



Evaluation of Dental Anxiety and the Role of Concomitant Factors in Their Anxiety Level in 9-12 years Old Children

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Abstract

Background: Child dental anxiety can be related to poor oral hygiene, along with more missing and decayed teeth. Information on the origin of dental fear and uncooperative behavior in pediatric dentistry is important for behavior management strategy. A limited number of studies have investigated the effects of environmental factors comparatively. Accordingly, the present study aimed to evaluate dental anxiety in children who referred to Hamadan Dental School with respect to such environmental factors during 2018-2019.

Methods: In this cross-sectional study, the level of child dental anxiety was evaluated by the Modified Child Dental Anxiety Scale (MCDAS) and Venham picture test (VPT). The study was conducted on 121 children aged 9-12 years old and the obtained data were statistically analyzed with SPSS 20. In addition, analytical methods such as *t* test, Freedman test, and independent *t* test ($\alpha=0.05$), as well as one-way ANOVA, Kruskal-Wallis, and Mann-Whitney were utilized for analyzing the data. Finally, the correlation between the two questionnaires was measured using the Pearson test.

Results: Tooth extraction and injection in the gum were operated with the highest level of anxiety. The relationship between MCDAS and VPT scores was significant. According to the MCDAS score, having a dental experience was the only factor that was significantly related to child dental anxiety. Based on the VPT score, gender, dental experience, clinic type, and mother's education level were the variables with a significant relationship with the child dental score.

Conclusions: In general, aggressive dental treatment such as tooth extraction and restoration should be avoided in the first visit of children. The level of dental anxiety among female children was higher compared to male children, therefore, female children need more attention in this regard. Eventually, mothers' awareness of dental and oral hygiene also plays an important role in reducing the dental anxiety of their children.

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Background

Child dental anxiety is considered as one of the main obstacles against proper dental treatment (1). Although a low level of fear and anxiety is not problematic, an abnormally high level of fear and anxiety can disturb daily functions. Children with extremely high levels of fear and anxiety toward dental treatment commonly have poor oral and dental hygiene because they often refuse to visit dental clinics (2). In addition, evidence has stressed the relationship between dental anxiety and oral hygiene (3). Previous research demonstrated that nine-year-old children have at least one decayed permanent tooth in their mouth and this number increases to 2 for 12-year-old children (4). Further, child dental anxiety can be a reason for the high prevalence of dental caries among

Highlights

- ▶ In this study tooth extraction and injection in the gum were operated with the highest level of anxiety
- ▶ In this study the relationship between MCDAS and VPT scores was significant
- ▶ The level of dental anxiety among female children was higher compared to male children

children. In this regard, it was concluded that dental fear and anxiety (DFA) are related to more decayed and missing teeth (5).

On the other hand, previous studies have not so far focused on the etiology of child dental anxiety comprehensively. However, Essau and Petermann

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(6) identified three groups of causes for explaining such phenomenon, including personal factors (e.g., age and mental characteristics), external factors (e.g., the socioeconomic status of the family, racial factors, education, and the like), and dental factors (e.g., dentistry team and pain). Therefore, dentists and society to obtain knowledge about factors that are supposed to affect child dental anxiety. Considering previous controversial results, more studies are needed in this regard. Accordingly, the present study sought to investigate the relationship between child dental anxiety and some social, economic, personal, and family-related factors.

Material and Methods

Data Collection Tools

Several tools were developed to assess participants' dental anxiety, including Children's Fear Survey Schedule-Dental Subscale (7), Corah's Dental Anxiety Scale (8), and Wong-Bakar pain scale (9). The present study utilized the Modified Child Dental Anxiety Scale (MCDAS) (10) and Venham Picture Test (VPT) which is illustrated in

Figure 1. Javadinejad et al (11) translated MCDAS into Persian. The scale consists of 8 questions on a 5-point Likert-type scale evaluating the anxiety level of children from different points of view. It must be noted that the last question of this scale was excluded because the nitrous oxide gas is not used for relaxation in dentistry centers supervised by Hamadan University of Medical Sciences. Similarly, Buchanan et al (12) confirmed the validity of VPT. It contains 8 pairs of images representing a child with different emotional states. To conduct this test, the children are asked to mark the most relevant pictures demonstrating their emotions when visiting a dentistry clinic. The higher score indicates that the child is more anxious.

Participants

The present cross-sectional study was conducted among children who referred to the Dental Clinic of the Dentistry Faculty of Hamadan University of Medical Sciences during 2015-2016. In general, 121 children within the age range of 9-12 years old were randomly selected to participate

Table 1. Demographic Information of Study Participants

Variable	State	No. (%)
Gender	Male	55 (45.5)
	Female	66 (54.4)
Age	9	62 (51.7)
	10	31 (25.8)
	11	14 (11.7)
	12	13 (10.8)
Birth order	First	72 (59.5)
	Second	38 (31.4)
	Third or older	11 (9.1)
Father's occupation	Worker	5 (4.2)
	Self-employed	66 (55.5)
	Civil servant	48 (40.3)
Mother's occupation	Housewife	92 (76)
	Self-employed	2 (1.7)
	Civil servant	27 (22.3)
Father's education level	Primary and lower	14 (12.2)
	Secondary and diploma	51 (44.3)
	Academic (bachelor)	31 (27)
	Mater or higher	19 (16.5)
Mother's education level	Primary and lower	16 (13.6)
	Secondary and diploma	66 (55.9)
	Academic (bachelor)	23 (19.5)
	Mater or higher	13 (11)
Socio-economic status of family	Poor	19 (16.8)
	Moderate	57 (50.4)
	Rather high	24 (21.2)
	High	13 (11.5)

in the present study. The inclusion criteria were children who were mentally and physically healthy, had the experience of visiting a dentist, and those cases that their parents filled the contest form. Moreover, it was necessary for the participants to have a knowledge of reading and writing in order to read and answer the questionnaires. The demographic information of children was extracted from their medical records.

Study Variables

As already mentioned, the present study aimed to explore the relationship between child dental anxiety and some personal, economic, and family-related factors such as age, gender, parent's occupation, parent's education level, the type of clinic (private or public), the type of dental specialist, medical experience, dental experience, as well as the social-economic level of the family and birth order.

Statistical Analyses

The lowest required sample size for questionnaire-based studies is five to ten samples for each question. However, the lowest number of required samples should not be lower than one hundred when the number of questions is lower than 15 (13). Accordingly, the sample size was determined to be 121 in the present study. The data were analyzed using SPSS software, version 20 at the 0.05 level of significance.

Likewise, various statistical tests were utilized based on the nature of variables. The relationship between age and the anxiety level was examined using the Pearson correlation coefficient. Furthermore, the Spearman correlation coefficient was applied to assess the relationship between VPT score and age. Other examinations were performed using independent pairwise *t* test and ANOVA. It is worth mentioning that the normality of data and the equality of

variances were evaluated using the Kolmogorov-Smirnov and the Levene tests, respectively. Finally, the Mann-Whitney and Kruskal-Wallis tests were employed for those cases the data of which failed to follow a normal curve.

Results

Table 1 presents demographic information of children who participated in the present study. As shown, 45.5% of them were males and the remaining participants were females. Furthermore, most participants were nine years old and the first child of their families. The information about the other study variables such as parent's occupation, parent's education level, and the socioeconomic status of children's families are summarized as well.

The results of assessing child dental anxiety based on MCDAS are provided in Table 2. Based on the data, tooth extraction was the most fear-inducing operation during which 15.7% of participants were very worried, followed by the injection in the gum. In contrast, looking at teeth and "being put to sleep for treatment" were among the operations with the least perceived fear.

The overall results of MCDAS are demonstrated in Figure 1. As shown, more than 45% of participants had no fear of facing a dentistry clinic while lower than 5% experienced the highest level of fear in this regard.

Table 3 also represents the results of the VPT test. Based on the data, picture 2 received the highest score of sadness, followed by picture 4.

Spearman correlation test was utilized to assess the association of the obtained anxiety scores by MCDAS and VPT. The results revealed that there was a significant correlation between the scores of the two questionnaires ($P=0.0001$).

Moreover, Table 4 demonstrates the association between MCDAS score and other variables of the study.

Table 2. Participants' Responses to MCDAS

Items	Responses				
	Relaxed-not Worried	Very Slightly Worried	Fairly Worried	Worried a lot	Very Worried
"Going to the dentist"	56 (46.7%)	39 (32.5%)	20 (16.7%)	4 (3.3%)	1 (0.8%)
"Having your teeth looked at"	81 (67.5%)	29 (24.2%)	8 (6.7%)	1 (0.8%)	1 (0.8%)
"Having your teeth scraped and polished"	78 (65.5%)	25 (21%)	11 (9.2%)	4 (3.4%)	1 (0.8%)
"Having an injection in the gum"	37 (30.6%)	43 (35.5%)	27 (22.3%)	7 (5.8%)	7 (5.8%)
"Having a filling"	48 (41%)	33 (28.2%)	27 (23.1%)	8 (8.6%)	1 (0.9%)
Having a tooth taken out"	30 (57.9%)	31 (27.3%)	18 (9.1%)	18 (15.7%)	18 (15.7%)
"Being put to sleep to have treatment"	70 (62.5%)	33 (26.8%)	11 (8.9%)	6 (5%)	1 (0.8%)

Note. MCDAS: Modified child dental anxiety scale.

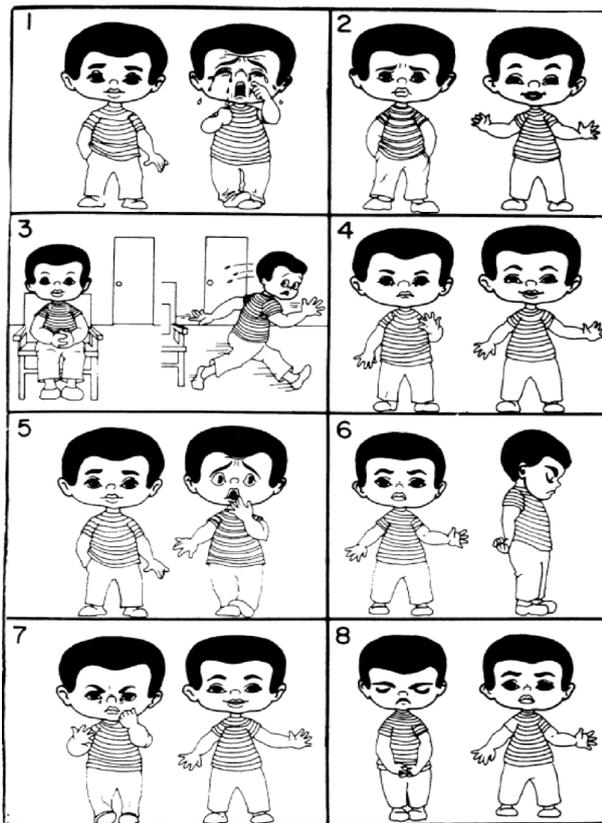


Figure 1. Venham Picture Test.

As explained earlier, various statistical tests were utilized based on the nature of variables. The types of these tests are presented as well. Based on the results, having an experience of dental treatment was the only variable with a significant association with the MCDAS score.

Likewise, the association between child dental anxiety based on the VPT score and the other variables is presented in Table 5. Accordingly, gender, dental experience, type of clinic, and mother's education level were the variables with a significant relationship with child dental anxiety based on the VPT score.

Discussion

The present study was conducted to assess the level of dental anxiety among children who attended the Dentistry Clinic of Hamadan University of Medical Sciences during 2015-2016.

The level of dental anxiety was measured using two instruments (i.e., VPT and MCDAS), which were proven to be valid and reliable tools in this regard (11,12).

As previously explained, a total number of 121 children aged between 9 and 12 years old were randomly selected for investigation.

According to the results of the present study, tooth extraction and injection in the gum were the most anxious-inducing operations, which is in line with the results of some previous studies such as Nilchiyan & Mohammadi (14) and Paryab & Hosseinbor (15), as well as Lee et al

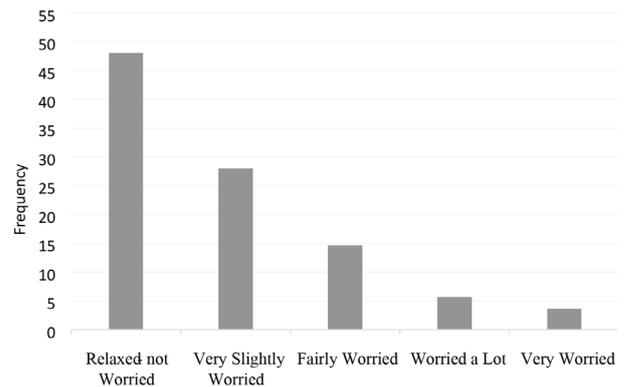


Figure 2. The Overall Results of Modified Child Dental Anxiety Scale.

(16), and Alsarheed (17). Such operations are normally accompanied by pain and have an aggressive nature.

Moreover, most children received no fear when visiting dental clinics or undergoing dental operations. The findings are in conformity with the results of Nilchiyan and Mohammadi (14).

However, the results contradict the results of Salem et al (18) whose participants were of lower ages. Children at lower ages have no distinct perception of fear and rarely have a dental experience. It is believed that dental anxiety decreases as the children grow older.

Based on the results, no significant relationship was observed between age and perceived anxiety in the present study. This finding corroborates with the result of Saatchi et al (19). All the above-mentioned studies were conducted on children aged near ten or higher who learned to adjust themselves to stressful situations. Younger children tend to admit their fears more freely than older ones. It is part of the normal growth process in preschool children to be afraid of unknown situations and people. New abilities develop as the child's age increases, and the child feels more confident, has more self-control, and gets ready to face social environments (20).

Miron and Colosi (21) explained that child dental anxiety has a root in physiological issues rather than

Table 3. Participants' Responses to VPT

Item	Response	
	Happy	Sad
Picture 1	111 (92.5%)	9 (7.5%)
Picture 2	91 (76.5%)	28 (23.5%)
Picture 3	116 (97.5%)	3 (2.5%)
Picture 4	96 (80%)	24 (20%)
Picture 5	98 (81.7%)	22 (18.3%)
Picture 6	115 (95.8%)	5 (4.2%)
Picture 7	105 (88.2%)	14 (11.8%)
Picture 8	109 (90.8%)	11 (9.2%)

Note. VPT, Venham picture test.

Table 4. Correlation Between MCDAS Score and Other Variables

Variables	Statistical Test	P value	
MCDAS score	Age	Pearson correlation	0.251
	Treatment	Pearson correlation	0.921
	Gender	Pairwise t-test	0.125
	Medical experience	Pairwise t-test	0.728
	Dental experience	Pairwise t-test	0.043
	Clinic type	Pairwise t-test	0.423
	Type of dental specialist	Pairwise t-test	0.723
	Birth order	Spearman correlation	0.731
	Father's occupation	ANOVA	0.833
	Mother's occupation	ANOVA	0.736
	Father's education level	ANOVA	0.428
	Mother's education level	ANOVA	0.703
	Socio-economic status of the family	ANOVA	0.360

Note. MCDAS: Modified child dental anxiety scale; ANOVA: Analysis of variance.

Table 5. Correlation Between VPT Score and Other Variables

Variables	Statistical Test	P Value	
VPT score	Age	Spearman correlation	0.953
	Treatment	Spearman correlation	0.222
	Gender	Mann-Whitney	0.011
	Medical experience	Mann-Whitney	0.162
	Dental experience	Mann-Whitney	0.035
	Clinic type	Mann-Whitney	0.029
	Type of dental specialist	Mann-Whitney	0.561
	Birth order	Spearman correlation	0.109
	Father's occupation	Kruskal-Wallis	0.995
	Mother's occupation	Kruskal-Wallis	0.184
	Father's education level	Kruskal-Wallis	0.386
	Mother's education level	Kruskal-Wallis	0.028
	Socio-economic status of family	Kruskal-Wallis	0.365

Note. VPT: Venham picture test.

psychological matters, therefore, children's age cannot play a great role in this regard. Contrarily, some studies concluded that children's age has a prominent effect on dental anxiety (18,22). To evaluate the relationship between age and child dental anxiety, the study sample should be taken from a wider range of age. Studies conducted on a wide range of ages commonly reported a significant relationship between these two parameters. For example, Suprabha et al. (22) conducted a study on children aged between 7 and 14 years old and found a significantly higher level of dental anxiety among children aged 7-10 years old compared to those who were within the age range of 11-14 years old. As previously mentioned, children at lower ages have no distinct perception toward fear and rarely have a dental experience while during older ages, they learn to adjust themselves to various unpleasant conditions and normally have a dental experience. In this

regard, it was reported that people aged 20-29 years old have the least dental anxiety (23).

In the present study, a significant relationship was observed between gender and dental anxiety. This finding is in line with the results of several studies (4,14,18,23). However, some other studies reported no relationship between these 2 variables (16,24,25). On the other hand, the results of a study performed in Africa showed no significant difference between the level of dental anxiety among girls and boys (26). It seems that cultural and social issues play a role in this regard (27). Socialization process and the establishment of cultural rules and patterns in older children led the boys to be more restricted to report subjective feelings like dental pain or dental fear while the social pressure for girls is in the other direction (20). Biological differences between female and male children can also be another reason why they perceived different

levels of dental anxiety (25).

In addition, physiological emotions such as stress, depression, fear, and social phobia are more prevalent in women than men and dental anxiety may be related to such emotions (28). Moreover, females are more open to declare their emotions than males (29). In agreement with most, but not all studies, DFA decrease by an increase in age (30).

Another finding of the present study was the significant relationship between mother's education level and dental anxiety based on the VPT score. This finding is in line with the results of Blackwell (31). In other words, educated mothers are more able to inform their children about dental treatments and to calm them down when facing such situations. Additionally, these mothers may be more careful about the oral and dental hygiene of their children so that their children visit dentists periodically and such experiences would gradually reduce the child dental anxiety (32).

Contrarily, no significant relationship was observed between the socioeconomic status of family and child dental anxiety, which is consistent with the findings of some previous studies (18,33). However, the results of one study demonstrated that child dental anxiety is more prevalent among immigrants and families with sub-standard socioeconomic status (34). The socioeconomic position is evidenced as a strong marker for health indicators and those with more deprivation exhibit worse general and oral health conditions. Similarly, children from poorer families have less access to dental care and thus experience higher loads of dental diseases, contributing probably to higher loads of dental fear (20).

Having a negative dental experience was significantly related to the child dental anxiety measured by both VPT and MCDAS instruments, which is in agreement with the findings of Suprabha et al (22) and Saatchi et al (19). In addition, a negative experience or an inadequate first dental visit during childhood can lead a grown person to present high levels of dental fear (20). The motivation for the first dental attendance can be decisive for the development of fear. If this first visit happens for preventive procedures, the prevalence of dental fear seems to be lower compared to when the dental visit is for emergency or curative procedures (20). If children have a painful dental experience, they would be anxious in the following visits. Therefore, considering the inhibition theory is very useful in this regard. According to this theory, children should have a neutral dental experience (e.g., examination) before undergoing any aggressive treatment such as tooth extraction or restoration (35).

These aspects reinforce the importance of early dental attention, preventing dental caries and, consequently, dental fear and the avoidance of dental appointments (20). Further, dental fear decreases by increasing the number of dental visits. This finding should not be attributed to children's age, The relation between dental fear and

previous dental experience is still controversial (36). Although some studies found no difference in terms of DFA in children with or without previous dental experience, at least, the results of one study demonstrated that children with previous dental experience have significantly lower DFA (30).

It is important to maintain a balance between the duration of the procedure and efficient behavior management with respect to child patients. Shorter appointments are suggested as a cooperation-enhancing approach for pediatric dental patients. Furthermore, children usually interpret longer treatment sessions as a sign of major problems that might cause significant anxiety leading to the development of behavioral management problems (7,37,38).

According to the VPT results, the relationship between the type of dental clinic and dental anxiety was also significant so that the level of dental anxiety was higher in private clinics than public clinics. Well-trained and experienced pediatric dentists may be more efficient in providing treatment in a shorter course and with the least traumatic approaches which significantly contribute to children's behaviors during and after treatment (36).

Public dental clinics normally have more visitors thus children can play with each other before the treatment leading to a reduction in their stress and anxiety. In the present study, no significant correlation was observed between the child dental anxiety and the other variables such as birth order, the type of dental specialist, and the medical experience of children, which is in line with the results of some previous studies (15,22).

Conclusions

In general, aggressive dental treatment such as tooth extraction and tooth restoration should be avoided in the first visit of children. Based on the results, the level of dental anxiety among female children was higher than male children, therefore, female children need more attention in this regard. Mothers' awareness of dental and oral hygiene also plays an important role in reducing the dental anxiety of their children.

Conflict of Interest Disclosures

The authors declare that there is no conflict of interest.

Authors' Contribution

All authors have contributed to the conception and design of the study. RR and MA supervised the conduct of the experiment. BA contributed to the data collection. The statistical analyses and interpretation of data were carried out by BA and MM.BA and RR drafted the manuscript. All the authors critically revised the manuscript for intellectual content and finally and approved the final version of the manuscript.

Ethical Statement

All steps of the study were approved by the Ethics Committee of Hamadan University of Medical Sciences. The parents of children filled out the consent form for their children participation in the

study. .

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