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Original Article

Behavior of Children Submitted to Tooth Extraction: Influence of Maternal and Child Psychosocial Characteristics

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Abstract

Objective: To assess the child's behavior during primary tooth extractions, taking into account child's psychosocial and demographic factors and maternal characteristics. **Material and Methods:** An observational cross-sectional study involving children aged 7-13 years attending at the dental clinics of the School of Dentistry, Federal University of Pelotas. Children who underwent primary tooth extraction under local anesthesia and accompanied by their mothers were included. Data collection consisted of a questionnaire applied to mothers, assessment of child's behavior (Frankl Scale) and record of the presence of the mother. Data were analyzed using Stata 12.0 software. Descriptive analysis of the variables of interest and the Chi-square and Fisher Exact tests were performed to investigate the effect of independent variables on the outcome. The association between independent variables and the outcome was observed by crude and adjusted multivariate analysis by Poisson Regression (prevalence ratio). A 5% significance level was adopted. **Results:** Of 333 children evaluated, 124 were included in this study. Most were female (54.5%) aged 7-10 years (65.8%). The adjusted multivariate analysis, maternal dental anxiety and presence of the mother were the variables that remained associated with the child's behavior. **Conclusion:** This study suggests that presence of the mother and maternal dental anxiety negatively affect the behavior of children aged 7-13 years during primary tooth extraction.

Keywords: Child Behavior; Mother-Child Relations; Tooth Extraction.

Introduction

Pediatric Dentistry is a field that requires the professional knowledge of preventive measures and restorative skills to perform the dental treatment of a child or adolescent, as well as concern for their well-being during the execution of procedures.

One of the biggest challenges faced by pediatric dentists is the management of their behavior during dental treatment, which is influenced by internal and external factors. Younger children, the presence of fear and anxiety, the child's personality and temper are internal factors that tend to influence the child's behavior during dental treatment [1-4]. Among external factors, dental pain and previous dental experiences, parents' feelings and expectations, as well as the clinical procedure itself, also affect the child's behavior [1,3-5].

The child's personality and habits and reactions to stress situations are directly connected to the characteristics of parents, highlighting the influence of maternal anxiety [6]. There is evidence that maternal anxiety has a reflection on quality of life related to the child's oral health [7], adherence to dental services [8], caries experience [9] and child's behavior [1,10].

While some children are able to cooperate in potentially stressful situations, such as visiting the dentist, others are more vulnerable to their fears and impulses and, therefore, more likely to react with emotional and behavioral symptoms [1-4]. Fearful and anxious children tend to exhibit non-cooperative behavior during dental care [1-4]. In addition to the child's feelings, previous dental experiences can influence child's behavior at subsequent visits [1,3,11], reducing the negative response and allowing the child to safely distinguish stressful from non-stressful procedures. A decrease of dental anxiety in children has been observed in sequential dental visits [12]. In contrast, emergency treatments, where pain is present, and those requiring the use of local anesthesia, appear to worsen their behavior at subsequent dental visits [13].

Among the strategies for the management of child's behavior during dental treatment, the presence of parents during dental care may be used to obtain the child's cooperation during dental procedure [14]. Therefore, the observation of the child's behavior and knowledge of its possible predictors are extremely important in pediatric dentistry. The hypothesis tested in this study is that in addition to the influence of the clinical procedures, there is a significant effect of maternal and psychosocial factors related to the child on the child's behavior. Thus, the objective was to evaluate the child's behavior during tooth extraction, taking into account child's psychosocial and demographic factors and maternal characteristics.

Material and Methods

Study Design and Participants

This cross-sectional study was performed with children attended at the Pediatric Dental Clinic of School of Dentistry - Federal University of Pelotas from 2014 March to 2015 November. Children who searched for the Pediatric Dental Clinic came from free demand or were referred from Basic Health Units (BHU) of the municipality or by other professionals.

A convenience sample was adopted. Inclusion criteria included tooth extraction of only one primary molar due to dental caries, procedure performed with local anesthesia, children in regular attendance in the Pediatric Dental Clinic, children accompanied by their mothers, and aged 7-13 years. Children with mental or systemic developmental disorders, those who sought emergency care or those going to the dentist for the first time were not included.

Clinic Procedure: Tooth Extraction

Dental treatment was performed by undergraduate students of the last year of graduation in Dentistry, supervised by pediatric dentistry teachers. In addition to the clinical technique, students used behavioral management techniques recommended by the American Academy of Pediatric Dentistry [14] and the Brazilian Association of Pediatric Dentistry: distraction, non-verbal communication, positive reinforcement and voice control. Protective stabilization was not performed.

As a treatment protocol, all dental extractions were performed with the prior application of topical anesthetic in the form of ointment (benzocaine 20%) and administration of local anesthesia with 2% lidocaine with constrictor vessel (epinephrine 1: 50,000). In lower molar teeth, the mandibular locking technique was performed, and the infiltrative technique was performed in upper molars.

Data Collection

Data collection consisted of an interview with mothers, an interview with children, assessment of child's behavior during dental treatment, and observation of the presence of the mother during clinical procedure.

The questionnaire applied by two previously trained undergraduate students was composed of questions about socioeconomic and demographic data, negative previous experience of children related to dental treatment, history of dental pain in the last month, maternal perception about child dental fear and maternal dental anxiety. Gender and age of children, maternal age and schooling were the demographic and socioeconomic characteristics collected. Maternal schooling was collected in years of study and dichotomized into two groups: eight years or less of formal education, which in Brazil corresponds to complete elementary school, and more than eight years of formal education.

Information on previous dental experiences was recorded. Mothers were asked if their children had any dental experience that they judged as having been quite unpleasant and caused distress to their children. The possible answers were "Yes" or "No". The presence of dental pain in the previous month was investigated using the question: "Has your son/daughter had dental pain in the last four weeks?" The answers were no (absent) and yes (present).

Maternal perception about child dental fear was assessed using the Dental Anxiety Question (DAQ): "Do you think your child is afraid of the dentist?" with following response options: a) No; b) Yes, a little; c) Yes; and d) Yes, a lot. Answer were dichotomized into Yes ("Yes, a little"; "Yes"; and "Yes, a lot" alternatives) and No ("No" alternative). Maternal dental anxiety was assessed by the

Dental Anxiety Scale (DAS) [15,16], with answers dichotomized in low/moderate anxiety degree and severe anxiety degree.

In order to prevent possible interference from mothers, children were interviewed at the first dental visit prior to any treatment, examination or contact with a dentist. Prior to dental treatment, after the interview with mothers, children were interviewed in a room separate from their mothers, about dental fear using the DAQ with answers dichotomized into Yes and No.

Child's behavior during dental treatment was assessed using the Frankl Scale [6], which classified behavior in four categories as following: 1) definitely negative (score 1); 2) negative (score 2); 3) positive (score 3); 4) definitely positive (score 4). An overall Frankl Scale score during dental treatment was considered for each child. The overall score consists of the mean score obtained from the sum of individual ratings received from three different instances during the appointment: at the beginning (including separation from the mother), during treatment procedure, and at conclusion. For statistical analysis, scores were dichotomized into cooperative behavior (definitely positive and positive categories) and uncooperative behavior (definitely negative and negative behavior). Child's behavior was assessed by previously trained and calibrated raters.

The presence of the mother during dental treatment was recorded as yes when she remained present throughout dental treatment accompany her child. Mothers waiting for their children in a separate room were considered as absent during dental treatment.

In order to test the methodology proposed, a pilot study involving 12 children was carried out (aged 7-13 years) and was not included in the final sample of this study.

Training and Calibration Process

Two hours of theoretical training about questionnaire application were performed with interviewers. Previously to behavior assessment, observers were trained and calibrated. Initially, two hours of theoretical training was conducted and the criteria were discussed. For the calibration process, 24 children, who were not included in the final sample, were assessed. Concordance was assessed by a weighted kappa coefficient. Inter-examiner agreement was tested against a 'gold standard' examiner. Inter-examiner Kappa values ranged from 0.89 to 0.90.

Ethical Aspects

This study was approved by the Ethics Research Committee of the Federal University of Pelotas, Brazil (protocol CEP/UFPEL number 29/2013). All mothers were invited to participate this study and signed the informed consent form. All children were invited to participate and signed the assent form.

Statistical Analysis

Data were analyzed using Stata version 14.0 software (Stata Corporation, College Station, TX, USA). Absolute and relative frequencies were obtained by descriptive analysis. Chi-square and

Fisher's exact tests were used to analyze the effect of independent variables on the outcome. The association between independent variables and the outcome was assessed by Poisson regression model with robust variance (Prevalence Ratio; 95% Confidence Interval; $p \leq 0.05$). A forward stepwise procedure was used to include or exclude explanatory variables in the model fitting. Variables with p values ≤ 0.20 in the crude analyses were included in the model fitting. Variables were removed from the model from the highest to the lowest, until all variables reported p values ≤ 0.20. For the final model, variables were considered significant if they had p value ≤ 0.05 after adjustment.

Results

All mothers and children invited accepted to participate of this study. Of the total of 333 children attended, 124 children underwent tooth extraction under local anesthesia and therefore were included in the study.

Among eligible children, the majority was female (67, 54.5%); aged 7-10 years (81; 65.8%), and reported fear of going to the dentist (68; 54.8%). Regarding maternal characteristics, most mothers studied less than eight years (77; 62.1%) and presented mild to moderate degree of dental anxiety (88; 70.9%). The majority of children presented uncooperative behavior (73; 58.9%) and were accompanied by their mother during dental treatment (67; 54.1%) (Table 1).

Table 1 presents bivariate analysis. Child's age, dental fear (self-reported and maternal perception), previous negative dental experience, dental pain in the last month, maternal dental anxiety and presence of the mother were associated with child's behavior. Children aged 7-10 years, who reported dental fear, with previous negative dental experience, with history of dental pain in the last month, whose mothers reported dental fear related to the child and with high levels of dental anxiety and those who remained present throughout the dental treatment were associated with uncooperative behavior during dental care.

Table 1. Description of the independent variables according to the outcome.

Variables		Child Behavior		
	n total (%)	Cooperative n (%)	Uncooperative n (%)	P value*
Gender				0.266
Male	56 (45.2)	20 (35.7)	36 (64.3)	
Female	68 (54.8)	31 (45.6)	37 (54.4)	
Age				0.042
07-10 years	81 (65.3)	28 (34.6)	53 (65.4)	
11-13 years	43 (34.7)	23 (53.5)	20 (46.5)	
Maternal schooling				0.901
≥8 years	47 (37.9)	19 (40.4)	28 (59.6)	
<8 years	77 (62.1)	32 (41.6)	45 (58.4)	
Dental fear				0.011
No	56 (45.2)	30 (53.6)	26 (46.4)	
Yes	68 (54.8)	21 (30.9)	47 (69.1)	
Previous negative dental experience				0.022
No	54 (43.5)	16 (29.6)	38 (70.4)	
Yes	70 (56.5)	35 (50.0)	35 (50.0)	

Dental pain in the last month				0.009
No	58 (46.8)	31 (53.4)	27 (46.6)	
Yes	66 (53.2)	20 (30.3)	46 (69.7)	
Maternal perception (child dental fear)				0.025
Without dental fear	58 (46.8)	30 (51.7)	28 (48.3)	
With dental fear	66 (53.2)	21 (31.8)	45 (68.2)	
Maternal dental anxiety#				<0.001
Low/Mild	88 (70.9)	46 (52.3)	42 (47.7)	
High	36 (29.1)	5 (13.9)	31 (86.1)	
Maternal presence				<0.001
Present	67 (54.1)	17 (25.4)	50 (74.6)	
Absent	57 (45.9)	34 (59.7)	23 (40.3)	

*Reference's value: p<0,05. # Fisher's exact test.

Table 2 shows the crude and adjusted multivariate analysis for age and sex. In the crude analysis, child's dental fear (self-reported and perceived by the mother), dental pain in the last month, maternal dental anxiety and presence of the mother were associated with child's behavior. After adjustment for gender and age, maternal dental anxiety and presence of the mother were the variables that remained associated with child's behavior. Children whose mothers presented high levels of dental anxiety showed 52% higher prevalence (p = 0.007) of uncooperative behavior during tooth extraction. The absence of the mother was a protective factor for the child's negative behavior during tooth extraction. The prevalence of negative behavior was 38% higher in children accompanied by their mothers.

Table 2. Association between independent variables and the outcome (child behavior). Multivariate analysis by Poisson Regression (crude and adjusted analysis).

	Child behavior			
Variables	Crude		Adjusted	
	RP (IC 95%)	P value*	RP (IC 95%)	**P value***
Gender		0.265		0.705
Female (Ref. Male)	0.84 (0.63-1.13)		0.94 (0.69-1.27)	
Age		0.062		0.287
11-13 years (Ref. 7-10)	0.71 (0.49-1.01)		0.82 (0.57-1.18)	
Maternal schooling		0.901		
<8 yearss (Ref. ≥8 years)	0.98 (0.72-1.32)			
Child dental fear		0.016	-	
Yes (Ref. No)	1.49 (1.01-2.06)			
Previous negative dental experience		0.022	-	
Yes (Ref. No)	0.71 (0.53-0.95)			
Dental pain in the last month		0.013	-	
Yes (Ref. No)	1.49 (1.09-2.06)			
Maternal perception (Child dental fear)		0.031	-	
With dental fear (Ref. Without dental fear)	1.41 (1.03-1.93)			
Maternal dental anxiety		<0.001		0.004
High (Ref. Low/Mild)	1.80 (1.39-2.33)		1.52 (1.15-2.04)	
Maternal presence		0.001		0.007
Absent (Ref. Present)	0.54 (0.38-0.76)		0.62 (0.44-0.88)	

*Reference's value: p<0,05; - variables not included in the final model after adjustments.

Discussion

The present study showed that the high degree of maternal dental anxiety and the presence of the mother during dental treatment were associated with the child's uncooperative behavior

during dental extraction. The child's behavior is a multidimensional process. Over the years, studies have consolidated the influence of the child's psychosocial and demographic characteristics on child's behavior during dental care [1-5,11-13]. In the bivariate analysis, uncooperative behavior was associated with younger children, dental fear (self-reported and maternal perception), dental pain, previous negative dental experiences, maternal dental anxiety and the presence of the mother during dental extraction.

It is expected that the child's behavior improves with advancing age, once older children tend to have a wider coping repertoire and therefore, positive skills to cope with stressful events such as dental treatment [1-3,17,18]. With maturity, there is an increase in the positive perception regarding dental treatment and, therefore, a trend of collaborate during dental treatment [18]. In addition, children develop mentally, emotionally, socially and cognitively over the years.

Regarding psychosocial characteristics, studies have shown that dental fear, dental pain and previous dental experiences have an impact on the child's behavior during dental treatment [1-3]. Children with high level of dental fear tend to exhibit uncooperative behavior during dental treatment [1,3,3,10]. Dental pain often leads to urgent care with the imperative of very invasive procedures. In addition, it is possible that this situation becomes an unpleasant and provocative suffering experience to the child [3]. The report of negative experiences in dental care is associated with the presence of dental fear and anxiety [11], poor quality of life related to oral health [19] and non-cooperative behavior in subsequent dental visits [1,3]. In the present study, dental pain, previous dental experience and dental fear (self-reported and perceived by the mother) did not remain associated with child's behavior in the final model, although literature shows a relationship between these variables and child's behavior [1,3]. In fact, variables dental pain, previous dental experience and dental fear were reported by the mother, which may have led to an information inaccuracy, since they may have been overestimated, mainly due to the context in which the study was developed.

Dental procedures have also been presented as predictors of child's behavior [1]. In a previous study [20], it was possible to observe, through drawings made by children, a plurality and complexity of concepts and ideas. The "procedures" category was the one that most received drawings and was directly associated with tooth extraction and oral surgery. Negative feelings were identified regarding curative dental procedures, such as instruments and equipment, and not exactly to the professional figure. Our study was carried out with children undergoing tooth extraction with the use of local anesthesia, a procedure that is very invasive in relation to the complexity [1], and stressful for children [21].

Family context is another predictor of child's behavior. The interaction with parents may affect the child's ability to manage their emotions as well as their behavior during dental care [22]. A previous study provides preliminary evidence that children who have emotionally intelligent mothers can develop the ability to cope with stressful conditions and situations in the dental environment [22]. The traits of the maternal personality may affect the child's behavior since the

child's personality is influenced and shaped by attitudes and experiences of individuals around him, especially his mother [23]. Within the family system, the mother represents the fundamental link to the child's behavior, and this strong influence is due to the process of primary socialization that children naturally experiences in their environment [24].

Negative attitudes, experiences, opinions and feelings transmitted by mothers about dental treatment are predictors of the child's anxiety reactions and may be reflected in the behavior manifested during dental treatment [25]. Our study found a strong association between the high degree of maternal dental anxiety and the child's uncooperative behavior during tooth extraction. This result corroborates numerous studies that observed a trend of non-cooperative behavior in children whose mothers present high levels of dental anxiety [1,3,10,13,18,25].

In Pediatric Dentistry, a controversy still persists regarding the presence of the mother during dental treatment [1,2,5,25,26]. Some studies have argued that the absence of parents during dental care serves as an effective tool for negative reinforcement of the child's behavior, since the presence of the parents would calm and would be a way for children to feel safer [26]. Some authors showed an improvement in child's behavior when the child was alone in dental care [26]. However, parallel to the behavioral evaluation, the authors measured the heart rate of these children, observing a contrary situation. Unaccompanied children have higher heart rate when compared to those accompanied by their mothers. This increase in heart rate coupled with an apparent improvement in behavior suggests that suppression of fear may induce increased anxiety in children [26]. On the other hand, there are those who discuss an improvement in the child's behavior when they are not accompanied by parents [1,2,5]. It is suggested that after the ambiance of the child with the dental environment, maternal characteristics, such as dental anxiety, negatively affect the child's behavior during dental treatment [15].

The American Academy of Pediatric Dentistry [14] recommends that the professional should understand the emotional needs by the parents' sense of protection related to the child involved in the dental care of their child. The presence of parents aims to provide psychological support to children and, in turn, improve adherence during dental care [14]. After considering other factors, the multivariate analysis of this study showed the absence of the mother as a protective factor for the non-cooperative behavior of children aged 7-13 years. Children accompanied by mothers presented higher prevalence of noncompliant behavior. Maternal dental anxiety strongly associated with the child's behavior was also observed. Children whose mothers were very anxious had higher prevalence of uncooperative behavior, a result similar to other studies presented in literature [1-4,10,11]. Children without the presence of parents during dental procedure showed less anxiety / fear and collaborative behavior [26].

Anxiety shown by mothers when accompanying their children during dental treatment may directly affect the child's feelings and reactions face this situation, resulting in strong tendency to manifest uncooperative behavior [1-4]. Therefore, if mothers are properly educated and motivated, they can become a great help in the strengthening of the link between child and dentist [14]. Thus,

the presence of parents could help to obtain the children's attention and increase their commitment, avoiding non-cooperative behaviors [14]. Although significantly associated in the bivariate analysis, dental fear (self-reported and maternal perception), previous negative dental experience and dental pain did not remain associated after adjustments in the multivariate analysis. The authors suggest that the context in which the study was performed may have interfered, demonstrating that in stressful situations, the mother has fundamental importance for a positive outcome, overlapping the child's psychosocial characteristics.

Maternal schooling is considered a strong determinant of socioeconomic status in scientific literature [27]. In this study, there was no association between maternal schooling and child's behavior. The authors hypothesize that the sample is homogeneous in relation to schooling, not allowing the measurement of a possible effect in the studied population. Studies have shown that maternal schooling has significant impact on children's oral health status [8,9], including adherence to the use of dental services, especially preventive services. The same has being observed in relation to gender. Although a difference in behavior is observed, there is still no consensus in literature regarding this issue [26].

Among the study limitations, the fact that children under six years of age were not evaluated makes it difficult to compare the behavior with older children. In addition, memory bias may have occurred, since some required information, such as prior negative dental experience depended on the mother's memory. Further studies assessing the characteristics that may affect the child's behavior should be performed in both age groups (below and above seven years of age), including other psychosocial characteristics such child's temper. Moreover, the convenience sample adopted limits the external validity of data. However, internal validity was obtained through the training of interviewers and evaluators. All children were attended under the orientation of teachers, PhD in Pediatric Dentistry.

Conclusion

Maternal dental anxiety and the presence of the mother during dental treatment were strongly associated with the child's behavior when submitted to dental extraction.

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