

Individual and contextual factors influencing dental health care utilization by preschool children: a multilevel analysis

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Abstract: The effect of contextual factors on dental care utilization was evaluated after adjustment for individual characteristics of Brazilian preschool children. This cross-sectional study assessed 639 preschool children aged 1 to 5 years from Santa Maria, a town in Rio Grande do Sul State, located in southern Brazil. Participants were randomly selected from children attending the National Children's Vaccination Day and 15 health centers were selected for this research. Visual examinations followed the ICDAS criteria. Parents answered a questionnaire about demographic and socioeconomic characteristics. Contextual influences on children's dental care utilization were obtained from two community-related variables: presence of dentists and presence of workers' associations in the neighborhood. Unadjusted and adjusted multilevel logistic regression models were used to describe the association between outcome and predictor variables. A prevalence of 21.6% was found for regular use of dental services. The unadjusted assessment of the associations of dental health care utilization with individual and contextual factors included children's ages, family income, parents' schooling, mothers' participation in their children's school activities, dental caries, and presence of workers' associations in the neighborhood as the main outcome covariates. Individual variables remained associated with the outcome after adding contextual variables in the model. In conclusion, individual and contextual variables were associated with dental health care utilization by preschool children.

Keywords: Dental Health Services; Multilevel Analysis; Child; Oral Health.

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Introduction

Unequal dental health care utilization by preschool children has been demonstrated in developing countries.^{1,2,3,4} Previous studies have suggested that some individual factors, such as being older, having a higher income, having one's own house, having access to preventive oral health information, having better educated parents, and being white children, could explain the reasons for seeking dental care services.^{3,4,5,6,7} Nevertheless, recent studies have demonstrated the importance of contextual factors for different oral health outcomes, including the use of dental services.^{8,9,10,11,12}

In Brazil, the latest official publication showed regional inequality in dental care utilization (SBBRASIL 2010). It is suggested that the economic and social attributes of the community might influence dental care utilization by people who reside in it.¹² Some recent evidence suggests that contextual determinants, such as a higher dentist-to-population ratio, influence dental care utilization by the population.¹²

Taking into account, risk for several conditions in individuals living in a community could be influenced by community context. Therefore, contextual and individual determinants have been used together in multilevel analyses. This allows adjusting individual characteristics by the contextual determinants of communities.^{5,13,14} Presently, few studies use multilevel analysis to assess individual and contextual factors for dental care utilization.^{5,10} Moreover, only one study was carried out with preschool children, showing that the use of dental care utilization was associated with individual factors (demographic, dental health, habits, and socioeconomic factors) and with contextual variables (dental care model).⁵ However, new studies are necessary to investigate other contexts in other regions.

Therefore, the aim of this study is to investigate the effect of contextual factors on dental care utilization after adjustment for individual characteristics of Brazilian preschool children.

Methodology

Ethics approval

This study was approved by the Research Ethics Committee of the Federal University of Santa Maria

and of the School of Dentistry of University of São Paulo, Brazil. A written informed consent was obtained from all parents.

Study design and data collection

A cross-sectional study was performed with preschool children aged 1 to 5 years from Santa Maria, a town in Rio Grande do Sul State, located in southern Brazil. The sample size was calculated as follows: 5% standard error, 80% power, 95% confidence interval, 10% non-response rate, 2:1 ratio of unexposed to exposed subjects, and a prevalence ratio to be detected of at least 1.8. Moreover, the sample design was adjusted to 1.4 (design effect). The minimum sample size was estimated at 456 children.⁴ As the present study was part of a survey in which other outcomes were considered, the final sample size was greater than the minimum required.

Participants were randomly selected from children attending the National Children's Vaccination Day. Fifteen health centers were selected for this research and all of them were equipped with a dental chair. These were the largest health centers in town and more than 85% of the children were vaccinated in these centers during the study.

Fifteen examiners and 30 assistants performed the clinical examination and administered the questionnaire. They had been trained and calibrated before data collection. More information about the methodology and data obtained in this epidemiological survey can be accessed in previous publications.^{4,15,16}

Children were examined for dental caries in a dental chair. Visual examinations followed the ICDAS criteria.^{17,18} As the ICDAS criteria are comparable with standard criteria (WHO) in an epidemiological survey of preschool children,¹⁹ we used the ICDAS cutoff point of 3 (0–2 sound, 3–6 carious) to calculate the decayed/missing/filled teeth (dmft) index. Only severity criteria were used for the analysis. In other words, only teeth with frank cavitation were considered. The sample was dichotomized into decayed teeth > 4 and decayed teeth ≤ 4.

Individual-level independent variables

A structured questionnaire was used to obtain individual data such as demographic variables,

socioeconomic factors, and data on dental health care utilization. The parents answered questions about age, children’s sex, race (black or white),²⁰ family income (less than 1 Brazilian minimum wage (BMW), between 1 and 2 BMW, between 2 and 3 BMW, and more than 3 BMW) parents’ schooling (≥ 8 years of formal education or < 8 years of formal education) and mothers’ participation in their children’s school activities (yes or no).

Contextual independent variables

Two community-related variables were used to assess the contextual influences on children’s dental care utilization: presence of dentists and presence of workers’ associations in the neighborhood (yes or no). These covariates have been previously used as community factors and community-related variables.^{12,13}

Outcome variable

The outcome was measured by a question from the questionnaire: “Has your child ever visited a dentist?” (Yes or No).

Data analysis

The STATA 12.0 software (Stata Corporation, College Station, USA) was used for data analysis. Unadjusted and adjusted multilevel logistic regression models were used to describe the association between outcome and predictor variables. The odds ratio (OR) and the respective 95% confidence intervals (95%CI) were calculated.

In the analysis, children (first level) were nested in neighborhoods (i.e., one of the 15 health centers) (second level). In the first stage, an unconditional model (‘null’ model) estimated the basic partition of data variability between two levels before individual and community characteristics were taken into account.²¹ The second model (Model 2) added covariates at the individual level; the “full” final model (Model 3) included individual factors and contextual covariates. Variables with a p-value ≤ 0.20 in the unadjusted analyses were entered into the adjusted models. They were retained and considered statistically significant in the final models only if they had a p-value ≤ 0.05 after adjustment.

Results

A total of 639 children, 321 males (50.2%) and 318 females (49.8%), participated in this study (91.3% participation rate). Failure to participate was mostly attributed to denied permission by guardians.

Participants were predominantly white and more than half of the caregivers had a high level of education. Most parents had a household income ≤ 3 BMW. A prevalence of 21.6% was found for regular use of dental services (Table 1).

Table 1. Individual and contextual level characteristics of the sample.

Variable	n	%
Individual Level (Child)		
Gender (n = 639)		
Male	321	50.2
Female	318	49.8
Age (n = 639)		
≤ 1 year	129	20.2
2 years	124	19.4
3 years	161	25.2
≥ 4 years	225	35.2
Skin color (n = 639)		
White	501	78.4
Black	138	21.2
Household income (n = 602)		
Less than 1 BMW	158	26.2
Between 1 BMW and 2 BMW	151	25.1
Between 2 BMW and 2 BMW	171	28.4
More than 3 BMW	122	20.3
Mother’s schooling (n = 633)		
≥ 8 years	357	56.4
< 8 years	276	43.6
Father’s schooling (n = 601)		
≥ 8 years	321	53.4
< 8 years	280	46.6
Mothers’ participation in school (n = 632)		
Yes	247	39.1
No	385	60.9
Dental caries (n = 639)		
≤ 4 decayed teeth	551	86.2
> 4 decayed teeth	88	13.7
Contextual level (Neighborhood)		
Workers’ association (n = 639)		
Present	245	38.4
Absent	394	63.7
Presence of Dentists (n = 639)		
Present	548	85.8
Absent	91	14.2

Table 2. Unadjusted assessment of the association of dental health care use among preschool children with individual and contextual-level variables.

Variable	n	Have never gone to the dentist	
		n (%)	OR (95%CI)
Individual-level variables			
Gender	639	497 (78.39)	
Male	321	247 (77.39)	1
Female	318	250 (79.62)	1.15 (0.79–1.68)
Age (year)	639	497 (78.39)	
≤ 1	129	114 (89.06)	1
2	124	104 (84.55)	0.67 (0.32–1.40)
3	161	128 (80.50)	0.80 (0.25–1.00)
≥ 4	225	151 (67.41)	0.25 (0.13–0.47)
Skin color	639	497 (78.39)	
White	501	394 (78.96)	1
Black	138	103 (76.30)	0.85 (0.54–1.34)
Household income	602	468 (78.39)	
Less than 1 BMW	158	134 (85.90)	1
Between 1 BMW and 2 BMW	151	116 (77.85)	0.57 (0.31–1.04)
Between 2 BMW and 2 BMW	171	132 (77.65)	0.57 (0.32–1.01)
More than 3 BMW	122	86 (70.49)	0.39 (0.21–0.71)
Mother's schooling (year)	633	492 (78.34)	
≥ 8	357	262 (73.80)	1
< 8	276	230 (84.25)	1.89 (1.26–2.83)
Father's schooling (year)	601	465 (77.89)	
≥ 8	321	233 (72.81)	1
< 8	280	232 (83.75)	1.92 (1.28–2.88)
Mothers' participation in school	632	491 (78.31)	
Yes	247	172 (69.92)	1
No	385	319 (83.73)	2.21 (1.50–3.25)
Dental caries	639	497 (78.39)	
< 4 decayed teeth	551	439 (80.40)	1
≥ 4 decayed teeth	88	58 (65.91)	0.47 (0.28–0.76)
Contextual-level variables (children living in the neighborhood)			
Workers' association	639	497 (78.39)	
Present	245	176 (72.43)	1
Absent	394	321 (82.10)	1.74 (1.19–2.55)
Presence of Dentists	639	497 (78.39)	
Present	548	425 (78.13)	1
Absent	91	72 (80.00)	1.12 (0.64–1.95)

Table 3. Multilevel Adjusted Assessment of dental health care use among preschool children associating individual and contextual variables.

Fixed effects	Model 1 ("null")	Model 2	Model 3
	OR(CI 95%)		
Intercept	3.55 (2.73–4.63)	6.62 (2.75–15.93)	4.86 (1.96–12.07)
Individual level (child)			
Gender			
Male		1	1
Female		1.08 (0.71–1.64)	1.07 (0.70–1.63)
Age (year)			
≤ 1		1	1
2		0.74 (0.34–1.62)	0.76 (0.34–1.66)
3		0.59 (0.29–1.21)	0.59 (0.29–1.22)
≥ 4		0.32 (0.16–0.64)	0.33 (0.17–0.65)
Skin color			
White		1	1
Black		0.67 (0.40–1.13)	0.68 (0.40–1.15)
Mother's schooling (year)			
≥ 8		1	1
< 8		1.95 (1.19–3.21)	1.91 (1.16–3.15)
Household income			
Less than 1 BMW		1	1
Between 1 BMW and 2 BMW		0.63 (0.33–1.18)	0.65 (0.34–1.22)
Between 2 BMW and 2 BMW		0.67 (0.35–1.26)	0.72 (0.38–1.36)
More than 3 BMW		0.49 (0.24–0.99)	0.52 (0.26–1.06)
Mothers' participation in school			
Yes		1	1
No		1.76 (1.15–2.71)	1.80 (1.17–2.77)
Dental caries			
≤ 4 decayed teeth		1	1
> 4 decayed teeth		0.50 (0.28–0.89)	0.51 (0.29–0.91)
Contextual level: Neighbourhood			
Workers' association			
Present			1
Absent			1.65 (1.04–2.60)
Presence of Dentists			
Present			1
Absent			0.74 (0.38–1.41)
Random effects			
Deviance (-2loglikelihood)	6.584.654	55.855.884	55.380.134

Model 1 ("null"): represents the unconditional model; Model 2: represents individual covariates; Model 3: represents subject and contextual-level covariates.

Table 2 shows the unadjusted assessment of the associations of dental health care utilization with individual and contextual variables. The analysis included children's ages, household income, parent's schooling, mothers' participation in their children's school activities, dental caries, and presence of workers' associations in the neighborhood as the main outcome covariates.

After adjusting for the individual covariates (Table 3 - Model 1), children's ages, household income, mother's schooling, mothers' participation in their children's school activities, and dental caries were identified as individual determinants of dental health service utilization. These variables remained associated with the outcome after adding the contextual variables in the model (Model 3). A higher use of dental health services was observed among those living in neighborhoods with workers' associations.

Discussion

International guidelines recommend that infants have an initial oral health evaluation in the first year of life.^{22,23} Evidence suggests that an early visit to the dentist (in the first year of life) should help prevent dental disease.^{6,24} Moreover, early educational oral health programs for mothers could increase the use of dental services by preschool children.²⁵ However, previous studies showed that dental care utilization by preschool children is low and is associated with socioeconomic factors.^{3,4,5,26}

In our study, socioeconomic factors were related to the use of dental care, as reported by other authors.^{3,4,5,26} The current study considered household income and parents' schooling as proxies for socioeconomic status, which were identified as individual determinants for the outcome. Notwithstanding, only mother's schooling was fitted into the final model after adjustment for contextual variables. Children whose mothers did not complete primary education were less likely to use dental services. It is known that poor educational level may lead to low income, unemployment, and poor occupational status. Financial costs and low level of information about the importance of oral health could be a hindrance to dental care.²⁷ Table 3 shows that socioeconomic variables affected the use of oral

health services at both individual and contextual levels. This finding confirms previous reports on the importance of investigating the impact of contextual factors on oral health outcomes.^{8,9,10,28}

Moreover, most children who participated in our study had their first dental visit after the age of 4 years. Only 14 children went to the dentist before their first year of life, as recommended by international guidelines.^{22,23} These findings could be related to socioeconomic status and availability of dental care.^{29,30} In other words, a social gradient in health is present in dental service utilization.

This study also verified that mothers' participation in their children's school activities positively influenced dental care utilization. Participative mothers were more likely to take their children to the dentist. We suggest that mothers who keep track of the school activities are more concerned with everything that involves their children, including oral health. Socioeconomic factors could be part of this relation. Generally, mothers with a higher family income are better informed and can afford to monitor their children in all aspects. Therefore, participation in children's school activities could be strongly modulated by socioeconomic status. Nevertheless, further studies are needed for comparison of our results. To our knowledge, no earlier study had investigated this association in the literature.

Furthermore, a significant effect of social context on dental care utilization by preschool children was verified in our analysis. In the final model, the number of workers' associations located in the neighborhood could be noted at the contextual level, as children who lived in areas with workers' associations were more likely to go to the dentist. This contextual variable could be related to social support. Neighborhood connection, such as time spent with friends that attend the meetings of an association can be a proxy for social support and social capital.^{31,32} We suggest that frequency of contact with friends may reduce social isolation, which plays an important role in maintaining oral health. In other words, oral health behaviors can be influenced by social controls. Participation in workers' associations implies interaction between

individuals, which may suggest the transmission of good ideas and healthier choices.^{13,33}

Regarding contextual variables, in this study, the prevalence of dental health care utilization was not influenced by the presence of dentists in the neighborhood (Table 3), which is in disagreement with a previous study¹² that analyzed data from the six largest metropolitan counties in Ohio, USA. Our study was conducted only in Santa Maria, Brazil, where there are a large number of dentists per capita. Almost all the participants in our study lived in areas where there were dentists. This could possibly explain our findings.

The cross-sectional design could be a possible limitation of our study. Therefore, our results should be interpreted along with the limitations of this type of study. Moreover, the number of workers' associations was provided by the local authorities and it is possible that it might not be perfectly correct, despite the fact that this information has been used in official local publications.

In our analysis, we used the multilevel approach to verify the extent to which the outcome is accounted for by contextual and individual variables. We adjusted the models according to the region where the children lived. Recent research has reported that contextual variables, such as city-level variables (suburbs with the worst social exclusion indices; socially-deprived areas), can negatively influence oral health outcomes.^{34,34} Therefore, assessing the characteristics of the neighborhood in which children live is important for the investigation into oral health inequalities.

Conclusion

In conclusion, individual and contextual variables are associated with dental health care utilization by preschool children. Therefore, these variables must be taken into consideration for redirection of resources allocated to public health and for the formulation of oral health policies.

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