

# Are maternal factors predictors of a child's first dental visit? A birth cohort study in Brazil

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**Abstract:** The purpose of this study was to investigate the association between maternal factors and dental visits of children within their first year of life. This study used data from the 2015 Pelotas Birth Cohort and included pregnant women and their children at 12 months of age, followed-up between May 2014 and December 2015. Socioeconomic and demographic data, information on the use of dental services during the last year, and information on dental fear were collected by interviewing the mothers. Information regarding dental caries and periodontal disease were collected during the mother's clinical examination. The date of each child's first visit to the dentist was recorded. Crude and adjusted Poisson regression models with robust variance were used. The sample comprised 2,287 mother-child dyads, of which 10.1% of children visited the dentist during the first year of life. Children whose mothers visited the dentist within the last year for preventive reasons (RR: 1.51; 95%CI: 1.12–2.03) or curative reasons (RR: 1.47; 95%CI: 1.08–2.01) were more likely to have visited the dentist during the first year of life compared to those whose mothers had not used dental services during this period. Maternal tooth loss was inversely associated with a child's visit to the dentist during the first year of life (RR: 0.69; 95%CI: 0.54–0.89). Considering the mother's history of using dental services, as well as their dental caries history, is necessary to understand and improve patterns of dental health care utilization and implement public oral health policies for young children.

**Keywords:** Pediatric Dentistry; Dental Caries; Mother-Child Relations; Cohort Studies.

## Introduction

A recent systematic review revealed that the prevalence of early childhood caries at age 5 varied from 23% to 90%, with the majority of the studies showing a prevalence higher than 50%.<sup>1</sup> In 2015, 7.8% of children worldwide were estimated to have untreated dental caries in their primary dentition.<sup>2</sup> Early childhood caries has a negative impact on children's oral health-related quality of life.<sup>3</sup> Establishing practices to maintain good oral health early in life is crucial for reducing the burden of dental caries in primary teeth; thus, it is important that children begin visiting the dentist early. A baby's first dental visit has been recommended



by the American Academy of Pediatric Dentistry to occur at the emergence of the first tooth and no later than 12 months of age.<sup>4</sup>

The first dental visit should occur mainly for preventive reasons, early diagnosis, and treatment of oral diseases,<sup>4,5</sup> and can improve the child's oral and general health, well-being, and performance in school.<sup>5</sup> In addition, the number and costs of dental procedures is lower for children who visited the dentist at an earlier age, confirming that the sooner the dental visit, the less the treatment needs in the future.<sup>5</sup> However, only a low percentage of children worldwide undergo their first dental visit at the recommended age, ranging from 0.3% to 13.5%.<sup>6-11</sup>

Mothers are still considered the primary caregiver of their children, including being responsible for their oral health care.<sup>12</sup> Studies have found that maternal characteristics, including age, poor oral hygiene habits, presence of decayed teeth, gingival bleeding, and irregular dental visiting patterns, may negatively influence the child's oral health conditions.<sup>10,12-15</sup> A study also reported that mothers of children aged between 12 and 18 months who had never been to the dentist or who only visited a dentist to resolve a dental problem were less likely to have children that had already visited the dentist.<sup>10</sup> However, the study was not representative of the population and had a cross-sectional design; thus, the findings should be interpreted with caution.

Longitudinal studies are ideal for evaluating the influence of different exposures on a determined outcome.<sup>16</sup> Two studies in a cohort of adolescent mothers showed that maternal oral care practices and oral conditions (namely, the presence of caries and gingival bleeding) influenced the occurrence of dental caries in their offsprings.<sup>15</sup> Moreover, maternal characteristics may affect the seeking of a child's oral health care.<sup>12</sup> Thus, the aim of this study was to investigate the association between maternal factors and the dentist-visiting habits of the mother's offspring within the latter's first year of life.

## Methodology

This study was approved by the Human Research Ethics Committee of the Federal University of Pelotas

under protocol number 717.271. Written informed consent was obtained from the mothers that approved participation in the research, including in all follow-ups.

This is a cohort study, carried out in the 2015 Pelotas (Brazil) Birth Cohort Study, and follows the STROBE recommendations. A detailed information on the cohort methodology has been published previously.<sup>17</sup>

## Study setting

### The 2015 Pelotas (Brazil) birth cohort study

Pelotas has 344,000 inhabitants and is located in Southern Brazil. Its economy is based on agriculture (rice and cattle), commerce, and education.

This is the fourth cohort from Pelotas, and comprised babies born in the urban area. While the previous cohort studies (1982, 1993, 2004) began at the birth of the child, the study conducted in 2015 included pregnant women, who were recruited during antenatal care.

### Antenatal study

The antenatal study included all women who were residents of the urban area of Pelotas with confirmed pregnancy and estimated delivery dates between December 2014 and May 2016. This time interval considered two situations: a possible error range in the calculation of gestational age and preterm births. The 123 public health facilities and private clinics providing antenatal care in the city were contacted weekly, between May 2014 and December 2015, in order to include all potential mothers in 2015. Women were visited at home at 16–24 weeks of gestation to answer a questionnaire that included questions about general health and sociodemographic and oral health information, and an oral health clinical examination was performed. Prior to the interviews, the women signed an informed consent to participate.

### Oral health assessment: a sub-study of the 2015 Pelotas (Brazil) birth cohort study

During the home visits of the pregnant women, data was collected regarding their dental visits within the last year with the question: "Did you visit the dentist within the last 12 months" and

included the following response options: No; Yes, for prevention/routine checkup; Yes, due to a problem. Additionally, dental fear was investigated with the following question: "Are you afraid of visiting the dentist?" (No/Yes). For the oral examination, a team consisting of 15 dentists was previously trained and calibrated with four hours of theoretical training and the criteria for oral conditions were discussed. For the calibration process, 20 volunteers were clinically examined. Dental caries was evaluated using the Decayed, Missing, and Filled Teeth (DMFT) index and the periodontal condition was assessed by measuring the clinical attachment loss (CAL). Internal consistency was assessed using the weighted kappa coefficient and intra-class correlation coefficient. Inter-examiner agreement was tested against a 'gold standard' examiner. Inter-examiner kappa values for dental caries ranged from 0.81 to 0.94. The intra-class correlation coefficient for CAL ranged from 0.74 to 0.91.

### Children's 12-month follow-up

The 12-month follow-up of children was conducted through home visits when they turned one, via face-to-face interviews.

As in the antenatal study, a semi-structured questionnaire was administered to the mothers by trained interviewers with experience in epidemiological studies. The interviewers underwent a theoretical-practical training of 40 hours in order to standardize the entire data collection process. They then conducted experimental interviews in order to identify comprehension difficulties and inconsistencies in the instruments.

### Outcome

The outcome (the use of dental services by the child during the first year of life) was recorded when children completed 12 months of age, and was evaluated using the following question: "Has the child ever visited the dentist?" at the 12-month follow-up. The response options were 'No' and 'Yes (subdivided into: Yes, routine/prevention; Yes, pain-related problem; Yes, non-painful problem)'. A lack of response or the answer 'I do not know/remember' was considered to be missing information and the respective children were not included in the study.

### Independent variables

During the prenatal accompaniment, data on maternal age, maternal schooling, information about whether the mother lived with a partner, and variables related to maternal oral health were collected. Maternal age was collected in the form of continuous years and divided into three categories (< 20 y, 20–34 y, and >34 y). The period of maternal schooling was collected in the form of continuous years and categorized into 0–4 y, 5–8 y, 9–11 y, and ≥ 12 y. Information about the mother cohabiting with a partner was collected and dichotomized (No and Yes).

Information related to the use of dental services within the last year (No; Yes, due to preventive treatment; Yes, due to curative treatment) and dental fear (No and Yes) was also collected during interviews.

Clinical evaluations included the assessment of maternal dental caries using the DMFT index and periodontal conditions using the CAL measurements. Clinical evaluations followed all the biosafety guidelines recommended by the World Health Organization.<sup>18</sup> Each item of the DMFT index was analyzed individually and dichotomized as "No" or "Yes" for each component (≥ 1 for decayed, missing, or filled components). Periodontal disease was classified according to the recommendations of the American Academy of Periodontics, developed in partnership with the Center for Disease Control and Prevention.<sup>20</sup> This classification considers three stages of the disease: a) mild periodontal disease: when a pregnant woman presents with two or more sites interproximal with at least 3 mm of insertion loss and two or more interproximal sites with ≥ 4 mm or a site with a drill depth of ≥ 5 mm (not on the same tooth); b) moderate periodontal disease: when at least two teeth show a loss of an interproximal insertion of 4 mm or greater, or at least two teeth exhibit a depth of 5 mm or more in interproximal locations; and c) severe periodontal disease: when at least two teeth have a 6 mm or greater interproximal insertion loss and at least one tooth has a 5 mm or greater deep pocket in interproximal locations. For analysis, the outcome was dichotomized into the "presence" (mild, moderate, or severe) or "absence" of periodontal disease.

## Data analysis

Exploratory statistical analyses were performed using Stata 14.0 (Stata Corporation, College Station, USA). Initially, a descriptive analysis for a variable of interest was performed, which presented absolute and relative frequencies according to the outcome (the use of a dental service during the first year of the child's life). Crude and adjusted Poisson regression models with a robust variance were used to assess the association between the maternal variables and outcome. The risk ratio (RR) was obtained with a 95% confidence interval (CI). A significance level of 0.05 was adopted. All variables with  $p$  values  $\leq 0.25$  in the crude analysis were included in the model fitting. A backward stepwise procedure was used to exclude the exploratory variables from the highest to the lowest  $p$ -value, until all variables reported  $p$  values  $\leq 0.250$ . In the final model, variables were considered significant if they had a  $p$  value of  $\leq 0.05$  after adjustment.

## Results

In the antenatal follow-up, 3,199 pregnant women were included, of which a total of 3,100 women were examined by dentists in the oral health assessment study with 25 women refusing to participate. From these pregnant women, 2,496 delivered their babies during 2015 (80.1%) from which 2,387 mother-child dyads were included in this study. A total of 100 mother-child dyads were excluded due to missing data.

The prevalence of children who visited the dentist during the first year of life was 10.1% ( $n = 242$ ). Only one mother was unable to answer whether the child had already been to the dentist during the first year of life (0.04%). Among the included children, the average age at the time of visit was 7 months. The reasons for the first visit were as follows: 90.9% due to a routine checkup/prevention, 3.7% due to pain-related problems, and 5.4% due to problems without pain. The majority of the children were boys (51.4%) (data not shown).

Table 1 shows the descriptive analyses of the sample sorted by independent variables and their distribution according to the use, or lack of use of a dental service by children during their first year

of life. There was an association between maternal use of dental services in the last year and maternal tooth loss among children who used a dental service within the first 12 months of their life.

Table 2 shows the results of the regression analysis. We found that the use of a dental service during the first year of the child's life was associated with the maternal use of a dental service in the last year and maternal tooth loss. Children whose mothers visited the dentist within the last year for preventive reasons (RR: 1.51; 95%CI: 1.12–2.03) or curative reasons (RR: 1.47; 95%CI: 1.08–2.01) were more likely to visit the dentist during the first year of life than children whose mothers had not used a dental service during this period. Maternal tooth loss was inversely associated with a child's visit to the dentist during the first year of life (RR: 0.69; 95%CI: 0.54–0.89). Maternal age showed a borderline association with the child's dentist visiting pattern, with older mothers ( $> 34$  y) more likely to take their child to the dentist compared to younger mothers ( $< 20$  y).

## Discussion

The main results of this study are that a low percentage of children (10%) from the 2015 Pelotas Birth Cohort visited the dentist during the first year of life and that maternal oral health factors were associated with the visiting pattern. Mothers that visited the dentist within the last year, regardless of the reason, were more likely to take their children to the dentist during the first year of life, while the presence of missing teeth in mothers was associated with a lower probability of the occurrence of such visits.

The low prevalence of dental visits within the first year of life observed in this study is similar to the previous study findings reported in the literature.<sup>6-11</sup> A previous study carried-out in Pelotas, five years earlier, found a prevalence close to 5% of the use of dental services during the first year of a child's life,<sup>10</sup> showing that no substantial change has been observed between the two periods. Two studies performed in cities also located in southern Brazil observed similar prevalence rates.<sup>7,8</sup> Moreover, similar results have also been observed across various countries

**Table 1.** Descriptive analyses of the sample sorted by maternal sociodemographic and dental related factors (independent variables) and its distribution according to child use of dental services until 12 months of age in a birth cohort in the city of Pelotas, RS, Brazil, 2020 (n = 2,387).

Variables	No		Yes		p-value
	n	(%)	n	(%)	
Age (years)*					0.238
< 20	299	(92.0)	26	(8.0)	
20–34	1,551	(89.7)	177	(10.2)	
> 34	294	(88.1)	40	(11.9)	
Education level (years)*					0.081
0–4	167	(95.4)	8	(4.6)	
5–8	456	(88.9)	57	(11.1)	
9–11	734	(89.7)	84	(10.3)	
≥ 12	780	(89.3)	93	(10.6)	
Living with partner*					0.514
No	344	(90.8)	35	(9.2)	
Yes	1,795	(89.7)	207	(10.3)	
Use of a dental service within the last year*					0.006
No	807	(92.3)	67	(7.7)	
Yes, due to preventive treatment	672	(87.8)	93	(12.2)	
Yes, due to curative treatment	644	(88.8)	81	(11.2)	
Dental fear*					0.951
Yes	402	(89.9)	45	(10.1)	
No	1,741	(89.8)	197	(10.2)	
Decayed teeth					0.602
No	1,287	(90.1)	141	(9.9)	
Yes	858	(89.5)	101	(10.5)	
Missing teeth					0.013
No	1,185	(88.5)	154	(11.5)	
Yes	960	(91.6)	88	(8.4)	
Filled teeth					0.254
No	325	(91.5)	30	(8.4)	
Yes	1,82	(89.6)	212	(10.4)	
Periodontal disease					0.492
Presence	319	(90.8)	32	(9.12)	
Absence	1,826	(89.7)	10	(10.3)	

\*Absence of information.

and economies. In countries with high-income economies, the prevalence of the first dental visit at the recommended age is even lower, as observed in the USA (2%),<sup>6</sup> Canada (0.3%),<sup>9</sup> and Poland (0.6%).<sup>11</sup>

The lack of health literacy in relation to the importance of dental visits during the first year may be a reason for such a low prevalence. Despite being underfunded, Brazil has the largest public health system in the world, which provides free dental care (Smiling Brazil, launched in 2004). The

system provides health care for vulnerable groups, while the wealthiest 25% of the population have access to private care.<sup>21</sup> Preventive and curative care is offered to the entire population, including children, and the system includes strategies for the care of pregnant women.

Notably, on comparing two national surveys, the opportunity for free dental care and a greater integrative dental care system has been highlighted as one of the reasons for the reduction in dental caries

**Table 2.** Crude and adjusted analyses of maternal variables and child use of dental services until 12 months of age in a birth cohort in the city of Pelotas, RS, Brazil, 2020 (n = 2,387).

Variables	Child use of dental service			
	RR <sup>c</sup> (95%CI)	p-value	RR <sup>a</sup> (95%CI)	p-value
Age (years)		0.100		0.052
< 20	1.00		1.00	
20–34	1.28 (0.86-1.90)		1.28 (0.87-1.89)	
> 34	1.47 (0.92-2.36)		1.53 (0.96-2.43)	
Education level (years)		0.149		
0–4	1.00			
5–8	2.43 (1.18-4.99)			
9–11	2.24 (1.10-4.55)			
≥ 12	2.33 (1.15-4.71)			
Living with partner		0.516		
No	1.00			
Yes	1.11 (0.79-1.57)			
Use of a dental service within the last year		0.012		0.010
No	1.00		1.00	
Yes, due to preventive treatment	1.58 (1.17-2.13)		1.51 (1.12-2.03)	
Yes, due to curative treatment	1.45 (1.07-1.98)		1.47 (1.08-2.01)	
Dental fear		0.951		
No	1.00			
Yes	1.01 (0.74-1.37)			
Decayed teeth		0.602		
No	1.00			
Yes	1.06 (0.83-1.35)			
Missing teeth		0.013		0.002
No	1.00		1.00	
Yes	0.73 (0.56-0.93)		0.69 (0.54-0.89)	
Filled teeth		0.258		
No	1.00			
Yes	1.23 (0.85-1.77)			
Periodontal disease		0.495		
Presence	1.00			
Absence	1.13 (0.79-1.61)			

RR: risk ratio; CI: confidence interval; <sup>c</sup>crude analysis; <sup>a</sup>adjusted analysis.

observed in the primary dentition.<sup>22,23</sup> However, the prevalence of dental caries at age 5 is still high (53.4%), and therefore there is room for improvements, including the need for increasing the frequency of early dental visits. Notably, the belief that primary teeth can be salvaged because they will eventually be replaced by permanent teeth is still present in the general population and could contribute toward parents not visiting the dentist during the early ages of their child. The integration of oral health promotion into primary medical care is strongly needed, and

collaboration with the medical community, considering the importance of oral health in relation to general health, is essential to provide a timely referral of each child to a dental office at the recommended age.<sup>6</sup>

Our data revealed that children whose mothers used dental services within the last year, regardless of whether for a preventive or curative reason, had a higher probability of visiting the dentist during the first year of life. The result is in line with previous study findings that show that the use of maternal dental services is a predictor of the use of children's



dental services.<sup>8,10,14</sup> Additionally, it is consistent with studies that report that for any medical consultation, maternal use of dental services is significantly associated with the child's use of dental services.<sup>23</sup> This can be explained by the fact that young children depend on their caregivers, especially mothers, to take care of their health needs.<sup>24</sup> When mothers have a habit of taking care of their own oral health, they end up transferring this habit to their children.<sup>25</sup> On the other hand, the main cause of the child's lack of treatment may be the lack of information and guidance on the importance of early dental care. The results of this study may have implications on health policy strategies; for example, mothers may be considered the primary target in any resulting policy to change the child's utilization of dental services. Facilitating regular preventive dental visits for the mothers, even during pregnancy, could improve the future oral health behavior of their children.

A recent systematic review,<sup>26</sup> which examined a conceptual model on factors that influence outcomes in children's oral health, showed that several factors may be potentially influenced by the maternal figure, including dental care utilization and oral health behaviors and practices. Our findings are in line with these results, demonstrating the influence of mothers' dental visit patterns on their babies' first dental visit.

Maternal tooth loss was inversely associated with dental visits of children at the recommended age. Previous findings indicate that tooth loss implies not only dental disease but also patients' attitudes towards their own oral health.<sup>27</sup> However, tooth loss is a complex outcome and has been associated with unfavorable contextual and individual factors reinforcing the impact of social inequalities on missing teeth. A lack of dental care over the course of one's life,<sup>27</sup> lower municipal human development index, absence of public water fluoridation, low education levels, low family income, no previous use of dental services, and a greater elapsed time period since the last dental consultation have been associated with tooth loss.<sup>27-29</sup> With the mother often being the primary person responsible for the oral health care of their children, the former's attitudes, knowledge, and habits are reflected in childcare.<sup>12</sup> However, a lack of oral health of the mothers and their offspring is a

reflection of several social and economic determinants that can hamper the quality of family life.

An association between maternal periodontal disease and dental caries and a child's first dental visit may have been expected but was found with the variables in our study. Herein, the main reason for seeking dental care during the first year of life was found to be for routine/preventive reasons, which was different from those at other ages. During the preschool age, the main use of dental services is to resolve a problem, such as dental caries.<sup>8,30</sup> Therefore, during a child's first year of life, the main reason for a dental visit is different from that at other ages, and consequently, a different maternal profile may also be expected at a different age of the child. In this study, the fact that most children visited the dentist for a routine checkup or preventive care precluded the use of this outcome, which was stratified by the reason for the first dental visit. Our sample primarily comprised young mothers (most aged 20–34 y), and consequently, the prevalence of periodontal disease was very low,<sup>31</sup> and may explain the absence of the association with the outcome.

The association between maternal schooling and the first dental visit was not observed in the final model after considering other factors. However, when the categories were considered individually, the CIs revealed an association. A study in the same city observed that children with mothers that presented with lower levels of education demonstrated a lower prevalence of dental visits. However, the study had a cross-sectional design, and only a descriptive analysis was performed without considering the confounding factors. Although it was performed as part of a national vaccination campaign, the eligibility criteria of the study affected the representativeness of the sample, especially because it was nested in a randomized clinical trial. In contrast, our study is a birth cohort study with a sample of more than 2,000 children followed-up since the pregnancy of their mothers.<sup>10</sup> Hartwig et al.'s study considered dental visits until the child was 18 months old, while in the present study, dental visits during the first year were considered. Thus, despite having been conducted in the same city, differences in results are expected and data comparisons should be assessed with caution.<sup>10</sup>

The progressive nature of dental diseases can quickly diminish the general health and quality of life of children, leading to pain and aesthetic problems, compromising the child's ability to eat well, sleep well, and function well at home and at school, thereby undermining their self-esteem and social development.<sup>3</sup> Thus, early dental visits enable the identification of individual risk factors of oral diseases, parental counseling and education, and initiation of preventive care procedures. Studies on the predictors of a child's first dental visit appear to provide important information for planning healthcare strategies that could decrease oral health diseases and assist to better allocate economical resources.

We highlight some major strengths of this study. The present investigation was nested in a birth cohort study, which collected data since pregnancy through face-to-face interviews and clinical examinations, and included more than 4,000 children and their mothers. Longitudinal studies of this nature are considered adequate to evaluate the effects of different exposures on a given outcome.<sup>16</sup> In addition, the data collected are more reliable, since they were obtained close to the event, and avoid a risk of memory bias. The study has a large sample size, with more than 2,400 dyads enrolled, and is thus one of the largest population-based studies on this topic, which reinforces our findings.

This study has some limitations. The mothers were asked for information about their use of dental services within the last year. This information was collected during pregnancy, which is often a unique period in a woman's life, and several myths and controversies related to dental care are often considered, which in

turn can reduce or delay the use of dental services. Since access to health services is a multifaceted and multidimensional issue,<sup>32</sup> it was difficult to determine whether the number of dental visits were influenced by the access to dental services, rather than by the dental visit itself.

## Conclusion

An association between maternal use of preventive dental care and a child's first dental visit during the first year of life was found. Additionally, maternal tooth loss due to dental caries was inversely associated with a child's first dental visit. Considering patterns of dental service availed by mothers, as well as their dental caries history is necessary to understand and improve patterns in dental health care utilization and implementing public oral health policies for young children.

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