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Indicators of Dental Anxiety in Children Just Prior to Treatment

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Objectives: We evaluated the relationship between child dental anxiety and selected child and parental characteristics. **Study design:** Children and their parents were interviewed at the New York University, College of Dentistry, Pediatric Dentistry Clinic. The Children's Fear Survey Schedule - Dental Subscale (CFSS-DS) evaluated child self-reported anxiety; the Modified Dental Anxiety Scale (MDAS) measured self-reported parental anxiety when the parent received dental treatment. **Results:** Ninety-three children and their parents completed the questionnaires. Mean CFSS-DS scores were higher for girls than boys (32.5 vs. 26.3, $p=0.003$) and for children whose accompanying parents had MDAS scores of 11+ vs. <11 (32.8 vs. 26.6, $p=0.001$). There was little difference in mean CFSS-DS scores among those aged 6-10 yrs. vs. 11-14 yrs. (30.1 vs. 29.3). Significant correlations were found between CFSS-DS and both gender (Spearman's rho, $r_s=0.31$) and MDAS scores ($r_s=0.33$), but not between CFSS-DS and child age ($r_s=-0.05$). Controlling simultaneously for gender, MDAS score and child age, a high CFSS-DS score (38+ vs. <38) was positively associated with girls ($OR_{adj}=3.76$, 95% CI: 1.13-12.54) and an MDAS score of ≥ 15 vs. <11 ($OR_{adj}=2.50$, 0.73-8.54), but weakly and inversely associated with age ($OR_{adj}=0.80$, 0.25-2.52). **Conclusion:** Child gender and parental anxiety are indicators of child dental anxiety.

Key words: children's dental anxiety, maternal anxiety, CFSS-DS

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INTRODUCTION

Widespread interest in the complex etiology of dental phobia reflects the significant psychosocial impact that fear-related factors can have on a child's behavior.

These fears are commonly psychological, emotional and cognitive in nature and may be related to changes in children as they pass through different developmental stages¹ The nature of these fears does not necessarily depend solely on a child's age, but can be correlated with intrinsic and extrinsic factors associated with the child's socio-cultural background and the influence of parental experience, particularly anxiety^{2,3}

As currently practiced, dental behavior management strategies for children too often employ unnecessarily invasive pharmacological approaches that may exacerbate stress levels in children and their caretakers.^{4,5}

To be able to institute change, more knowledge is mandatory on dental anxiety and predisposing factors for an elevated anxiety level among pediatric dentistry patients in the US population.

Dental anxiety in childhood can seriously impact a child's perception of dentists and greatly diminish the dental experience. In order to improve the delivery of dental care for uncooperative pediatric patients, it is important to determine the characteristics that place these children at an elevated risk of being anxious in dental surroundings. The aim of the current research was to investigate various childhood and paternal characteristics in relation to anxious behavior on the part of children presenting for dental treatment.

MATERIALS AND METHOD

A total of 118 children aged 6 to 14 years and their parents who attended the Department of Pediatric Dentistry Clinic at the New York University College of Dentistry agreed to participate in the study which involved answering questions regarding various aspects of their fear related to dental care.

In the current analysis, we were interested in four key variables, i.e., child anxiety and stress associated with fear of dentists and dental treatment (the dependent variable), child gender, child age, and level of dental anxiety as reported by the parent who accompanied the child to the dental visit.

In order to evaluate each child's self-reported anxiety and stress related to fear of dentists and dental treatment, we employed the Children's Fear Survey Schedule - Dental Subscale (CFSS-DS).⁶⁻⁹ The CFSS-DS is based on an instrument using fifteen Likert items, each scored from 1 to 5. For example, one item states "I am afraid of dentists" while another reads "I am afraid of injections." All responses are scored as follows: "not afraid at all" (1), "afraid a little" (2), "somewhat afraid" (3), "afraid" (4), or "very afraid" (5). The total Likert scale score is obtained by summing the individual item scores and can range from 15 (lowest) to 75 (highest). The CFSS-DS questionnaire was administered in English only to the child by study personnel shortly before the provision of dental treatment. We didn't have any information on the dental treatment planned for the child.

The Modified Dental Anxiety Scale (MDAS), a modification of the Corah Dental Anxiety Scale (CDAS)¹⁰⁻¹³, was used to measure self-reported parental anxiety associated with their own dental visits. The modification to the CDAS was accomplished by adding a fifth item that relates to fear of injection. The MDAS questionnaire is comprised of five Likert items scored 1 to 5, with possible responses ranging from "not anxious" (1), "slightly anxious" (2), "fairly anxious" (3), "very anxious" (4), and "extremely anxious" (5). A total MDAS score can range from 5 to 25. The MDAS has been shown to be highly reliable, valid, more comprehensive than other anxiety questionnaires, and simple to complete.¹⁴ The instrument was self-administered by the parent during the time in which the child was receiving dental care. The MDAS was provided in English only. Data were not collected on a parent/guardian gender and could not be included in the analysis.

Standard statistical methods, including frequency distributions, correlations, tests of differences in proportions and means (or their non-parametric analogues), linear regression, and logistic regression, were used to analyze study data. CFSS-DS, age, and MDAS scores were analyzed as either continuous or categorical variables depending upon the specific analysis. In addition to its continuous form and as in previous studies, the CFSS-DS score was also dichotomized using a cut-point of 38+ to identify children who were highly anxious in the dental setting¹⁵⁻¹⁷ Child age was categorized as 6-10 and 11-14 years while MDAS scores were dichotomized as ≤ 10 and 11+ and trichotomized as ≤ 10 , 11-14 and 15+ years.

The study was approved by the New York University Langone Medical Center, Institutional Review Board. Written consent was obtained from the accompanying parent, and assent was compulsory for all children aged 8 years and older.

RESULTS

A total of ninety-three children and their attending parents provided complete data for each of the study questionnaires, and the analysis was restricted to those parent/child pairs.

The distributions of children by CFSS-DS score, gender, and age, as well as the MDAS scores of the accompanying parent, are presented in Table 1. The majority of child participants had a CFSS-DS score of less than 38 (79%). In the subject group there were more girls (57%) than boys, and the largest age group was aged 6 to 10 years (68%). Forty-seven percent of the accompanying parents had an MDAS score of less than 11.

As shown in Table 2, bivariate analyses revealed higher mean dental anxiety (CFSS-DS) scores for girls compared to boys. CFSS-DS scores were also higher among those children whose accompanying parent had an MDAS score of 11+ relative to those with a lower score, but there was little difference in mean dental anxiety scores for children aged 6-10 and those 11-14 years, even when we compared mean CFSS-DS scores by age (6-10 vs. 11-14) separately for girls (32.4 vs. 32.6) and boys (26.7 vs. 25.6). Similarly, there were statistically significant positive correlations between CFSS-DS and both gender (girls vs. boys; Spearman's rho (r_s) = 0.31) and MDAS scores (r_s = 0.33), but little correlation between CFSS-DS and age of the child (r_s = -0.05).

Because fear of injections has been reported to be inversely related to age, we tested the relationship in our sample of children. There was a moderate, but statistically non-significant, difference in the mean score for the CFSS-DS item "I am afraid of injections" among children aged 6-10 [3.21 (SD=1.47)] vs. those aged 11-14 years [2.83 (SD=1.78)] (P_{M-W} = 0.24), and a modest inverse correlation (r_s = -0.18, p =0.09). Similar correlations and mean differences were observed when we further stratified our analysis by gender.

Using CFSS-DS scores as the outcome variable and gender, age, and MDAS scores as independent variables, multiple linear regression revealed that gender (girls vs. boys) and increasing

Table 1. Characteristics of study participants included in the analysis

Characteristic	n	(%)	Mean (SD)	Min-Max
CFSS-DS score (child)				
<38	73	78.5		
38+	20	21.5	29.8 (10.2)	15-55
Gender				
Boys	40	43.0		
Girls	53	57.0	--	--
Child age (years)				
6-10	63	67.7		
11-14	30	32.3	9.2 (2.3)	6-14
MDAS score (parent)				
<10	44	47.3		
11+	49	52.7		
<10	44	47.3		
11-14	25	26.9		
15+	24	25.8	11.5 (5.0)	5-24

Note: includes only those subjects with no missing data, n=93.

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Table 2. CFSS-DS scores by study participant characteristics

Characteristic	CFSS-DS		Correlation with CFSS-DS	
	Mean (SD)	p-value ¹	Coefficient (r _s) ²	p-value
Gender				
Boys	26.3 (8.8)			
Girls	32.5 (10.4)	0.003	0.31	0.003
Child age (years)				
6-10	30.1 (10.4)			
11-14	29.3 (9.9)	0.85	-0.05	0.634
MDAS score				
<10	26.6 (9.7)			
11+	32.8 (9.8)	0.001		
<10	26.6 (9.7)			
11-14	31.4 (8.6)			
15+	34.1 ³ 11.0)	0.004	0.33	0.001

¹ Based on Mann-Whitey or Kruskal-Wallis tests, two-tailed.

² CFSS, age, MDAS (continuous), gender (dichotomous); Spearman's rho

³ For MDAS, the distribution of CFSS-DS was statistically higher for children whose parent had a MDAS score of 15+ vs. <10; the other group comparisons were not statistically different from one another.

Note: includes only those subjects with no missing data, n=93

Table 3. Indicators of CFSS-DS Score based on linear regression

Variable	Coefficients		
	Unstandardized (SE)	Standardized	P-value
Intercept	25.545 (4.549)	--	
Gender (girls vs. boys)	5.579 (2.010)	0.273	0.007
Child age (years)	- 0.508 (0.438)	-0.115	0.25
MDAS score	0.501 (0.204)	0.244	0.016

Model significance: p= 0.002; adjusted R² = 12.6; n=93

MDAS scores were positively and statistically significantly related to childhood dental anxiety scores. The beta-coefficient for age in relation to CFSS_DS was not statistically significant, but suggested that as child age increased, CFSS-DS scores declined modestly. The standardized regression coefficients suggest that of the three explanatory variables in the model, gender and MDAS play a more important role than age (Table 3)

We examined the relationship between *severe* dental stress/anxiety (i.e., a CFSS-DS score of 38+ vs. ≤38) and child gender, age, and parental MDAS score using logistic regression. As presented in Table 4, girls were more likely than boys to have a high CFSS-DS score, and the relationship was statistically significant and strong, with crude and adjusted ORs over 3.7. Having a parent with an MDAS score of 15+ increased the odds of severe dental

Table 4. Odds ratios for the association between a high CFSS-DS (38+) score and study participant characteristics

Characteristic	CFSS Score		OR ¹ (95% CI)		OR ³ (95% CI)	
	37+	<37				
	n	n				
Gender						
Boys	4	36	1.0 (ref)		1.0 (ref)	
Girls	16	37	3.89	1.19	3.76	1.13
			- 12.77		- 12.54	
Child age (years)						
6-10	14	49	1.0 (ref)		1.0 (ref)	
11-14	6	24	0.88	0.30	0.80	0.25
			- 2.56		- 2.52	
MDAS score						
<10	7	37	1.0 (ref)		1.0 (ref)	
11-14	5	20	1.32	0.37	1.13	0.31
			- 4.71		- 4.18	
15+	8	16	2.64	0.82	2.50	0.73
			- 8.53		- 8.54	

¹ Crude odds ratio ² 95% confidence interval adjusted for each other variable in the table, ³ Odds ratio n=93

Table 5. The joint effect of child gender and parental MDAS in relation to CFSS-DS (38+)

Characteristic	CFSS Score	OR ¹ (95% CI)		OR ³	
		38+	<38		
Child Gender	MDAS Score	n	n		
Boys	<10	2	20	1.0 (ref)	1.0 (ref)
Boys	11+	2	16	1.25	0.16
				- 9.88	
Girls	<10	5	17	2.94	0.51
				- 17.14	
Girls	11+	11	20	5.50	1.08
				- 28.05	

¹ Crude odds ratio ²95% confidence interval ³OR adjusted for age

stress/anxiety by approximately 150% compared to parents with lower scores; however, the adjusted odds ratio was not statistically significant (OR_{adj}=2.50, 95% CI 0.73 – 8.54). Children aged 11-14 years had a 20% reduction in the odds of severe dental stress/anxiety (OR_{adj}=0.80) relative to children ages 6-10, but the association did not approach statistical significance.

Our sample size precluded an in-depth analysis of effect modification; however, because both child gender and parental MDAS score appeared to be important indicators of severe dental stress/anxiety among children, we explored their possible joint effect. Based upon point estimates, boys whose parent presented with a high MDAS score had little increased odds of severe dental anxiety (OR_{adj} = 1.25) relative to boys whose parent had a low MDAS score (OR_{adj}=1.0). On the other hand and again relative to boys

whose parent had a low MDAS score, girls whose parent had a low MDAS score had nearly 3-times the odds of severe dental anxiety while girls whose parent had an MDAS score of 11+ had a 5.5-fold increase in the odds of severe anxiety (Table 5).

While we limited our primary analysis to the ninety-three children and parents who provided complete information on each of the four variables of interest, we also conducted a secondary analysis in which we repeated each of the above crude analyses using all available data for the two variables, e.g., 93 subjects were included in the restricted analyses involving child age and fear of injection, while the unrestricted analysis had a sample size of 115. In general, the results of the unrestricted analyses were in keeping with those reported in the restricted analyses; however, in correlating child age with fear of injection, the resulting correlation became statistically significant ($r_s = -0.21, p=0.02$).

DISCUSSION

The way a child is brought up is determined by environmental differences and multicultural approach, which are parts of American society. These differences within the society influence a parent-child interrelationship and result in a variety of etiological factors inherent in creating anxious behavior in children undergoing dental treatments.

The apparent association of gender and age influences on manifesting fears among US pediatric dental patients is far from consistent or universal as there is limited data available. As derived from the published US literature, a general approach in treating such uncooperative children basically depends on using different sedation methods.¹⁸⁻²⁰

Therefore, we examined potential indicators of dental anxiety among children ages 6 through 14 years who were attending the Department of Pediatric Dentistry Clinic at the New York University College of Dentistry.

We found a relationship between child gender (girls vs. boys) and dental anxiety level, and the association was apparent even after controlling for child age and parental anxiety as measured by MDAS scores. In addition, our results revealed that compared to boys, girls were more than three times as likely to have *severe* dental anxiety even after again adjusting simultaneously for child age and the anxiety level of the accompanying parent. Our results are thus in keeping with previous studies that have reported a tendency for girls to exhibit higher levels of fear than boys in the dental office.^{14,21-24}

It is noteworthy however, that other investigations have not found such a relationship^{6,7,17,22,25,26}, and at least one European study reported that boys had higher dental anxiety than girls.¹⁶ It is not clear why some studies find that girls are more likely to show dental anxiety than boys, and others do not. These differences may exist due to potential variety of personality related cognitive traits, which are influenced by cultural background. It is possible that social and cultural views may play a role; for example, in some cultures, it is more socially acceptable for girls to exhibit or admit fearful behavior than boys.²⁷ The gender-specific manifestation of fear may also have a biological origin, reflecting distinctive psychological functioning as well as differences in anticipating and reacting to stressful situations.²⁸⁻³⁰ However, differences could persist due to gender related differences determined by the specificity of conditioning process and learned responses that individuals have experienced throughout life.³⁰

It has been reported that the manner in which the child is capable of coping with unpleasant and potentially fearful situations depends on the development of cognitive abilities and occurs with increasing age.^{8,16,22} During early life, children lack cognitive ability and do not have a clear perception of fearful situations; they are thus more prone to experience anxiety.³¹ As children grow older, they learn to control the expression of their fear, which further leads to a decrease in uncooperative behavior.³²

As with gender, research findings available on age as a potential factor in childhood anxiety vary across studies.^{28,29} While we found only weak evidence of an inverse relationship between child age and dental anxiety, some studies have reported much stronger inverse relationships, particularly among children aged 4 years and younger.^{8,21,29,33} A possible explanation for the relatively weak relationship observed in our study relative to the stronger associations reported by others, may hinge on the fact that our sample of children included only those aged 6 years and older, thereby excluding individuals that other studies have reported as being most likely to exhibit anxious tendencies.

It has been reported that the most relevant age-related factor involved in children acquiring a fear of dentists and dental procedures is the fear of injections.³³ We also found that child age was negatively related to a fear of dental injections; however, only the correlation between age and fear of injection achieved statistical significance, and then when the analysis included all subjects with usable age and fear of injection data (i.e., the unrestricted analysis with $n=115$). As needle phobia can, apart from dental treatment, be related to an array of medical procedures, it should be considered a separate phenomenon.

The results of our analysis suggest that parental anxiety about their own dental treatment is an indicator of elevated dental anxiety in their children. In fact, very high MDAS scores (15+) were associated with a 2.5-fold increase in the likelihood of *severe* dental anxiety. Our exploration into the joint effect of child gender and parental anxiety on child dental anxiety suggests that girls suffer the greatest impact in terms of dental anxiety when their parent has an elevated MDAS score.

Children absorb parental attitudes and easily adopt the negative behavior patterns of their parents. Mothers develop an early psychological attachment with their child and are known to subtly transmit fears and anxiety to their children. Therefore, it is likely that parents remember their unpleasant childhood dental experiences and transfer them onto their children.³⁴ Accordingly, parental levels of dental fear can play a key role in the development of a child's dental anxiety.³⁵⁻³⁸ According to some European studies, parents' age and demographic factors, such as education or place of birth, did not influence children's anxiety; yet a strong correlation in the anxiety scores between parents and children was found.³⁸

In light of changing patterns in the gender-specific role of parents in child rearing, some recent findings support the role of the father in transferring dental fear from parent to child.³⁹ Evidence is mounting that whichever person is closest to the child (mother, father or guardian), is usually the one with which the child is most likely to identify and the person most likely to transfer dental fear.

Our findings should be considered in light of study limitations. We did not collect information on the socioeconomic status of the child's family, the dental treatment planned for the child, or the race of the child; consequently, we could not control for the potentially

confounding effect of these variables. Further, our analysis was restricted to children and parents who provided complete information for each of the four study variables, and it is possible that the resulting exclusion of data could have biased our results. However, when we conducted parallel analyses using all available information, the results of the crude analyses were similar to those obtained in the restricted analysis.

In an attempt to reveal some factors that are involved in fearful child behavior, this study gives a broader prospective on the current situation among US pediatric dental population, as well as possible solutions for applying different behavioral techniques in treating such children. Although many questions still remain, the present data supports a basic approach encouraging clinicians to consider more active psychological behavior management for anxious children, instead of focusing on the pharmacological concept. Consequently, patients and clinicians both may benefit in the long-term.

CONCLUSIONS

Based on the results of this study, the following conclusions can be drawn:

1. Girls were more likely than boys to report dental anxiety and they were more than three times as likely to have *severe* dental anxiety.
2. Children who had a parent with high dental anxiety were at an elevated risk of experiencing anxiety in the dental setting.
3. Age of the child had a relatively modest impact on their risk of severe dental anxiety.
4. The results provide a foundation upon which the provider can decide which behavior guidance techniques would be best suited for an individual patient.
5. The influence of past parental dental experience and its potential effect on a child's behavior in the dental setting should be investigated further in light of cultural and social diversities.

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