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ORIGINAL ARTICLE

Dental Fear/Anxiety in Children and Child Emotional and Behavioural Problems

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ABSTRACT

Objective: To investigate the association between emotional and behavioural problems and dental fear/anxiety (DFA) in children aged four to 12 years treated at a clinic in southern Brazil. **Material and Methods:** In this cross-sectional study where mother-child dyads were interviewed, emotional and behavioural problems were investigated using the Strengths and Difficulties Questionnaire (SDQ) (considering five subscales). Children's DFA was evaluated through the Venham Picture Test. For each SDQ subscale, Poisson regression model was explored. Prevalence ratios (PR) were estimated, considering a significant level of $p \leq 0.05$. **Results:** Overall, 128 children participated in this study. Most children were female (54.7%) and aged between 7 and 9 years (39.8%). The prevalence of emotional problems was 47.7% and behavioural problems were 46.1%. The prevalence of DFA was 18.8%. Children with emotional problems had a 2.3 higher prevalence of DFA (95%CI 1.06-5.04). In general, behavioural problems were not associated with DFA (95%CI 0.84-3.34) only when conduct problems were considered (2.20; 95%CI 1.02-4.70). **Conclusion:** Children aged between 4 and 12 years who present emotional and conduct problems tend to show higher DFA.

Keywords: Neurodevelopmental Disorders; Dental Anxiety; Child; Observational Study.

Introduction

Dental fear/anxiety (DFA) has a high prevalence among children and adolescents, ranging from 10% to 20% [1], and tends to decrease with age [2]. Child DFA is predicted by several factors, including socioeconomic and demographic characteristics. Girls, younger age, poverty, and low maternal educational level are associated with higher dental fear [1]. In addition, the presence of dental fear is also associated with irregular patterns of dental visits [3,4], negative experiences during previous dental visits [3,4], presence of dental pain [2], and non-collaborative behaviours during dental treatments [4]. There is evidence that the type of procedure also plays an important role in fear/anxiety acquisition. More anxious children tend to manifest more pain-related behaviours and report more dental anxiety after being exposed to the use of local anaesthesia [5,6].

Although clinical and general characteristics have great importance in this relation, psychological characteristics as determinants of children's DFA have been investigated. Studies have shown that psychological well-being is inversely associated with DFA [7]. Children with specific temperaments, such as emotional regulation and effortful control, present lower DFA scores [8].

Considering that DFA is one of the main causes of non-cooperative behaviour during a dental visit, and it has been associated with the presence of other fears, mainly those related to loss of control [9], a study that investigates the association between emotional behavioural problems and DFA is of great importance. Therefore, we hypothesized that children who presented emotional and behavioural problems will be more likely to show high DFA. Thus, the aim of this study was to investigate the association between emotional and behavioural problems and DFA in children aged four to 12 years.

Material and Methods

Study Design and Ethical Clearance

This study has a cross-sectional design and is supported by the "Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)" Statement [10]. This study was approved by the Human Research Ethics Committee of the Federal University of Pelotas under Protocol number 29/2013. All mother-child dyads were invited to participate. Mothers and children who accepted participating signed the consent and assent form, respectively.

Sampling

The minimum sample size was estimated from the prevalence of dental fear reported in the study of Shim and co-workers [2]. It was calculated considering the prevalence of dental fear/anxiety of 10%, a margin of error of 5% points, and confidence level of 95%, and a finite population of 586 children. The sample was increased by 10% to cover non-responses. One hundred and twenty-four children were estimated to compose the sample.

Eligibility criteria included children aged between 4 to 12 years old and accompanied by his/her mother. The sample consisted of children who had not previously attended in a Paediatric Dental Clinic randomly selected according to the order of arrival from May to December 2016. Participants who were not able to understand and answer the questionnaire were excluded. More details about methods are presented in Cademartori et al. [11].

Data Collection

The Paediatric Dental Clinic is a reference in dental care for children and belongs to the School of Dentistry/ Federal University of Pelotas, located in the city of Pelotas. Children who receive dental care in this dental clinic came from free demand or were referred from the Basic Health Units (BHU) of the municipality or by other professionals. Pelotas is a city in southern Brazilian with an estimated population of more than 340 thousand inhabitants.

Data collection was based on interviews before the dental treatment was performed with mothers and children. The mothers' questionnaire was composed of questions related to demographic and socioeconomic data and psychological data. In a separate room without the presence of mothers, children were interviewed.

Exposure Variable

Child emotional and behavioural problems were screened using the Strengths and Difficulties Questionnaire (SDQ-P), completed by mothers [12]. The questionnaire has 25 items with a three-point Likert scale (0 to 2 points) as answer alternatives. In this scale, the following five subscales are included: Emotional symptoms, Conduct problems, Hyperactivity-inattention, Peer relationship problems, and Prosocial behaviour. The overall score (Total Difficulties) ranges from zero to 40, excluding questions related to the Prosocial Behaviour subscale. The higher the overall score, the greater the emotional and behavioural difficulties. In the Prosocial behaviour subscale, a high score indicates greater child strength. In this study, the mean score for overall score of each subscale was considered. Also, each subscale was dichotomized into normal and abnormal using the mean score as the cut-off point. In addition, subscales were pooled into emotional (Internalizing problems: Emotional symptoms and Peer problem subscales) and behavioural (Externalizing: Hyperactivity-inattention and Conduct problems subscales) problems, as indicated for epidemiologic studies or those with low-risk population for emotional and behavioural difficulties [13].

Outcome Variable

To assess the outcome and to minimize possible sources of bias, child's DFA was measured using the modified Venham Picture Test (mVPT) [14], applied in a separate waiting room, without the presence of mothers, before dental care. The mVPT consists of 8 figures numbered from 1 to 8 exploring emotional reactions, such as neutral (little anxiety), cheerful (absence of anxiety), fear (presence of anxiety), distress crying (presence of anxiety), sadness (presence of anxiety), anger (presence of anxiety) and panic (presence of anxiety). Each pair of cards features two children, one with an expression related to anxiety and the other not. Before the mVPT cards are presented, a standardized question was asked, " I would like you to point to the boy who is feeling the same as you are right now. Look carefully at the figures' faces and see how they feel". The overall score ranges from zero to eight points [14]. The cut-off point was established according to a previous study [15], which was chosen to classify individuals according to their level of anxiety, in which 0 is defined as the absence of anxiety, 1 to 3, mild anxiety, and from 4 to 8, anxiety. For analysis purposes, mVPT was dichotomized into yes (4 to 8 scores) and no (0 to 3 scores).

Covariates

Age was categorized as ranging from four to six years, seven to nine years, and 10 to 12 years. Maternal educational level was collected in years of study and categorized into eight years of study and more than eight years of study. The Brazilian version of Corah's Dental Anxiety Scale was used to assess maternal dental anxiety [16]. This tool contains four multiple-choice items scored on one to five scales. The overall score ranges from

four to 20 points. The cut-off point of 13 was used [16,17]. The Beck Anxiety Inventory was used to assess maternal anxiety severity. It is a self-report inventory with 21 items scored from zero to three points. Anxiety levels were classified with a cut-off point of 21 [18]. The question: "Did your child have toothache due to dental caries in the last 4 weeks?", with yes and no as answer alternatives, was used to assess the child's dental pain due to dental caries. Children's behaviour during the previous dental experience was investigated using a question about the occurrence of some negative experience and uncooperative behaviour during dental care (Yes/No). Mothers reported children's history of hospitalization (Yes/No), considering more than 24 hours of hospitalization.

Training Process

In relation to the training process, two hours of theoretical training about the questionnaire were performed with interviewers. The mother's interviewer was blinded to the child interview, as the child's interviewer was blinded to the mother's interview. Third and fourth researchers, blinded to previous steps, double-entered data.

Statistical Analyses

Statistical analyses were performed using Stata 14.0 (Stata Corporation, College Station, TX, USA), and descriptive analysis was performed. The association between DFA and children's emotional and behavioural problems was tested using the Mann-Whitney test was used. Poisson regression models adjusted for covariates were tested with each SDQ-subscales as the outcome. The child's age and gender, maternal educational level, maternal anxiety, maternal dental anxiety, child's previous dental experience, history of hospitalization, and child's dental pain were used as covariates since they are all potential indicators of both exposure and outcome. Prevalence Ratio (PR) was the effect measure used and a 95% confidence interval (CI) was adopted.

Results

The sample was composed of 128 children aged between 4 and 12 years. No child was excluded from the study for missing data or for not accepting to participate. Most children were female (54.7%) and were aged between 7 and 9 years (39.8%). The prevalence of emotional problems was 47.7%, behavioural problems was 46.1%, and DFA was 18.8% (Data not shown). Table 1 describes the sample characteristics according to the presence of DFA.

Table 1. Distribution of the sample according to the Dental Fear/Anxiety.

Variables	Overall	Dental Fear/Anxiety	
	N (%)	No	Yes
		N (%)	N (%)
Gender			
Male	58 (45.3)	48 (82.8)	10 (17.2)
Female	70 (54.7)	56 (80)	14 (20)
Age			
4-6 years	48 (37.5)	31 (64.6)	17 (35.4)
7-9 years	51 (39.8)	46 (90.2)	05 (9.8)
10-12 years	29 (22.7)	27 (93.1)	02 (6.9)
Maternal Educational Level			
≤ 8 years	77 (60.2)	66 (85.7)	11 (14.3)
>8 years	51 (39.8)	38 (74.5)	13 (25.5)
Maternal Dental Anxiety			

Low/Moderate	111 (86.7)	92 (82.9)	19 (17.1)
High anxiety	17 (13.3)	12 (70.6)	05 (29.4)
Maternal Anxiety			
Low/Moderate anxiety	60 (46.9)	47 (78.3)	13 (21.7)
High anxiety	68 (53.1)	57 (83.8)	11 (16.2)
Previous Dental Experience			
No	90 (72)	77 (85.6)	13 (14.4)
Yes	35 (28)	25 (71.4)	10 (28.6)
History of Hospitalization			
No	67 (52.3)	51 (76.1)	16 (23.9)
Yes	61 (47.7)	53 (86.9)	08 (13.1)
Dental Pain due to Dental Caries			
No	65 (50.8)	55 (84.6)	10 (15.4)
Yes	63 (49.2)	49 (77.8)	14 (22.2)

Table 2 shows the association between emotional and behavioural problems and children's DFA. Behavioural problems were associated with the presence of DFA (p<0.022). When subscales were considered, the association was significant in the Hyperactivity-inattention (p=0.030) and Conduct problems (p=0.032) subscales with children with DFA. Emotional problems were not associated with DFA (p=0.542). However, Emotional symptoms and Peer problems were associated with children's DFA (p=0.024 and p=0.021, respectively). Prosocial behaviour was not associated with children's DFA (p=0.642).

Table 2. Mean scores of the SDQ-P subscales in children aged 4 to 12 years according to the Dental Fear/Anxiety.

SDQ-P	Overall Mean (SD)	Dental Fear/Anxiety Absence Mean (SD)	Dental Fear/Anxiety Presence Mean (SD)	p-value*
Emotional (Internalizing) Problems	4.0 (0.2)	3.6 (0.3)	5.5 (0.4)	0.05
Emotional Symptoms	2.4 (0.1)	2.3 (0.1)	3.1 (0.2)	0.02
Peer Problems	1.6 (0.1)	1.4 (0.2)	2.4 (0.2)	0.02
Behavioural (Externalizing) Problems	4.7 (0.3)	4.4 (0.3)	6.0 (0.3)	0.02
Hyperactivity-Inattention	3.0 (0.2)	2.8 (0.2)	3.9 (0.2)	0.03
Conduct Problems	1.6 (0.1)	1.5 (0.1)	2.2 (0.1)	0.03
Prosocial Behaviour	7.4 (0.2)	7.5 (0.2)	7.3 (0.2)	0.64

+Mann-Whitney test; *It was considered significant if p<0.05.

Crude and adjusted associations between emotional and behavioural problems with children's DFA are presented in Table 3. After adjustments, emotional problems remained associated to children's DFA (PR 2.3; 95%CI 1.06-5.04). On the other hand, behavioural problems were not associated to children's DFA (PR 1.7; 95%CI 0.84-3.34). However, children with conduct problems presented twice more DFA when compared with those without conduct problems (PR 2.20; 95%CI 1.02-4.70).

Table 3. Association between the social-emotional and behavioural problems and the Dental Fear/Anxiety in children aged 4 to 12 years. Crude and adjusted Poisson Regression models.

SDQ-P	Dental Fear/Anxiety PR[c] (95% CI)	p-value	PR[a] (95% CI)	p-value*
Emotional Problems (Internalizing) (Ref. Normal)	1.00	0.006	1.00	0.031
Abnormal	2.7 (1.32-5.49)		2.3 (1.06-5.04)	
Emotional Symptoms (Ref. Normal)	1.00	<0.001		0.011
Abnormal	3.5 (1.76-7.13)		2.8 (1.24-6.24)	
Peer Problems (Ref. Normal)	1.00	<0.001	1.00	0.062
Abnormal	3.4 (1.71-6.78)		2.2 (0.95-4.96)	
Behavioural Problems (Externalizing) (Ref. Normal)	1.00	0.189	1.00	0.141
Abnormal	1.6 (0.78-3.41)		1.7 (0.84-3.34)	

Hyperactivity-Inattention (Ref. Normal)	1.00	0.037	1.00	0.300
Abnormal	2.2 (1.04-4.48)		1.5 (0.69-3.23)	
Conduct Problems (Ref. Normal)	1.00	0.012	1.00	0.041
Abnormal	2.5 (1.22-5.12)		2.2 (1.02-4.70)	
Prosocial Behaviour	1.00	0.275	1.00	0.691
(Ref. Normal)	1.6 (0.68-3.77)		1.2 (0.51-2.77)	

†Ref: Reference category; ††PR: Prevalence Ratio, c: crude analysis, a: adjusted analysis; Multivariate analysis by Poisson regression adjusted for child's age, child's gender, maternal schooling, previous dental experience of children, history of hospitalization, child's dental pain, maternal anxiety, and maternal dental anxiety; *It was considered significant if $p<0.05$.

Discussion

The present study investigated a possible association between emotional and behavioural problems with DFA among children. Our findings showed that children with emotional problems, specifically those with emotional symptoms, and those with conduct problems, reported more dental fear/anxiety than children without these psychological problems.

Over the years, literature has shown that child DFA is associated with clinical, behavioural, demographic, socioeconomic, and psychological characteristics. The prevalence of DFA is higher among younger children [1,3], children from families with lower income [3,7], and those enrolled in public schools [4]. In addition, family structure and presence of siblings are family-related factors associated with DFA [19]. A paternal positive control can buffer the relationship between children's impulsivity and behavioural problems, whereas parental negative control strengthens the relationship between fear and emotional problems [20]. The fact is that well-functioning families provide an environment more suited to the child's psychological development [20].

Emotional problems are those related to emotional symptoms and peer problems, which tend to affect the social experiences of children [21]. Some studies have demonstrated that emotional problems, specifically state of anxiety [22,23], are associated with higher scores of children's DFA. On the other hand, other studies have found a weak correlation between DFA and emotional problems [24] or even no association [22,25]. Our findings showed a positive association between emotional problems and children's DFA, specifically about emotional symptoms. Children with problems related to emotional symptoms presented almost three times more dental fear. The fact is that children's DFA is strongly associated with a high level of comorbid phobias, depression, mood disorders, and other psychiatric disorders and symptoms [26]. The pathway by which this association occurs has not yet been elucidated in the literature. Thus, studies investigating factors that could mediate this relationship should be carried out.

Children's temperament should be considered as a possible mediator of dental fear-externalizing problems. Anger and impulsivity are positively associated with more behavioural problems. In the face of stressful environments (i.e., family stressors), children with resistant temperament are at risk for behavioural problems, amplifying the tendency of showing more aggressive and impulsive behaviours [27], which are characteristics among children with conduct problems. These aggressive tendencies prevent children from learning self-modulation skills face to stressors, such as dental treatment.

On the other hand, children less impulsive and with more fearful temperament tend to show more emotional problems [20]. People with fearful temperament, especially fears related to lack of control, present more dental fear [9]. In this same line, a genetic component has been explored. Randall et al. [28] showed that dental fear and fear of pain are genetically related, and fear of pain is a major component of the phenotypic variance of dental fear [28]. This co-occurrence between fears and specific personality traits can determine an

individual's dental fear experience [9]. Children with social-emotional behaviour problems tend to present more uncooperative behaviour during dental treatment [11].

Our findings also showed children with conduct problems presenting twice-higher prevalence of DFA than children without behavioural problems. Behavioural problems include hyperactivity-inattention disorder and conduct problems reflecting the child negatively acting on the external environment [21]. In fact, children with behavioural problems tend to present more non-collaborative behaviour during dental treatment [11], showing traits of negative feelings such as fear, irritability, and anger [29].

One explanation for this association is that children with behavioural problems, who tend to behave in a non-cooperative way, make the dental visit a stressful event, with moments of suffering and, therefore, a negative experience. Negative experiences are closely associated with greater levels of dental fear. Our study did not explore negative experiences as a mediator of this association. However, our analysis was adjusted for this factor, as well as for the psychological characteristics of the mother, known to influence the mental state of the child.

A limitation of this study is related to the external validity of the results. Our findings should be interpreted with caution, especially in the generalization of results, once the sample belonged to a Public Dental Clinic. One of the strengths of this study is the fact that emotional and behavioural problems were evaluated using the SDQ-P, a tool widely used to screen mental disorders. In addition, it is important to highlight the blinding of researchers at each stage to the other study phases. As previously recommended, to ensure a more conservative approach to behavioural problems, the emotional and behavioural problem constructs domains were adopted once the risk related to emotional and behavioural problems of the study population was unknown [13].

Conclusion

Our findings demonstrate that children aged between 4 and 12 years who present emotional and conduct problems tend to show higher DFA. Thus, our findings reinforce that paediatric dentist should recognize the children's social-emotional and behavioural problems as an important determinant of DFA, which will allow the application of appropriate management techniques for these children.

Authors' Contributions

MGC	https://orcid.org/0000-0002-2433-8298	Conceptualization, Methodology, Validation, Formal Analysis, Investigation, Data Curation, Writing - Original Draft, Writing - Review and Editing, Supervision and Project Administration.
FBM	https://orcid.org/0000-0002-1617-6727	Investigation, Writing - Original Draft, Writing - Review and Editing and Supervision.
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MLG	https://orcid.org/0000-0002-6512-2602	Formal Analysis, Conceptualization, Writing - Original Draft, Writing - Review and Editing and Project Administration.

All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

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None.

Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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