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Dental pain and associated factors in 2 to 4-year-old children in Goiânia

Dor dentária e fatores associados em crianças de 2 a 4 anos de idade de Goiânia

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ABSTRACT: *Objective:* To investigate the prevalence of dental pain and associated factors in 2–4-year-old children in Goiânia (GO). *Methods:* Cross-sectional study using home interviews with parents or guardians and anthropometric measures. The sample consisted of 385 children from 2 to 4 years old. The variables analyzed were: dental pain sometime in their lives, and demographic, socioeconomic and health-related factors (health condition, diet, nutritional status and behavior). Bivariate analysis and logistic regression were performed, based on a hierarchical model for risk assessment, considering the sample weights. *Results:* Dental pain prevalence was 9.9% (95%CI 7.4 – 13.1). After adjustment for other variables, children whose mothers had low education level and those who regularly consumed artificial powder juice containing sugar were more likely to have dental pain (OR = 3.03 and 2.15, respectively). *Conclusion:* It was concluded that one in ten children had dental pain, and the prevalence was associated with low education level of the mother and the regular consumption of artificial powder juice.

Keywords: Toothache. Child, preschool. Prevalence. Risk factors. Social class. Diet.

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RESUMO: *Objetivo:* Conhecer a prevalência de dor dentária e os fatores associados em crianças de dois a quatro anos de idade em Goiânia (GO). *Métodos:* Estudo transversal utilizando entrevistas domiciliares com pais ou responsáveis e medidas antropométricas. Fizeram parte da amostra 385 crianças de 2 a 4 anos. As variáveis analisadas foram: dor dentária alguma vez na vida e fatores demográficos, socioeconômicos e relacionados à saúde (condição de saúde, alimentação, estado nutricional e comportamentos). Foi realizada análise bivariada e regressão logística, com base em modelo hierárquico de determinação do agravo, sendo considerados os pesos amostrais. *Resultados:* A prevalência de dor foi de 9,9% (IC95% 7,4 – 13,1). Após ajuste pelas demais variáveis, as crianças cujas mães tinham baixa escolaridade e as que consumiam regularmente suco artificial em pó contendo açúcar tiveram mais chances de ter dor (OR = 3,03 e 2,15, respectivamente). *Conclusão:* Uma em cada dez crianças apresentou dor dentária, e a prevalência foi associada à baixa escolaridade da mãe e ao consumo regular de suco artificial em pó.

Palavras-chave: Odontalgia. Pré-escolar. Prevalência. Fatores de risco. Classe social. Dieta.

INTRODUCTION

Oral diseases may cause pain, suffering, and psychological embarrassment resulting in damage at individual and collective levels. Due to its social importance, the decrease in population's dental pain was included in oral health global goals for the year of 2020, with the aim of reducing the number of absent days at school, job, and work[1].

Interest in such subject has been increasing during the last years. Epidemiological studies about dental pain have investigated not only the prevalence of the problem, but also its association with socioeconomic and demographic factors and impacts in the quality of life[2-9]. Most studies include scholars and teenagers as the study population, with only few of them considering younger children and pre-scholars at the deciduous dentition phase.

In childhood, dental pain may be attributed to transitory oral injuries, deciduous tooth exfoliation, and permanent tooth eruption. However, caries is the clinical condition with the most consistent correlation with dental pain[5,7]. There is evidence that dental pain is frequent among preschoolers, even in populations with historically low levels of caries experience[2], and pain produces an impact on the quality of life of children and their families[4,5].

In Brazil, studies with children younger than 5 years old have showed prevalence of 9.1% in Recife, 11.3% in Canoas, and 21% in Macapá[3,10,11]. Discrepancies among the Brazilian regions were also seen in a study using adolescents[12]. Thus, it is relevant to estimate the dental pain prevalence among children younger than five years old in other municipalities and regions in the country.

Studies about factors associated with dental pain in Brazilian preschoolers showed that the prevalence is very high among groups of black-colored skin[6] and of very low socioeconomic condition[3,6]. More frequent dental pain reports were found in

older children, with lower family income[3] and whose mothers had less than four schooling years[6].

Even though dental pain causes an impact on eating and is associated with caries, which has the high frequency of sugar intake as one of its etiological factors, only few studies performed with adolescents have approached the relationship between dental pain and diet[12-14]. There is also the need for better understanding the association of pain with other health-related factors in the early years of life, such as breast-feeding, nutritional status, food consumption, and health condition. The coexistence of multiple health risk factors associated with dental pain may indicate the need for integrated approaches of oral health promotion.

In this context, the objective of the present study was to investigate the prevalence of dental pain and its association with demographic, socioeconomic, and health-related factors in 2 to 4-year old children in Goiânia, State of Goiás, Brazil. Results may be useful for knowing the magnitude of the problem, identifying risk and protective factors, and clarifying the existent iniquities in a Brazilian municipality. They may also contribute for public policies directed to the health of children younger than 5 years old.

METHODS

Data from the cross-sectional study "Nutritional profile of children younger than 5 years old in the city of Goiânia" were analyzed, with home basis, approved by the Ethics Research Committee (ERC) from *Universidade Federal de Goiás*.

STUDY POPULATION AND SAMPLING

Children aged six months to four years old were included in the main study. The sampling calculation was based on the prevalence of overweight, resulting in 829 children. Eight-hundred and thirty-two participated in the study. Sampling by clusters of permanent private homes happened in three stages: census sectors, residences, and children.

The present analysis included children aged 2 to 4 years old (n = 442). From these, only children whose mothers answered "yes" or "no" to the question about dental pain were included, and 12 whose answers were "I don't know" and 45 who did not answer to this question were excluded. The final sample of the present study was composed of 385 children. Later, the sample statistical power was calculated to verify if the number of children was sufficient to investigate the dental pain outcome based on the maternal educational level exposition factor. With a sample including 385 children, it was possible to find as statistically significant an Odds Ratio (OR) of at least 2.5, considering the outcome prevalence in the group of non-exposed children of 7%, with an 88.5% power, and 95% confidence level.

DATA COLLECTION

After the pilot study, data collection was done with ten pairs of previously qualified interviewers. Parents and/or guardians were interviewed using a structured questionnaire and anthropometric measures. Phone calls were done to 5% of the interviewed subjects with the aim of verifying the questionnaire answers. Kappa's test values varied from 0.68 to 0.95 and they showed a substantial to excellent concordance.

VARIABLES INCLUDED IN THE PRESENT STUDY

The dependent variable was obtained with a report of dental pain sometime in life (Yes/No), which has been used in most studies about the theme[2,3,10].

The demographical variables were age (in complete years) and gender. With regard to socioeconomic variables, it was used the home location in Sanitary Districts (SD) of the municipality. These were divided according to their socioeconomic characteristics: Group I (Campinas-Center SD), located more centrally and with the best indicators; Group II (North, South, and East SD), with intermediate indicators; and Group III (Southwest, West, and Northwest SD), with the worst indicators.

Other variables from this block were: family structure; birth order; daycare frequency; age of parents; educational level of parents; if mom worked in the past year; kind of residence; number of rooms used for sleeping; water supply; acceptance of *Bolsa Família* grant; and socioeconomic class[15].

The health conditions and related behaviors were evaluated using the following variables: child's premature birth; diagnosed health problem; child eats while watching TV; and physical activity practice (at schools). In order to assess breastfeeding-related variables, concepts recommended by the World Health Organization (WHO)[16] and Health Ministry[17] were used. Foods containing addition of sugar were chosen for the intake analysis of aliments: soda and artificial powder juice, chocolates, bonbons, and filled cookies, where the last three ones were grouped in one variable defined as junkie food. Consumption in four days or less in a week was considered as irregular food intake, and five days or more in a week as a regular intake, according to the methodology from PeNSE 2009[12]. The nutritional status was assessed through the body mass index (BMI) for age and age height, recommended by the WHO[18].

DATA ANALYSIS

Firstly, the dental pain prevalence was calculated. Analysis of the factors associated with outcome was performed considering a hierarchical model to determine the worsening (Figure 1)[19].

Variables were divided into three blocks. The demographic characteristics (Block 1) like gender and age, used for controlling the others, are in the more distal level. The socioeconomic conditions (Block 2) hypothetically influence on the health-related conditions and behaviors (Block 3), the most proximal level of the evaluated outcome.

The statistical analysis was performed based on the effect of the sampling design for complex samples and sampling weights in the module Complex Samples from the statistical program Statistical Package for the Social Sciences (SPSS), version 17.0. The OR was used as a measure of effect with 95% confidence interval, obtained in the logistic regression analysis, for identification of the variables associated with dental pain. All variables with a significance level of $p < 0.20$ seen in the bivariate analysis (Rao-Scott χ^2 test) were included in the multiple logistic regression model. Rao-Scott is a corrected Pearson's χ^2 test for an outline effect of the complex sampling used in the present study.

The multiple logistic regression analysis was done following the hierarchical model structured in the variable blocks that were previously described. In every block, it was used the stepwise forward selection procedure, where the model began from the variable with more statistical significance in the bivariate analysis and, then, adding other variables, each by each, through decreasing order of statistical significance. The new variable remained in the multiple model if it presented $p < 0.05$ in Wald's statistics and/or was a control variable. Variables of each block that remained statistically significant ($p < 0.05$) were chosen to form the adjusted regression analysis for the higher blocks, from the analysis of internal multiple regression to every block. Variables from demographic characteristics block continued as control variables for the hierarchically lower blocks, regardless the presented statistical significance, due to the evidence of its association with dental pain reported in previous studies. The adjustment quality of each stage that forms the final model was assessed following the Pseudo R Square that was obtained using Nagelkerke test. It showed that the final model is not different from the complete model and that the remaining variables contributed for explaining the dental pain outcome.

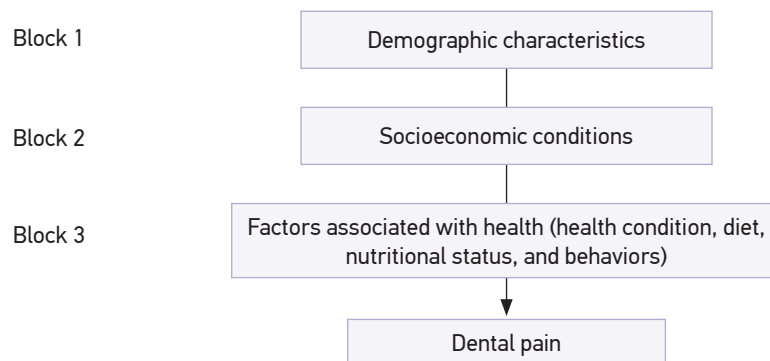| Block 1 | Demographic characteristics |
Block 2	Socioeconomic conditions
Block 3	Factors associated with health (health condition, diet, nutritional status, and behaviors)
	Dental pain

Figure 1. Hierarchical model proposed for the determination of dental pain in children under five years old in Goiânia (GO).

RESULTS

The total sample (n = 385) included mostly the female gender and subjects were between 2 and 3 years old (Table 1). Most parents studied for eight or more years. The majority of families was from C to E socioeconomic classes and only 17.8% received the *Bolsa Família* grant. Dental pain prevalence any time in life was of 9.9% (95%CI 7.4 – 13.1).

Most children used to eat while watching television (56.8%) and did not practice any physical activity at school (93.9%). A great amount of children was already regularly consuming junk food (27.1%) and sugary drinks, like soda (31.7%) and artificial powder juice containing sugar (36.8%). It was also found a high prevalence of overweight (31.9%) (Table 2).

Results from the bivariate analysis of the association between dental pain and demographic and socioeconomic variables are in Table 1. There were statistically significant differences about the mother's educational level, with higher rates of dental pain in children whose mothers had less than 8 years of educational level (p = 0.016). As to health-related variables (Table 2), there was a higher prevalence of dental pain in children who regularly consumed artificial powder juice containing sugar (p = 0.015), compared to those that drank this beverage irregularly.

For the multiple logistics regression analysis, variables with significance level of p < 0.20 seen in the bivariate analysis were chosen. In the block composed of socioeconomic variables, variables included SD, mother's educational level, economic class, and *Bolsa Família* grant. Water supply was not included due to the low frequency of

Table 1. Frequency distribution and results of the bivariate association between dental pain and demographic and socioeconomic variables. Children from 2 to 4 years old, Goiânia (GO), Brazil, 2012.

Variables (n*)	Frequencies n (%)	Dental pain n**	Dental pain %***	p-value****
Dental pain some time in life (n = 385)		38	9.9	
Demographic characteristics				
Age (n = 385)				
2 years old	137 (35.3)	13	9.4	
3 years old	132 (35.1)	12	9.8	0.952
4 years old	116 (29.6)	13	10.7	
Gender (n = 385)				
Male	189 (47.0)	18	9.0	
Female	196 (53.0)	20	10.7	0.566
Socioeconomic characteristics				
Sanitary District (n = 385)				
Group I	47 (13.3)	3	5.4	
Group II	127 (34.8)	11	7.3	0.071
Group III	211 (51.9)	24	12.8	

Table1. Continuation.

Variables (n*)	Frequencies n (%)	Dental pain		p-value****
		n**	%***	
Family structure (n = 385)				
Nuclear	286 (75.8)	28	9.6	0.775
Non-nuclear	99 (24.2)	10	10.8	
Birth order (n = 385)				
1st child	179 (43.8)	19	12.1	
2nd child	127 (33.4)	9	7.4	0.460
≥ 3rd child	79 (22.8)	10	9.5	
Goes to daycare (n = 385)				
No	250 (65.1)	26	10.3	0.752
Yes	135 (34.9)	12	9.2	
Father's age (n = 372)				
≥ 30 years old	225 (58.7)	21	9.0	0.386
until 29 years old	147 (41.3)	17	12.2	
Mother's age (n = 380)				
≥ 30 years old	161 (40.3)	19	11.4	0.563
until 29 years old	219 (59.7)	19	9.0	
Mother's educational level (n = 377)				
≥ 8	306 (78.7)	23	7.3	0.016
< 8	71 (21.3)	14	18.8	
Father's educational level (n = 351)				
≥ 8	269 (74.2)	23	8.9	0.278
< 8	82 (25.8)	11	13.4	
Mom worked in the last year (n = 385)				
No	162 (43.3)	18	11.0	0.563
Yes	223 (56.7)	20	9.1	
Kind of residence (n = 385)				
Masonry with complete finishing	288 (72.8)	27	9.3	0.556
Masonry with incomplete finishing	97 (27.2)	11	11.5	
Rooms used for sleeping (n = 385)				
1 room	79 (21.5)	11	13.8	
2 rooms	176 (44.2)	18	11.0	0.209
≥ 3 rooms	130 (34.3)	9	6.1	
Water supply (n = 384)				
Public supply	357 (93.0)	37	10.5	0.089
Well/cistern	27 (7.0)	1	2.8	
Economic class (n = 385)				
A/B classes	141 (32.9)	11	8.7	
C class	200 (55.2)	19	8.9	0.192
D/E classes	44 (11.9)	8	18.1	
Receives *Bolsa Família* grant (n = 385)				
No	322 (82.2)	27	8.6	0.089
Yes	63 (17.8)	11	15.9	

*Total of valid cases; **total sample without considering the sample weights; ***corrected for sample design; ****Rao-Scott test.

Table 2. Frequency distribution and results of the bivariate association between dental pain and health-related variables. Children from 2 to 4 years old, Goiânia (GO), Brazil, 2012.

Variables (n*)	Frequencies n (%)	Dental pain		p-value****
		n**	%***	
Health conditions				
Premature (n = 385)				
No	343 (89.8)	36	10.2	0.616
Yes	42 (10.2)	2	7.2	
Diagnosed health problem (n = 384)				
No	308 (80.1)	31	10.1	0.583
Yes	76 (19.9)	6	8.0	
Health-related behaviors				
Eats watching TV (n = 382)				
No	163 (43.2)	11	7.2	0.198
Yes	219 (56.8)	26	11.2	
Practices physical activities at school (n = 357)				
Yes	26 (6.1)	3	12.5	0.698
No	331 (93.9)	32	9.7	
Diet (n = 385)				
Breastfeeding				
≥ 1 year	148 (42.1)	13	9.9	0.552
≥ 6 months < 1 year	96 (27.1)	13	12.0	
< 6 months	96 (27.4)	5	5.9	
He/she was never breastfed	4 (3.5)	2	10.6	
Exclusive maternal breastfeeding				
≥ 6 months	184 (48.4)	9	7.8	0.339
< 6 months	191 (51.6)	28	10.9	
Junk food				
Irregular consumption	284 (72.9)	27	9.7	0.859
Regular consumption	101 (27.1)	11	10.5	
Soda				
Irregular consumption	267 (68.3)	23	9.0	0.463
Regular consumption	118 (31.7)	15	11.8	
Artificial powder juice containing sugar				
Irregular consumption	252 (63.2)	18	7.3	0.015
Regular consumption	133 (36.8)	20	14.4	
Nutritional status				
Age BMI (n = 370)				
Appropriate	250 (68.1)	25	10.3	0.890
With overweight	120 (31.9)	12	9.7	
Age height				
Appropriate	355 (95.1)	38	10.7	0.213
Low	18 (4.9)	0	0	

*Total of valid cases; **total sample without considering the sample weights; ***corrected for sample design; ****Rao-Scott test.

children who reported dental pain and whose residences did not have public supply (only one child). After adjustment for the variables from the same block, only mother's educational level remained associated with dental pain. In the block of health-related characteristics, the variables chosen were: eats while watching TV and drinks artificial powder juice containing sugar. After the adjustment, only the latter remained significantly.

The results from the final model of logistic regression analysis are in Table 3. Occurrence of dental pain was associated with the mother's educational level and

Table 3. Frequency distribution and results of the logistic regression of the association between dental pain and independent variables. Children from 2 to 4 years old, Goiânia (GO), Brazil, 2012.

Independent variables	Non-adjusted		Adjusted*	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Block 1 – Demographic factors				
Gender				
Male	1	0.567	1	0.562
Female	1.21 (0.62 – 2.38)		1.22 (0.61 – 2.43)	
Age (years)				
2	1		1	
3	1.06 (0.39 – 2.83)	0.951	1.04 (0.39 – 2.80)	0.941
4	1.15 (0.45 – 2.93)		1.16 (0.46 – 2.94)	
Block 2 – Socioeconomic factors				
Mother's educational level (years)				
≥ 8	1	0.020	1	0.016
< 8	2.95 (1.19 – 7.27)		3.03 (1.24 – 7.39)	
Sanitary District**				
Group I	1			
Group II	1.38 (0.40 – 4.83)	0.077		
Group III	2.58 (0.73 – 9.08)			
Economic class**				
A/B Classes	1			
C Class	1.02 (0.41 – 2.54)	0.169		
D/E Classes	2.32 (0.81 – 6.65)			
Receives *Bolsa Família* grant**				
No	1	0.094		
Yes	2.00 (0.89 – 4.50)			
Block 3 – Health-related factors				
Artificial powder juice contanining sugar				
Irregular consumption	1	0.017	1	0.017
Regular consumption	2.14 (1.15 – 4.00)		2.15 (1.15 – 4.02)	
Eats watching TV**				
No	1	0.202		
Yes	1.62 (0.77 – 3.43)			

*Adjusted for variables in the same block and higher; **variables not kept in the model for presenting p > 0.05 in the adjusted analysis.
OR: Odds Ratio; 95%CI: 95% confidence interval.

consumption of artificial powder juice containing sugar. Adjustment by gender and age did not change the association between dental pain and artificial juice consumption and increased the significance of mother's educational level variable. Children whose mothers had lower educational level (< 8 years) had 3.03 more chances of presenting dental pain compared to those mothers with more educational level. Children who regularly drank juice had 2.15 more chances of presenting pain than those who drank it less frequently.

DISCUSSION

The association found between higher prevalence of dental pain and mothers' low educational level, even after adjustment for other variables, confirms the influence of social inequality in the Brazilian population's oral health. Thus, oral health actions need to be integrated with other sectors like education and social assistance in order to combat health iniquities. The great majority of studies published about dental pain in childhood and adolescence in Brazil shows the effect of one or more socioeconomic factors[4,6-9,12,13].

The relation between economic deprivation and pain was also found with regard to the orofacial pain[20]. An explanation for this finding may be more exposure of the less privileged people to risk factors for oral health problems. Another hypothesis is that less economically privileged subjects would be more exposed to stressful events, and they may present a lower threshold to pain[21].

The association found between dental pain and regular consumption of industrialized juice with sugar constitutes the first evidence of this association, which may happen due to the cariogenic potential of this food component, since there is evidence of the relation between dental pain and caries. Therefore, the higher intake frequency of this kind of juice may be associated with more prevalence of caries, which constitutes an important factor for pain. Another possible explanation may be associated with the socioeconomic condition, since subjects who consume more this kind of food are those with less economic power, who does not have any condition of buying healthier products, like pulp juice[22]. However, in the present study, the association between industrialized juice intake and dental pain did not depend on the socioeconomic condition, it was assessed through the mother's educational level.

Dental caries, main clinical condition related to dental pain, is the most associated disease in the medical literature with the intake of industrialized drinks, like soda, juice, and energizers, which have a high sugar concentration. Another characteristic is its acidity, which favors the dissolution of teeth mineral salts and the formation of an acid plaque, producing dental erosion in different degrees according to the kind of drink[23,24].

Unlike the findings of Freire et al.[12], there was no association between pain and regular intake of sodas and junkie food. This finding may have happened due to the higher consumption of sodas among the population groups with higher income in Brazil[22], which is in disagreement with the relation between dental pain and economic deprivation, and also with what was considered in the group of junkie food in both studies.

Dental pain prevalence in Goiânia, Brazil, was very close to that found in studies about children on the same age range and with a reminiscent period: 9.1% in Recife and 11.3% in Canoas[3,11]. Higher prevalence in this age group was seen in the city of Macapá (21%)[10]. Absence of a significant association between gender and dental pain, seen in the present study, was also reported in previous studies[4,6,13,14,25].

Because this study is part of another larger project, it has implications that should be discussed. Since the instrument for data collection was extensive, it was used only one question about dental pain sometime in life, without assessing more recent periods of pain and its severity. Parents or guardians answered such question. This is the most commonly used method, because children in this age range may sub-report dental pain as a consequence of memory bias. Therefore, we must consider that parents or guardian's reports may not be accurate. Pain may have been a result of, besides dental caries, permanent teeth eruption and deciduous exfoliation. However, clinical variables and oral health behaviors that could be related to dental pain were not included in the study that created the used database.

This present investigation was the first study about dental pain in children younger than 5 years old, with a population basis of domiciliary approach. This is an important fact since, in Brazil, few children in this age range go to kindergarten. Thus, studies with school basis are not representations of this population. Another positive point was the use of sample weights in the sampling process, which makes it a more representative sample of the population.

CONCLUSION

We have concluded that one in every ten children had dental pain in the studied population, and the prevalence was associated with the mother's low educational level and with the intake of artificial powder juice containing sugar. Therefore, the implementation of strategies to improve life conditions and to promote a healthy nutrition has the potential of decreasing oral health problems and the impact on people's quality of life from the dental pain. In addition, amongst the approach of common risk factors, these measures would also cause impacts on the prevalence of other non-communicable chronic diseases like diabetes and obesity, which are presenting increasing rates among the population, especially in infants.

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