral examination. Details on the medical, socioeconomic, and demographic history, as well as dietary and general habits, were collected using a take-home questionnaire to be completed by the parents or legal guardians. The clinical examination was performed in the classroom, with the child in the supine decubitus position, using artificial light, a sterile clinical mirror, and a periodontal probe. Before the examination, the professional brushed the children's teeth with fluoride toothpaste and flossed them. Cotton rolls were used to control humidity, and cotton gauze was used to dry the dental surfaces.

Two calibrated examiners (XXXX and YYYYY), both specialists and pediatric dentistry professors, recorded the caries on all surfaces of temporary teeth according to the International Caries Detection and Assessment System (ICDAS)<sup>(14)</sup> as follows: sound tooth surface (ICDAS 0), non-cavitated lesion (ICDAS 1+2), enamel breakdown (ICDAS 3), an underlying shadow from dentin (ICDAS 4) and cavity with visible dentin (ICDAS 5+6).

Lesion activity was recorded according to Nyvad's classification.<sup>(15)</sup>

### *Reproducibility*

The calibration process included theoretical activities, diagnostic photographic imaging, and clinical examinations performed by a gold standard examiner (ZZZZ). Before the start of the survey, the intra-examiner (unweighted) Kappa Cohen for ICDAS was 0.71 (XXXX) and 0.85 (YYYY), and  $>0.70$  for inter-examiner reproducibility. During the survey, calibration was performed with 5% of the sample, with seven days between examinations. The intraexaminer Kappa Cohen (unweighted index) obtained was  $>0.90$ .

### *Non-response analysis*

The overall non-response rate was 15.8% ( $n=115$ ); 9.7% corresponded to children attending public schools; 8.0% were girls ( $n=58$ ).

Reasons for nonparticipation: parents/guardians did not consent (3.3%), children did not return questionnaires (6.6%), preschoolers were not available at school during the survey (3.4%), family move (1.8%), and children not allowing to be examined (0.7%).

### *Data Analysis*

Overall caries prevalence was defined as the percentage of individuals with at least one carious surface (cavitated or not), missing surface (extracted or with indication for extraction) or surface restored due to caries. Caries extension was defined as the number of affected surfaces, expressed as the sum of carious surfaces (cavitated and non-cavitated) + extraction/indication for extraction due to caries + restorations due to caries. It will be expressed with the modified dmft index (dmft m).

Severity was estimated as follows: initial lesions (non-cavitated lesions), moderate (cavitated lesions in enamel and underlying shad-

ow from dentin), or severe (cavitated lesions in dentin), regardless of their activity.<sup>(16)</sup>

Sociodemographic, dietary, and oral health variables were evaluated. Sociodemographic characteristics included “sex” (male vs. female), “socioeconomic status” (low, medium, or high), “mother’s education level” (MEL) (primary, secondary, or higher), and “type of school” (public vs. private). Socioeconomic status (SES) was assessed using the simplified version of the Socioeconomic Level Index (“INSE” in Spanish), validated for the Uruguayan population by the School of Social Sciences (School of Sociology).<sup>(17)</sup>

The eating variable included “soft drink consumption” (never/rarely vs. daily). The oral health variables included “who brushes the child’s teeth” (adult vs. child alone), “started using fluoride toothpaste” (since first tooth eruption, before or after age 2) and “frequency of toothpaste use” ( $\geq$ twice /day vs.  $<$ twice/day).

A weighting variable was created considering a two-stage sampling strategy. A post-stratification procedure considering the number of children in each school, the sex, and geographic totals was implemented to compensate for participant dropout. A sociodemographic categorization was used when considering public schools.

Descriptive and bivariate analyses were performed to provide summary statistics and a preliminary assessment of the association between predictor variables and caries prevalence, extent, and severity (Mann-Whitney test).

Adjusted and unadjusted Poisson regression models assessed the association between explanatory variables and caries prevalence and extent. Prevalence ratios (PR), rate ratios (RR), and their 95% confidence intervals (CI) were

calculated. The estimation of the model was performed stepwise to eliminate non-significant variables. The model adjustment process included explanatory variables that presented a p-value  $\leq 0.25$  in the unadjusted analyses.

The free software R Core Team 2012 was used to analyze the data statistically.

(R: A language and environment for statistical computing R Foundation for Statistical Computing, Vienna, Austria ISBN 3-900051-07-D, <http://www.R-project.org/>).<sup>(18)</sup>

## Results

A total of 614 preschoolers were examined: 310 (50.49%) were female, 317 (51.63%) attended public schools, and 572 (93.2%) reported daily consumption of soft drinks. More than 95% of the children reported using fluoridated toothpaste.

The preliminary analysis of the relationship between caries and sociodemographic, dietary, and oral health variables is shown in Table 1. The overall prevalence was 70.9% and differed significantly between education levels, SES and MEL. Children attending public schools with low SES and primary MEL showed a significantly higher caries prevalence. The mean caries extent (dmft m) in this sample was 10.0 (95% CI = 8.70-11.30), with 7.65 decayed, 1.88 missing and 0.47 filled teeth.

Children attending public schools, with low SES, primary MEL, who brushed their teeth less than twice a day and consumed soft drinks daily, had a significantly higher number of affected surfaces. Untreated cavitated caries lesions were the most prevalent [40.9% (95% CI = 36.10-45.90)]. Only 14.4% (11.10-17.80) of individuals had initial caries lesions.

**Table 1. Frequency distribution of the sample, overall prevalence, and extent (number of surfaces affected) of caries according to the explanatory variables.**

	n (%)	Prevalence % (95% CI)	p.value	Extension (dmft) mean (95% CI)	p-value *
<b>Sociodemographic characteristics</b>					
<b>Sex</b>			<b>0.45</b>		<b>0.71</b>
Female	310 (50.49)	72.70 (66.50-78.90)		9.90 (8.10-11.90)	
Male	304 (49.51)	69.20 (62.70-75.80)		10.00 (8.20-11.90)	
<b>Socioeconomic status<sup>†</sup></b>			<0.01*		<0.01*
High	130 (21.49)	48.50 (35.10-61.80)		4.20 (2.40-6.10)	
Medium	338 (55.87)	72.50 (66.70-78.30)		9.50 (7.80-11.20)	
Low	137 (22.65)	74.90 (66.50-83.30)		12.60 (9.90-15.40)	
<b>Mother's Education Level</b>			<0.01*		<0.01*
Higher	211 (34.40)	57.50 (47.70-67.30)		5.40 (3.50-7.20)	
Secondary	249 (40.60)	70.70 (63.60-77.90)		9.40 (7.50-11.20)	
Primary	154 (25.10)	77.90 (70.60-85.30)		13.10 (10.40-15.70)	
<b>Type of school</b>			<0.01*		<0.01*
Private	297 (48.37)	59.60 (53.90-65.30)		5.50 (4.50-6.50)	
Public	317 (51.63)	72.30 (67.30-77.30)		10.50 (9.10-12.00)	
<b>Dietary habits</b>					
<b>Soft drink consumption</b>			0.11		<0.01*
Never or rarely	42 (6.80)	69.70 (64.90-74.40)		9.20 (7.90-10.50)	
Daily	572 (93.20)	83.60 (70.20-97.00)		17.70 (10.80-24.60)	
<b>Oral health habits</b>					
<b>Who brushes the child's teeth <sup>ψ</sup></b>			0.61		0.37
An adult helps him/her	223 (36.50)	69.20 (61.70-76.70)		9.30 (7.30-11.30)	
The child brushes alone	388 (63.50)	71.60 (65.90-77.30)		10.40 (8.70-12.10)	
<b>How long the child has been using toothpaste <sup>ψ</sup></b>			0.19		0.15
From the eruption of the first tooth	69 (11.30)	58.10 (42.20-73.90)		8.00 (3.40-12.60)	
Before age 2	235 (38.50)	71.20 (64.00-78.40)		8.90 (7.10-10.90)	
After age 2	307 (50.20)	72.90 (66.50-79.20)		11.20 (9.20-13.20)	
<b>Frequency of toothpaste use</b>			0.18		<0.01*
≥ twice a day	517 (84.20)	69.20 (64.20-74.20)		9.30 (7.80-10.70)	
< twice a day	97 (15.80)	77.30 (67.30-87.30)		12.70 (9.50-15.80)	
<b>TOTAL</b>	614 (100)	70.90 (66.40-75.50)		10.00 (8.70-11.30)	

† Missing data \*chi2 p-value <sup>ψ</sup> Three children report not brushing their teeth or using fluoride toothpaste.

When studying the association between caries prevalence and the explanatory variables (Poisson regression analysis), low and medium SES (PR=1.55; 95% CI=1.15-2.08 and PR=1.50; 95% CI=1.12-2.01 respectively), MEL (primary PR=1.35; 95% CI=1.11-1.65 and secondary PR=1.23; 95% CI=1.01-1.50), children who attended public school (PR=1.21; 95% CI=1.08-1.36) and those who consumed soft drinks daily (PR=1.20; 95% CI=1.01-1.43) had significant results only in the unadjusted model

(Table 2). Considering the extension, in the adjusted analysis (Poisson regression), children with low and medium SES (RR=1.78; 95% CI=1.01-3.11 and RR=1.66; 95% CI=0.99-2.79 respectively), primary NEM (RR=1.86; 95% CI=1.21-2.87); low SES (RR=1.78; 95% CI=1.01-3.11) and daily soft drink consumption (RR=1.79; 95% CI=1.20-2.68) were more likely to have caries lesions (Table 2).

**Table 2. Association between explanatory variables, prevalence and extent of caries (Poisson regression models, unadjusted and adjusted).**

	PREVALENCE				EXTENSION			
	Not adjusted PR (95% CI)	P	Adjusted PR (95% CI)	P	Not adjusted RR (95% CI)	P	Adjusted RR (95% CI)	P
<b>Sociodemographic characteristics</b>								
Sex								
Female	REF				REF			
Male	0.95 (0.84-1.08)	0.46			1.01 (0.77-1.31)	0.96		
<b>Socioeconomic status<sup>†</sup></b>								
High	REF		REF		REF		REF	
Medium	1.50 (1.12-2.01)	<0,01*	1.33 (1.01-1.92)	0.46*	2.25 (1.40-3.60)	<0.01*	1.66 (0.99-2.79)	0.05*
Low	1,55 (1.15-2,08)	<0,01*	1.39 (0.94-1.88)	0.11	2.98 (1.83-4.87)	<0.01*	1.78 (1.01-3.11)	0.05*
<b>Mother's Education Level</b>								
Higher	REF		REF		REF		REF	
Secondary	1.23 (1.01-1.50)	0,04*	1.10 (0.89-1.36)	0.39	1.74 (1.17-2.60)	0.01*	1.38 (0.92-2.09)	0.12
Primary	1.35 (1.11-1.65)	<0,01*	1.21 (0.97-1.52)	0.09	2.43 (1.63-3.62)	<0.01*	1.86 (1.21-2.87)	<0.01*
<b>Type of school</b>								
Private	REF		REF		REF		REF	
Public	1.21 (1.08-1.36)	<0.01*	1.03 (0.88-1.20)	0.74	1,90 (1.50-2.42)	<0.01*	1.26 (0.96-1.65)	0.09
<b>Dietary habits</b>								
<b>Soft drink consumption</b>								
Never or rarely	REF		REF		REF		REF	
Daily	1.20 (1.01-1.43)	0.04*	1.18 (0.98-1.41)	0.08	1.92 (1.27-2.90)	<0.01*	1.79 (1.20-2.68)	<0.01*
<b>Oral health habits</b>								
<b>Who brushes the child's teeth<sup>‡</sup></b>								

	PREVALENCE				EXTENSION			
	Not adjusted PR (95% CI)	P	Adjusted PR (95% CI)	P	Not adjusted RR (95% CI)	P	Adjusted RR (95% CI)	P
An adult helps him	REF				REF			
The child brushes alone	1.03 (0.90-1.18)	0.62			1.12 (0.84-1.48)	0.45		
How long the child has been using toothpaste <sup>ψ</sup>								
Since the eruption of the first tooth	REF		REF		REF		REF	
Before age 2	1.22 (0.91-1.64)	0.17	1.24 (0.92-1.68)	0.15	1.12 (0.61-2.05)	0.72	1.18 (0.64-2.19)	0.59
After age 2	1.25 (0.94-1.67)	0.12	1.29 (0.97-1.73)	0.08	1.39 (0.76-2.54)	0.28	1.51 (0.84-2.72)	0.17
Frequency of use of toothpaste								
≥ twice a day	REF		REF		REF		REF	
< twice a day	1.12 (0.96-1.30)	0.15	1.13 (0.59-2.17)	0.71	1.37 (1.02-1.83)	0.03*	1.81 (0.89-1.57)	0.25

† Missing data \*chi2 p-value <sup>ψ</sup> Three children report not brushing their teeth or using fluoride toothpaste.

## Discussion/Conclusion

This population-based study was conducted to evaluate dental caries in Uruguayan preschoolers. A high prevalence and extent of caries was recorded, and untreated cavitated caries lesions were the most prevalent condition. The disease appeared mainly in children from public schools with low SES and whose mothers had a primary education level. Prevalence was not uniform in this population: the most vulnerable sectors were the most affected.

As expected, the prevalence, extent, and severity of caries recorded in our study were similar to those reported by other Latin American countries. In comparison with the rest of the world and despite having a high HDI and a fluoridated salt program, Uruguay has a high caries prevalence similar to that of China and India<sup>(19-22)</sup> but higher than that of some developed countries.<sup>(9,10,23)</sup>

This prevalence and extent of caries was higher in children attending public schools, with low SES and whose mothers had a lower education level ( $p < 0.01$ ), similar to what has been reported in other countries.<sup>(8,20,22,24-27)</sup>

Patrik (2006), cited by Rai and Tiwari (2018), groups and describes different factors influencing oral health. He points out as distal factors parents' occupation, income, education, social class, and access to dental care and, as proximal factors, the author mentions risk factors in parents and children that mainly include their oral health knowledge, behaviors, parental attitudes, and some psychosocial aspects. These studies report that distal factors such as MEL and SES are strongly associated with caries in children under six. Distal factors appear more relevant in developing countries and influence proximal factors.<sup>(28)</sup>

Since 2008, the Ministry of Public Health has made pregnant women and children a priority population for oral care.<sup>(29)</sup> These policies have not been implemented, which would explain the results obtained. This policy was developed only for diagnostic purposes and did not include preventive-therapeutic strategies to prevent or solve the problems detected.

The Bangkok Global Summit Expert Panel defined ECC as dental caries disease in preschool children. It is a common, often untreated dis-



ease that can profoundly impact children's lives.<sup>(23,30)</sup> Coincidentally, our data show that untreated cavitated lesions were the most prevalent.

A similar study in Colombia showed that the most frequent lesions were non-cavitated lesions.<sup>(19)</sup> This difference in lesion severity could be explained by the fact that the children surveyed in the Colombian study were younger (2.5 to 4 years old).

Although five was the index age set by the WHO-FDI for evaluating oral health in children with primary dentition, the results suggest that children's dental care should begin before that age, as soon as the teeth erupt, to control the disease and reduce its severity.<sup>(2)</sup>

Supervised adult toothbrushing from the eruption of the first tooth with fluoride toothpaste two or more times a day effectively reduces the prevalence of caries lesions.<sup>(31-33)</sup> This study found that children who brushed two or more times a day with fluoride toothpaste of at least 1000 ppm showed a decrease in the extent of cavitated and non-cavitated lesions.

Dental caries disease is mediated by biofilm, modified by the presence of sugars, resulting in an imbalance of the demineralization and remineralization process of dental hard tissues.

<sup>(30)</sup> Sugar is not considered an essential nutrient, and evidence shows that it may contribute to overweight, obesity, and caries. WHO guidelines recommend reducing the consumption of free sugars to less than 10% of daily caloric intake. However, a recent PAHO/WHO study in Latin American countries reports that in Uruguay, Bolivia, and Peru SSBs consumption doubled between 1999 and 2013.<sup>(34)</sup> In Uruguay, a survey conducted by the National Institute of Statistics (INE) found that 20% of children aged 2 to 6 consume sugary juice or soft drinks.<sup>(35)</sup> In our survey, children who consume sugary drinks daily are 1.79 times more likely to develop a new caries lesion.

Uruguay has had a community salt fluoridation program (250 mg FNa/Kg fine salt;

250 mg FK/Kg coarse salt) for domestic use since 1991.<sup>(36)</sup> Population-based methods of fluoride administration are especially beneficial in low socioeconomic populations without access to professionally applied dentifrices or fluorides. A study conducted in Uruguay detected significant variability in the fluoride concentration of salt for domestic use, evidencing a lack of quality control in the production process.<sup>(37)</sup>

The high prevalence of caries in primary dentition is a risk factor for caries in permanent dentition.<sup>(38)</sup> Dental caries in young children can negatively affect their normal growth and development, cause significant pain, feeding problems, sleep disorders, speech and learning problems, malocclusions, general health problems, low self-esteem, and interfere with their social adaptation and quality of life.<sup>(3)</sup>

One of the strengths of this study is how well the target population responded, the high reliability of the two examiners who performed the clinical examinations and the conditions in which the visual caries diagnosis was performed (clean, dry, and well-lit surface), and the use of a detailed and validated method for the clinical examination.

Currently, Uruguay has no public health policies regarding children's oral health. This work is the first to provide population data on caries in this age group. It includes essential information to aid oral-health public-policy making that adapts to the health reality of Uruguayan children.

In conclusion, these data are a significant input for the Ministry of Public Health to develop health policies adapted to the reality of the country's population, addressing the problem of oral health from birth to positively impact the prevalence and severity of dental caries in preschool children. Developing a care protocol that prioritizes the first dental visit during the child's 1000 days is essential.

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**Statement of patient consent**

The legal guardians of the children have given their written informed consent. The children provided their verbal consent.

**Authorship contribution:**

1. Conception and design of study
2. Acquisition of data
3. Data analysis
4. Discussion of results
5. Drafting of the manuscript
6. Approval of the final version of the manuscript

GGR has contributed in 1, 2, 3, 4, 5 y 6.

ICA has contributed in 2 y 6.

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