



Pesquisa Brasileira em Odontopediatria e  
Clínica Integrada

ISSN: 1519-0501

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Brasil

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Pesquisa Brasileira em Odontopediatria e Clínica Integrada, vol. 15, núm. 1, 2015  
Universidade Estadual da Paraíba  
Paraíba, Brasil

Available in: <http://www.redalyc.org/articulo.oa?id=63741065023>

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Original Article

## Prevalence of Teething Symptoms in Primary Teeth and Associated Factors: Cross-Sectional Study in Children aged 12-23 months in Pelotas, Brazil

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Academic Editors: Alessandro Leite Cavalcanti and Wilton Wilney Nascimento Padilha

Received: 22 December 2014 / Accepted: 01 July 2015 / Published: 30 July 2015

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### Abstract

**Objective:** To identify the main teething symptoms reported by mothers and associated factors. **Material and Methods:** Cross-sectional study conducted with mothers of children aged 12-23 months visiting 12 public health care centers during National Children Vaccination day in Pelotas, Rio Grande do Sul, Brazil, in 2011. Mothers were interviewed and information on teething symptoms and socioeconomic (family structure, income, maternal schooling and child skin color) and demographic variables (maternal age and child sex) was collected. Chi-square, Fisher exact test and Poisson regression analyses were performed ( $P < 0.05$ ). **Results:** A total of 188 mother-child pairs were interviewed. Teething symptoms were reported by 91.93% mothers. Symptoms most frequently reported were excessive salivation (67.7%), irritability (65.2%), fever (44.1%), feeding difficulty (34.2%) and sleep disturbance (31.7%). Teething symptoms were not associated with socioeconomic and demographic variables investigated ( $p > 0.05$ ). **Conclusion:** Most mothers linked children symptoms with primary teeth eruption. Excessive salivation and irritability were the symptoms most reported by mothers. Socioeconomic and demographic variables were not statistically associated with maternal report of teething symptoms in their children. Dentists should provide adequate orientation to mothers and follow up their children. Dentists should refer to medical care services if symptoms persist, once these symptoms can be attributed to other causes.

**Keywords:** Tooth Eruption; Deciduous Teeth; Signs and Symptoms.

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## Introduction

The eruption of primary teeth is a physiological process in which there is the translocation of the developing tooth through the bone by a coordinated bone metabolism up to reaching a working position in the oral cavity [1].

The relationship between tooth eruption and the emergence of local and systemic alterations is controversial among dentists and physicians. In this context, there are two lines of thought: one believes that, for being a physiological process, tooth eruption could not bring any change in the child, while another believes that there is a series of local and systemic symptoms that could be associated with the eruption process [2].

Some of the main symptoms reported by parents, pediatricians and dentists associated with the eruption of primary teeth are diarrhea, sialorrhea, loss of appetite, fever, irritability, cough, vomiting, difficulty sleeping and runny nose [3,4]. Some of these conditions may result from local changes that occur with the tooth movement, generating gingival inflammation that causes itching, swelling and gingival erythema. These symptoms can also be attributed to a complex interaction of inflammatory cells, enamel matrix proteins and immunoglobulin E (IgE), which results in a hypersensitivity reaction, thereby causing systemic disorders [5].

Another important factor is stress generated by multiple dental eruptions, which is sufficient to decrease the child's resistance to infection, and tooth eruption may indirectly affect the child's overall health, making him more vulnerable to infectious diseases [6], justifying increasing temperature, cough, runny nose, lethargy, gastrointestinal disorders, cough, convulsions, herpes and other events occurred during this period. Thus, fever conditions are usually related to a viral origin and not to tooth eruption [7], since tooth eruption is insufficient to determine these symptoms, although these symptoms may occur concomitantly to the eruptive process. Thus, even though parents and some health professionals associate tooth eruption to the onset of some symptoms, other organic causes should be excluded in order to avoid more serious health complications [8].

The eruption of primary teeth is an important stage in child development and parents may have different perceptions about this phenomenon, especially in different cultural, social and economic contexts. The analysis of possible related factors can identify risk groups and will enable establishing important preventive measures aiming to clarify and guide parents. Thus, the aim of this study was to identify the main teething symptoms reported by mothers, associating their perceptions to socioeconomic and demographic variables.

## Material and Methods

### Study design, participants and location

This cross-sectional study was conducted in Pelotas and included 188 children aged 12-24 months randomly selected in 12 Basic Health Units in the National Vaccination Day in June 2011. Vaccination coverage in the city of Pelotas was 93.98%. This cross-sectional study was associated to

a randomized controlled trial (RCT) investigating the effectiveness of educational strategies in the prevention of dental caries. Mothers were interviewed through a questionnaire.

### Data Collection

The questionnaire included demographic (child's sex, maternal perception about child's skin color and maternal age) and socioeconomic questions (family income, number of children, family structure and maternal schooling). In addition, mothers were asked about the age of the eruption of first primary tooth (Do you remember approximately how old was your child when the first tooth erupted?) and the symptoms perceived by the mother during this phenomenon.

The mother was asked if she perceived / observed any change in her child at the eruption of first tooth of your child between the first and second year of age such as lack of appetite, fever, diarrhea, salivation/drooling, irritability, sleep disorders and/or others. To determine the prevalence of perception of eruption symptoms, a positive response to any of the symptoms was considered, thus evaluating the frequency of occurrence of all forms of reported symptoms.

Skin color reported by mothers according to the Brazilian Institute of Geography and Statistics [9] was collected and categorized into white and non-white (yellow, indigenous, black and brown). Maternal schooling considered the number of years of study and was categorized into two groups ( $> 8$  or  $\leq 8$  years). The income of all economically active members of the family in the last month was collected in Brazilian currency and categorized in minimum wages for the year 2011 (R\$ 545,00) and categorized into tertiles: the 1<sup>st</sup> tertile was 0-1.2 minimum wages, the 2<sup>nd</sup> tertile was 1.3-2 minimum wages and the 3<sup>rd</sup> tertile was 2.1-7.8 minimum wages. Family structure was collected and dichotomized into nucleated family when both parents lived together or not nucleate when any other form of family structure was mentioned. Maternal age was collected in years and dichotomized by the median (15-25 or 26-42 years). The age of the eruption of first primary tooth was measured in months.

Children who did not live in Pelotas or who had difficulty understanding the interview questions were excluded.

### Statistical Analysis

Data were tabulated through the EpiData 3.1 software, performing double entry and then comparison of data generated was performed in order to detect and correct errors.

The STATA software version 11.0 was used to analyze data by performing a descriptive analysis to determine the prevalence of eruption symptoms and the relative and absolute frequency to characterize the sample. Chi-square and Fisher exact tests were used to assess the association between eruption symptoms and study variables.

Multivariate analysis by Poisson regression with robust variance was performed to examine associations between the outcome variable and independent variables, estimating prevalence ratios

(PR) and 95% confidence intervals. No independent variable was included in the adjusted analysis, because the predetermined P value ( $P \leq 0.20$ ) was not found. The significance level was set at 5%.

#### Ethical aspects

The project was submitted to the Research Ethics Committee of the School of Dentistry, Federal University of Pelotas, meeting the requirements of resolution 466/2012 of the National Health Council. The project was presented to the Municipal Health Department for authorization so that the study could be conducted. All interviews were carried out after signing of free and informed consent form.

#### Results

Overall, 188 mother-child pairs were interviewed and of these, two did not remember the symptoms that occurred during the time of eruption of the first tooth of their children. The average age of children in the sample was 15.58 months, the youngest with 12 months and the oldest with 23 months.

Of the total sample, 25 (13.29%) did not have any erupted tooth. Among those who already had erupted teeth, the average age of the first tooth eruption reported by mothers was 7.74 months, and the earliest eruption occurred at the age of one month and the latest at 15 months. Of the 161 mothers interviewed, 148 (91.93%) reported that their children had some type of local or systemic symptoms during the eruption of the first tooth.

Although not statistically significant, eruption symptoms have been most frequently reported among boys, white skin color, and whose mothers aged 26 years or more and higher schooling (> 8 years), living in nucleated families and with income higher than 1.1 minimum wages (Table 1).

**Table 1. Descriptive table relating the socioeconomic and demographic variables with the report of having shown eruption symptoms (yes) or not (no) of the first primary tooth.**

Variables	N(%)		P-value
	Yes	No	
<b>Sex</b>			0.504*
Male	82 (93.18%)	6 (6.82%)	
Female	65 (90.28%)	7 (9.72%)	
<b>Skin color</b>			1.000 <sup>£</sup>
White	117 (92.13%)	10 (7.87%)	
Not White	31 (91.18%)	3 (8.82%)	
<b>Maternal age</b>			0.571*
26-42 years	79 (93.24%)	5 (6.76%)	
15-25 years	69 (90.8%)	8 (9.2%)	
<b>Maternal schooling</b>			0.388*
> 8 years	86 (93.48%)	6 (6.52%)	
0-8 years	61 (89.71%)	7 (10.29%)	
<b>Family structure</b>			0.695 <sup>£</sup>
Nucleated	123 (91.11%)	12 (8.89%)	
Not-Nucleated	25 (96.15%)	1 (3.85%)	
<b>Family income (monthly)<sup>¥</sup></b>			0.910 <sup>£</sup>

1 <sup>st</sup> tertile (0-1.2 MW)	45 (93.75%)	3 (6.25%)
2 <sup>nd</sup> tertile (1.3-2 MW)	46 (95.83%)	2 (4.17%)
3 <sup>rd</sup> tertile (2.1-7.8 MW)	49 (92.45%)	4 (7.55%)

£ (Fisher's exact test); \* (Chi-square test); ¥ (Brazilian minimum wage in 2011 = R\$ 545,00); MW = minimum wage.

The most reported symptoms were excessive salivation (67.7%) and irritability (65.2%) during the eruption of the first primary tooth. In addition, fever (44.1%), difficulty feeding (34.2%), sleep disorders (31.7%) and other symptoms (6.2%) were also reported.

Poisson regression analysis showed that the report of mothers in relation to eruption symptoms had no association with the study variables ( $P \geq 0.05$ ) (Table 2).

**Table 2. Association between eruption symptoms of the first primary tooth and socioeconomic and demographic variables in Pelotas, Rio Grande do Sul, 2011. Crude analysis of Poisson regression with robust variance.**

Variables	PR (CI 95%)	P-value
<b>Sex</b>		
Male	1.00	0.513
Female	0.97 (0.88 – 1.06)	
<b>Skin color</b>		
White	1.00	0.861
Not White	0.99 (0.88 – 1.11)	
<b>Maternal age</b>		
26-42 years	1.00	0.568
15-25 years	1.03 (0.94 – 1.12)	
<b>Maternal schooling</b>		
> 8 years	1.00	0.406
0-8 years	1.04 (0.94 – 1.15)	
<b>Family structure</b>		
Nucleated	1.00	0.806
Not-Nucleated	1.05 (0.68 – 1.62)	
<b>Family income (monthly)¥</b>		
1 <sup>st</sup> tertile (0-1.2 MW)	1.00	0.785
2 <sup>nd</sup> tertile (1.3-2 MW)	1.02 (0.93 – 1.12)	
3 <sup>rd</sup> tertile (2.1-7.8 MW)	0.98 (0.89 – 1.10)	

RP (prevalence ratio); CI (confidence interval); ¥ (Brazilian minimum wage in 2011 = R \$ 545.00); MW = minimum wage

## Discussion

In this study, most mothers interviewed (91.93%) reported that their children had symptoms during the eruption of the first primary tooth, as shown by several studies [3,4,10-13]. One of them, conducted in Saudi Arabia, 71.8% of mothers of children aged 4-24 months believed that the eruption of teeth somehow affected the health of their children, causing local and/or systemic signs and symptoms [13]. In southern Brazil, a study was also carried out with mothers of children from six months to one year of age, where 73% of them recognized symptoms during the eruption of the teeth of their children [10]. On the other hand, in the southeastern Brazil, 63% of mothers of children aged 0-4 years did not report any symptoms associated with eruptive phase [14]. However, the mothers in this study are from a rural population working in the field during the day and not

effectively monitoring the development of their children [14], unlike mothers from urban populations.

Furthermore, it should be considered that this study was conducted in southern Brazil and that, due to the weather, children are susceptible to higher rates of respiratory infections, which may lead to higher prevalence of symptoms similar to those related to teething symptoms [15].

Another aspect to consider is the memory bias of mothers when data collection occurs after children have been through the eruption phase, and mothers tend not to remember or not associate symptoms to tooth eruption. In this study, children whose mothers were questioned were within the erupting period of primary teeth, which may explain the high prevalence of reports of eruption symptoms.

Excess salivation was the most reported symptom (67.7%), followed by irritability (65.22%) and fever symptoms (44.1%), which were also frequently reported in other studies [8,10,12].

During eruption, there is a strong pressure on the fibrous tissue of gums, causing pain, itching and lesions, leading to inflammation and fever [16]. This may explain irritability shown by children in this period.

The increase in salivary flow in this development period can be explained by reduced swallowing ability associated with increased production of saliva generated by the maturation of cells of the salivary glands and is considered a physiological phenomenon, unrelated to teeth eruption [17]. There is also an increase in the habit of taking hands to the mouth, which are rubbed on the gums and finger sucking stimulates salivation, which could contribute to increased salivation in the eruption period [18].

The habit of taking hands to the mouth [3], chewing objects [19], presence of diarrhea [3, 20] and vomiting [3] were changes observed in other studies, but were not mentioned by this sample. The behavior of taking hands to the mouth and chewing objects have been linked to an attempt to relieve pain and itching [21], which could cause viruses and intestinal infections and lead to diarrhea and vomiting [22]. Therefore, diarrhea and vomiting may not necessarily be related to tooth eruption, but may be consequences of the child attempts to reduce discomfort.

It has also been reported that multiple dental eruptions are enough stress to decrease resistance to infection, and stress is an important factor that can determine the appearance of indirect effects of tooth eruption in the child's overall health [6].

Few studies have examined the association between presence of eruption symptoms and socioeconomic and demographic factors [3,10,13]. There was no significant association with any of the study variables; however, it has been shown that higher schooling and married mothers believed that tooth eruption was related with symptoms presented by their children [13]. A possible explanation for the less educated mothers to have lower perception would be the fact that, due to their lower knowledge, they only perceive symptoms when these are more severe.

Higher perception is also justified when mothers with higher income of nucleated families reported more eruption symptoms [14]. The children of these families do not have more



susceptibility to eruption symptoms, but the largest number of reports may be due to the greater propensity of mothers to maintain good health practices and pay more attention to symptoms that appear during the first year of life [10].

On the other hand, a study conducted with Nigerian mothers found that those of lower socioeconomic status tend to assign more tooth eruption symptoms to their children [3]. Maternal age was also associated with reporting tooth eruption symptoms, and younger mothers had higher perception, and this higher perception was associated to that fact that older mothers had previous experiences of tooth eruption symptoms with other children [3].

With respect to individual demographic aspects such as gender and race, no studies have investigated the association of the presence of symptoms with these aspects, although some studies have shown accelerated eruption when these individual factors are compared, but the subject is still controversial and there is no consensus among researchers [23,24].

There is no consensus in literature regarding socioeconomic conditions and eruption symptoms, and these factors may be more related to the care and attention that mothers give to their children than actually to greater susceptibility to these symptoms.

Studies have shown that regardless of socioeconomic status, in most cases, parents seek the pediatrician when the child presents symptoms such as fever, diarrhea and vomiting during the period of tooth eruption [25,26]. In cases of local symptoms, mothers adhere to the use of teething ring and topical medications and rarely seek the dentist [27,28].

Opinions on the causes of tooth eruption symptoms differ among professionals and thus different types of treatments have been proposed. A study has shown that treatments used by pediatricians in children with tooth eruption symptom included placebos with the main function of reducing the anxiety of parents around the problem [29]. A survey carried out with pediatricians and pediatric dentists showed that 96.4% of them believe in the presence of local symptoms and 81.8% believe in the presence of general symptoms during the eruptive phase of primary teeth [30]. The therapy most used by these professionals was the prescription of topical anesthetics, followed by the use of chamomile-based products, the recommendation of teething rings was the third most mentioned, followed by antipyretic prescription.

There is no evidence that there are specific signs and symptoms related to the eruption period of primary teeth that enable a reliable diagnosis without ruling out other organic pathologies [31]. Thus, health professionals involved in the care of children should seek other causes before attributing severe signs and symptoms to teeth eruption [8].

Due to changes that may accompany it, teeth eruption can be an inconvenience to children and parents, who many times do not find satisfactory answers in consultations with health professionals in order to identify the events related to this period as well as minimize their effects.

Thus, further studies should be carried out to elucidate the possible relationship between signs and symptoms present in children and the tooth eruption period. Due to the cross-sectional



design of study, it does not allow establishing any temporal relationship, thus longitudinal and population-based studies are needed to clarify this issue.

## Conclusion

Most mothers relate the presence of symptoms and signs to the tooth eruption period. Excessive salivation and irritability were the most reported signs and symptoms. The socioeconomic and demographic condition showed no association with maternal report of teething symptoms in their children.

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