

# Dental behaviour management problems and associated factors in Brazilian children



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DOI 10.23804/ejpd.2020.21.03.06

## Abstract

**Aim** To identify factors associated with negative child behaviour in the dental setting.

**Materials and methods** A cross-sectional study was conducted with a sample of 324 mother-child pairs (children aged 3 to 12 years) seen at a university clinic in Canoas, southern Brazil. Mother's anxiety was measured using the Beck Anxiety Inventory. Oral examinations were performed to determine caries experience (dmft/DMFT index) in the mothers and children. Child behaviour was evaluated at six moments of the dental visit using the Frankl scale. Statistical analysis involved Poisson regression with robust variance.

**Results** The prevalence of negative child behaviour was 9.3%, with a greater frequency among younger children, those with no previous use of dental services and those whose mothers exhibited a moderate to severe level of anxiety. The multivariable analysis demonstrated that the probability of negative behaviour was 2.4-fold greater among children who had not previous dental services attendance (PR = 2.37, 95% CI:1.13-4.95; p=0.022) and 3.1-fold greater among those whose mothers had a moderate to severe level of anxiety (PR = 3.08, 95% CI:1.64-5.75; p<0.001).

**Conclusion** Mother's anxiety, younger age and no previous history of visiting a dentist are associated with negative behaviour during a dental appointment and therefore merit special attention.

**KEYWORDS** Child behaviour, Anxiety, Behavioural control, Dental fear and anxiety.

## Introduction

Dental behaviour management problems (DBMP) are highly prevalent and represent a major issue in dental care due to the resulting delay, difficulty or even impossibility of providing care to children [Gustafsson et al., 2010; Klingberg and Broberg, 2007]. Therefore, the child and family can be impeded from having their requests for dental counseling and treatment fulfilled. The adequate handling of behaviour before, during and after a dental appointment is a basic presupposition in the practice of paediatric dentistry.

DBMP can be associated with fear and anxiety, which may create barriers to successful treatment in the paediatric population [Gustafsson et al., 2010; Klingberg and Broberg, 2007]. Child temperament, fear of unknown and/or perceived parental anxiety can increase the level of stress in a paediatric patient [Tsoi et al., 2017; Sharma et al., 2017; Arpacı et al., 2016; Xia et al., 2011]. In addition, studies investigating the effect of dental procedures such as restorations and extractions in DBMP are scarce and the results are conflicting [Tsoi et al., 2017]. On the other hand, some researchers have suggested that demographic and socioeconomic variables may also influence the behavioural adaptation of children in the dental office [Ramos-Jorge et al., 2006; Folan et al., 2004; Colares and Richman, 2002].

Clarifying factors associated with child behaviour in the dental setting could guide paediatric dentists in the proper use of behaviour management techniques [Rantavuori et al., 2002]. Moreover, knowledge and understanding of DBMP could help the dental staff receive and treat children according to their individual needs, which could contribute to the prevention of DBMP and ineffective dental care.

Therefore, the aim of the present study was to investigate factors associated with negative child behaviour in the dental setting in a sample of Brazilian children aged 3 to 12 years.

## Methods

### Study design and participants

A cross-sectional study was conducted with children aged three to 12 years and their mothers who sought dental care at the paediatric dental clinic of Universidade Luterana do Brasil in the city of Canoas, which is located in southern Brazil. The city has a population of approximately 300,000 inhabitants and all households are connected to the public water supply (fluoride level: 0.8 ppm).

The sample size required to estimate the association between negative behaviour and previous dental experience employing a 95% confidence level, 95% statistical power, 1:4 ratio of exposed to non-exposed individuals and prevalence rates of 78% and 44% for exposed and non-exposed individuals, respectively, was determined to be n = 208 [Xia

et al., 2011]. To enable multivariate analysis, the sample size was increased by 30%, resulting in a minimum sample of 271 children.

### Inclusion criteria

The inclusion criteria in the study were: children with good general health, age between 3 and 12 years and mother accompanying the child in the consultation. In order for the required sample size to be reached, all the mother/child pairs that met the inclusion criteria were invited to participate in the study. Mothers and children were recruited from March to November 2017.

### Dependent and Independent study variables

All examiners were previously trained and calibrated for the data collection process, which involved:

- an interview with the mothers addressing demographic and socioeconomic variables as well as an assessment of mother's anxiety;
- clinical examinations of the mother and child;
- an evaluation of child behaviour during a dental appointment (dependent variable).

The following socioeconomic and demographic characteristics were collected during interviews with the mothers: child's gender, child's age, mother's age at birth of the child, household income (categorized based on the Brazilian monthly minimum wage), family structure (nuclear/non-nuclear), mother's schooling (in years) and child's previous dental experience (yes/no).

Mother's anxiety was assessed using the Beck Anxiety Inventory (BAI), which is a self-report scale consisting of 21 statements that describe anxiety symptoms [Beck et al., 1988], validated in a Brazilian population [Gorenstein and Andrade, 1996]. Each item/symptom is scored on a four-point scale ranging from 0 to 3. The total BAI score ranges from 0 to 63 points and is interpreted as follows: 0 to 10 = minimal level of anxiety, 11 to 19 = mild anxiety, 20 to 30 = moderate anxiety and 31 to 63 = severe anxiety. For statistical purposes, this variable was dichotomised as minimal/mild anxiety (0 to 19 points) or moderate/severe anxiety (20 to 63 points).

Two examiners with Certificate in Pediatric Dentistry performed all clinical examinations screening for dental caries (one examined all mothers and the other examined all children) using the World Health Organization (WHO) criteria [WHO, 1997] modified to record non-cavitated lesions. The mothers and children were examined in different rooms sitting in the dental chair under artificial light and using dental equipment after tooth brushing. For children, caries severity was evaluated by counting the number of decayed, missed or filled primary and permanent teeth (dmft/DMFT index). The index was then categorised into caries-free (dmft/DMFT = 0), low severity (dmft/DMFT = 1-4) or high severity (dmft/DMFT >5). High severity was determined based on the significant caries index [Bratthall, 2000], corresponding to the mean dmft/DMFT of the tertile of the sample with the highest caries score. For mothers, the DMFT index was categorised into tertiles, as follows: DMFT < 14 = first tertile, DMFT 14-20 = second tertile and DMFT > 20 = third tertile.

Intra-examiner reliability was assessed using the weighted Kappa (K) statistic. For such, 20 mother-child pairs were examined a second time after a two-week interval. Intra-examiner K was 0.81 (95% CI: 0.78 to 0.83) for the children's dmft/DMFT index and 0.92 (95% CI: 0.90 to 0.93) for the mothers' DMFT index.

Child behaviour during the dental appointment (dependent variable) was evaluated by a single, independent, previously trained examiner using the Frankl Behaviour Rating Scale [Frankl et al., 1962]. Behaviour was evaluated at six moments: reaction to first contact with the dentist, separation from the mother, entering the dental office, sitting in the dental chair, clinical examination and prophylaxis and after the exam. The hierarchy values were inverted, with the lower numbers indicating the most collaborative behaviours at dental chair while the higher numbers the worst behaviours. Therefore, each moment was rated as follows: 1 = definitely positive, 2 = positive, 3 = negative and 4 = definitely negative. Child behaviour scores obtained at each moment were summed and total score was classified as follows: 6 = definitely positive, 7-12 = positive, 13-18 = negative and 19-24 = definitely negative. In the present study, a total score of 6-12 was considered indicative of positive behaviour and a total score > 12 was considered indicative of negative behaviour.

### Data analysis

The statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 17.0. Associations between child behaviour and the independent variables were evaluated using the chi-square test. Unadjusted and adjusted prevalence ratios of negative behaviour were estimated using Poisson regression with robust variance. The multivariate model followed a hierarchical approach [Victora et al., 1997] from distal to proximal determinants on three levels: demographic (child's gender, child's age and mother's age at birth of child); socioeconomic (family income, family structure and mother's schooling) and mother's anxiety; clinical variables (mother's DMFT, previous use of dental service, child's dmft/DMFT, history of restoration and history of extraction) (Fig. 1). All variables on each level were entered into the initial model and those not contributing to the fit of the model were then eliminated (stepwise backward) if the Wald p-value was higher than 0.20. The final model estimated prevalence ratios for the selected variables after adjusting for variables on the same level or higher level.

### Ethical considerations

This study received approval from the Human Research Ethics Committee of Universidade Federal de Minas Gerais (UFMG), Belo Horizonte, MG, Brazil (certificate number: 2006093H). In compliance with national and international regulations, all participants' rights were protected. All mothers read and signed a statement of informed consent prior to their participation.

### Results

A total of 324 mother-child pairs participated in the study. Among the children, 49.7% were boys, 50.3% were girls and age ranged from 3 to 12 years (mean and standard deviation [SD]: 8.1 ± 2.2 years; median and 25th to 75th percentile [P25-P75]: 8.0 [6.0-10.0] years). Among the mothers, 80% were younger than 35 years of age at the birth of their children. A nuclear family structure was found in 77.6% of the families. Half of the mothers had up to eight years of schooling and more than 90% of the children had previous dental experience. Only 14.5% of the children were caries-free. Two-thirds of the mothers had a DMFT index > 13 and 15.2% had moderate to severe anxiety.

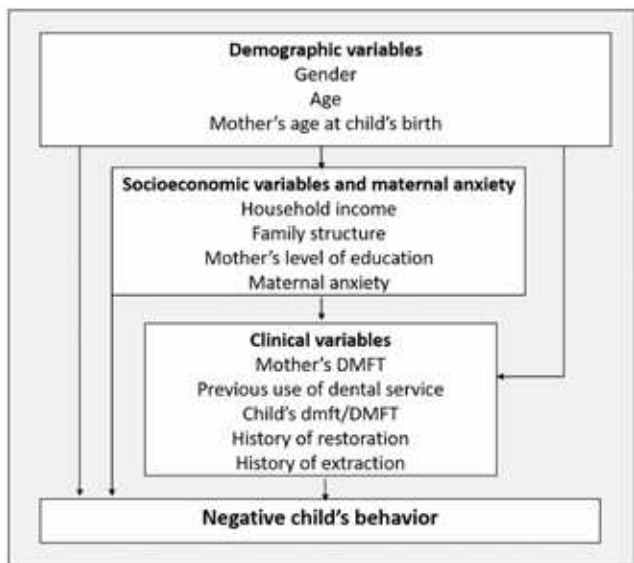


FIG. 1 Hierarchical conceptual model for child's negative behaviour during the dental visit.

Child behaviour scores obtained during the dental visit ranged from 6 to 24, with a mean (SD) of 9.4 (3.0) and a median (P25-P75) of 9.0 (7.0-11.0). Among the total sample, 17.3% of the children had definitely positive behaviour, 73.5% had positive behaviour, 7.4% had negative behaviour and 1.9% had definitely negative behaviour. Thus, 9.3% of the sample had negative behaviour. Figure 2 displays the mean child behaviour scores at the six moments evaluated. Scores gradually increased throughout the course of the visit, reaching a peak during clinical examination, followed by a reduction at the end of the visit.

Table 1 summarises the distribution of the children with negative behaviour according to the independent variables. The prevalence of negative behaviour was significantly higher among younger children ( $p < 0.001$ ), those with no previous use of dental services ( $p = 0.001$ ) and those whose mothers exhibited a moderate/severe level of anxiety. Socioeconomic variables, previous caries experience and a history of restorations or extractions were not associated with the outcome.

The multivariate analysis (Table 2) demonstrated that the probability of negative behaviour was 2.4-fold greater among children who had not previously used a dental service and

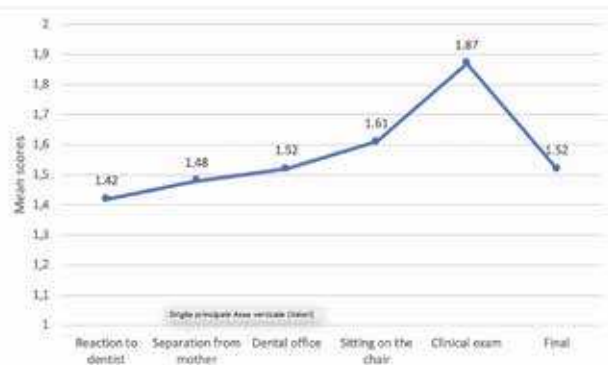


FIG. 2 Mean child behaviour scores at the six moments of the dental visit.

Variables	Total		Negative Child's Behaviour		p*
	n	(%)	n	(%)	
<b>Demographic characteristics</b>					
Gender					0.972
Male	161	(49.7%)	15	(9.3%)	
Female	163	(50.3%)	15	(9.2%)	
Age (years)					< 0.001
3-6	82	(25.4%)	20	(24.4%)	
7-9	134	(41.5%)	7	(5.2%)	
10-12	107	(33.1%)	3	(2.8%)	
Mother's age at birth of child					0.342
< 35 years	257	(80.1%)	26	(10.1%)	
≥ 35 years	64	(19.1%)	4	(6.3%)	
<b>Socioeconomic variables and mother's anxiety</b>					
Household Income					0.886
< 2 times BMMW	106	(33.0%)	10	(9.4%)	
2-3 times BMMW	107	(33.3%)	11	(10.3%)	
> 3 times BMMW	108	(33.6%)	9	(8.3%)	
Family Structure					0.213
Nuclear	250	(77.6%)	26	(10.4%)	
Non-nuclear	72	(22.4%)	4	(5.6%)	
Mother's schooling					0.392
≤ 8 years	158	(49.2%)	17	(10.8%)	
> 8 years	163	(50.8%)	13	(8.0%)	
Mother's anxiety					0.001
Minimal	274	(84.8%)	19	(6.9%)	
Moderate/Severe	49	(15.2%)	11	(22.4%)	
<b>Clinical variables</b>					
Dental caries (mother)					0.462
1st tertile (DMFT < 14)	109	(33.6%)	13	(11.9%)	
2nd tertile (DMFT 14-20)	116	(35.8%)	10	(8.6%)	
3rd tertile (DMFT > 20)	99	(30.6%)	7	(7.1%)	
Previous use of dental service					0.001
Yes	298	(92.3%)	23	(7.7%)	
No	25	(7.7%)	7	(28.0%)	
Dental caries (children)					0.106
Caries free	47	(14.5%)	4	(8.5%)	
Low severity	106	(32.7%)	5	(4.7%)	
High severity	171	(52.8%)	21	(12.3%)	
History of restoration					0.551
Yes	168	(51.9%)	14	(8.3%)	
No	156	(48.1%)	16	(10.3%)	
History of extraction					0.539
Yes	72	(22.2%)	8	(11.1%)	
No	252	(77.8%)	22	(8.7%)	

\*Chi-square test

\* BMMW – Brazilian monthly minimum wage

TABLE 1 Distribution of children with negative behaviour according to independent variables.

Variables	Unadjusted			Adjusted		
	PR	(95%CI)	p	PRa	(95%CI)	P
<b>Demographic variables</b>						
Gender			0.972			
Male	1.01	(0.51-2.00)				
Female	1.00					
Age (years)			0.000			0.000
3-6	1.00			1.00		
7-9	0.21	(0.10-0.48)		0.21	(0.10-0.48)	
10-12	0.11	(0.03-0.37)		0.11	(0.03-0.37)	
Mother's age at child's birth			0.353			
< 35 years	1.62	(0.59-4.47)				
≥ 35 years	1.00					
<b>Socioeconomic variables and maternal anxiety</b>						
Household Inc.			0.887			
< 2 BMMW*	1.13	(0.48-2.67)				
2-3 BMMW	1.23	(0.53-2.86)				
> 3 BMMW	1.00					
Family structure			0.228			
Nuclear	1.87	(0.67-5.18)				
Non-nuclear	1.00					
Mother's level of education			0.394			
≤ 8 years	1.35	(0.68-2.68)				
> 8 years	1.00					
Maternal anxiety			0.001			0.000
Minimal	1.00			1.00		
Moderate/severe	3.24	(1.64-6.37)		3.08	(1.64-5.75)	
<b>Clinical variables</b>						
Dental caries (mother)			0.467			
1st tertile (DMFT<14)	1.69	(0.70-4.06)				
2nd tertile (DMFT 14-20)	1.22	(0.48-3.08)				
3rd tertile (DMFT >20)	1.00					
Previous use of dental service			0.001			0.022
Yes	1.00			1.00		
No	3.63	(1.73-7.61)		2.37	(1.13-4.95)	
Dental caries (child)			0.130			
Caries free	1.00					
Low severity	0.55	(0.16-1.97)				
High severity	1.44	(0.52-4.00)				
History of restor.			0.551			
Yes	0.81	(0.41-1.61)				
No	1.00					
History of extrac.			0.537			
Yes	1.27	(0.59-2.74)				
No	1.00					

\*BMMW: Brazilian monthly minimum wage.

**TABLE 2** Unadjusted and adjusted prevalence ratios (PR) for associations between child's negative behaviour and independent variables.

3.1-fold greater in those whose mothers had a moderate to severe level of anxiety. Furthermore, the probability of having negative behaviour was almost 80% lower in children aged 7 to 9 years and almost 90% lower among children aged 10 to 12 years compared to those aged 3 to 6 years.

### Discussion

DBMP is a major challenge in paediatric dentistry and the factors that lead to negative behaviour in the dental setting need to be identified. The main findings of the present study show that such negative behaviour is strongly linked to mother's anxiety, whereas previous experience with a dental appointment is related to better behaviour. This knowledge can contribute to preparation and counseling prior to a dental appointment to improve the behaviour of children when undergoing dental care.

Scales, images and behavioural observations have been used to evaluate feelings such as dental anxiety and fear [Sharma et al., 2017; Xia et al., 2011; Klingberg and Broberg, 2007]. In the present study, the Frankl Behaviour Rating Scale was used to assess the outcome and led to the determination that 9.3% of the children had negative behaviour. This classification is one of the most reliable tools developed for rating the behaviour of children in dental settings [Frankl et al., 1962]. Authors [Sharma et al., 2017] used the same scale and also identified a higher prevalence of negative child behaviour during clinical examinations in a sample of children aged 2 to 8 years. When a child lies on the dental chair and is being examined, he/she must deal directly with unknown people and events, which can result in uncooperative behaviour [Venham and Gaulin-Kremer, 1979].

The strong association between mother's anxiety and negative child behaviour was independent of the child's age and a previous history of using dental services. It is likely that mother's anxiety exerts a direct influence on dental fear and anxiety in children [Gustafsson et al., 2010; Rantavuori et al., 2002]. Anxious mothers tend to report feeling guilty or upset because of their children's dental problems or treatment experiences [Goettems et al., 2011]. Parents do not want their children to face situations that may cause discomfort and, in this sense, mother's anxiety affects child behaviour in the dental setting. Moreover, mother's dental anxiety has been suggested to be an indicator of child oral health and dental service attendance as well as a predictor of child dental behaviour [Salem et al., 2012; Gustafsson et al., 2010]. The findings of the present study suggest the need for careful preparation with previous counseling for parents/caregivers in an effort to diminish their anxiety, which could contribute to reducing fear and anxiety in their children [Popescu et al., 2014; Xia et al., 2011].

In the present study, more than 90% of the children had previously visited a dentist. Among these children, 7% exhibited negative behaviour. In contrast, 28% of the children with no previous dental experience exhibited negative behaviour. This variable remained associated even after the adjustment for age, suggesting that a previous history of dental visits *per se* contributes to better behaviour on the part of the child. Authors [Rantavuori et al., 2002] found that a problematic first visit was a strong predictor of dental anxiety, but that children were less likely to present anxiety in the dental setting after the fourth appointment, even in cases with a history of a disturbed first visit. Such findings

lend support to the notion that dentists should be particularly prepared for negative behaviour during the first appointment, independently of the child's age.

Greater dental anxiety has been reported among 5-year-old children with more caries experience; moreover, after adjusting for confounding factors, anxiety was greater only among children with history of extraction, whereas a history of restoration was not a predictor of child anxiety [Milson et al., 2003]. In the present study, negative child behaviour was not associated with dental caries experience, including a history of restoration or extraction, which was prevalent in the sample. This absence of an association with previous dental experiences, regardless of the type of treatment, is interesting. It is possible that different factors related to the type of care, including the psychological approach to the patient and technical preparation of the dentist exert an influence on how previous experiences affect the behaviour of children in future visits to the dentist. Qualitative studies may contribute to a better understanding of this issue, including the reasons for divergences in the findings reported in studies conducted in different communities.

As expected, the increase in age served as a protective factor for negative behaviour in the present study. Previous studies have also reported a higher prevalence of DBMP in younger children [Sharma et al., 2017; Xia et al., 2011]. Therefore, DBMP may reflect the normal development of children, with a difference in the understanding or perception of dental treatment between younger and older children. Older children are better at assimilating explanations given by their parents and/or dentists, which reduce their dental anxiety [Abanto et al., 2017]. Dental care is a novel, unknown situation to be experienced and advanced cognitive skills are required to understand abstract phenomena, such as pain, discomfort and anxiety. Thus, when dealing with younger children, uncooperative behaviour can in fact be seen as an expected reaction, reflecting their expected immaturity to manage the situation [Klingberg and Broberg, 2007].

Socioeconomic variables were not associated with negative behaviour in the present study. Children with DBMP form a heterogeneous group, in which personal characteristics play significant roles and influence a child's ability to cope with dental treatment [Gustafsson et al., 2007]. Nevertheless, the influence of socioeconomic characteristics on the individual and contextual levels should not be discarded. It is possible that factors not evaluated in the present investigation, such as the characteristics of the dental services, including the background and training of the dentists, may exert an influence on the outcome evaluated.

Some methodological aspects of this study merit discussion. The cross-sectional design constitutes a limitation, as it does not enable tracking changes in dental behaviour over time. Moreover, the participants were recruited from a single clinic, which limits the generalization of the findings. Future longitudinal studies should perform a more in-depth investigation of the relationship between the characteristics of children with behavioural problems during dental care and their parents/caregivers as well as explore the possible influence of contextual factors on the outcome. On the other hand, the use of validated, specific scales to measure all variables, including the outcome, and the training/calibration of the examiners contributed to the internal validity of findings, constituting important strengths of the present investigation. Moreover, the sample size enabled the detection of variables associated with the outcome of interest.

## Conclusion

In conclusion, the findings of the present study demonstrate that behavioural problems among children during a dental appointment are strongly associated with mother's anxiety, the previous use of dental services and a younger age of the child. These factors should be taken into account when organising and preparing dental care so that a dental appointment can be a positive experience, especially for younger children.

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