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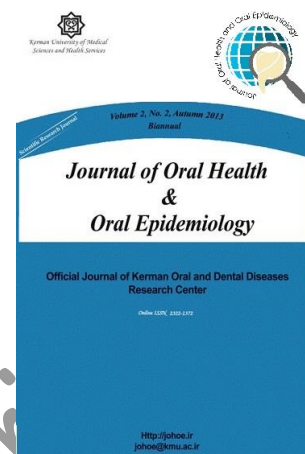
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## **The relationship between anxiety, quality of life, and oral health of children aged 4-6 years in kindergartens in Tehran, Iran**

Adib Bagheri <sup>1</sup>, Maryam SadeghiPour\* <sup>2</sup>, Ali Asghar Soleimani <sup>3</sup>, Nika Mehrnia<sup>4</sup>, Sarvin Soleimanpoor<sup>5</sup>

- 1- Dept. of Community Oral Health, School of Dentistry, Shahid Beheshti University of Medical Sciences
- 2- Assistant professor, Dept. of Community Oral Health, School of Dentistry, Shahid Beheshti University of Medical Sciences
- 3- Assistant professor, Dept. of Pediatric Dentistry, School of Dentistry, Shahid Beheshti University of Medical Sciences
- 4- Postgraduate student of Periodontics, Dept. of Periodontics, School of Dentistry, Shahed University
- 5- School of Dentistry, Shahid Beheshti University of Medical Sciences, Tehran, Iran

**Correspondence to:** Saadet cinarsoy cigerim; [saadetcinarsoy@live.com](mailto:saadetcinarsoy@live.com)

### **ABSTRACT**

**Background:** Although oral health indicators have shown significant improvement in recent decades, oral diseases are still considered a common chronic disease with high prevalence in society. These diseases are considered important community health issues due to the effects they have on people's lives and the effects their treatment may have. Numerous studies have shown an association between anxiety and decreased oral health indicators, with anxiety disorders being the most common childhood psychiatric disorders. This study attempts to determine the link between anxiety, quality of life and oral health in children.

**Methods:** This study was performed on a random sample of 600 children aged 4–6 years in kindergartens in Tehran, and finally, 443 were evaluated. The Preschool Anxiety Scale (PAS) questionnaire measured children's anxiety, and the Early Childhood Oral Health Impact Scale (F-ECOHIS) questionnaire was used for quality of life. Structural equation modelling (SEM) was used to evaluate the simultaneous effect of anxiety and oral health variables on the life

quality related to oral health. The causal relationship between the variables were investigated and confirmed with this tool and the  $X^2/df$ , GFI, CFI, NNFI(TGF), and RMSEA indices.

**Results:** The reliability of the PAS and F-ECOHIS questionnaire was confirmed by Cronbach's alpha coefficient. Structural equation modeling (SEM) was used to investigate the concurrent effects of anxiety and oral health on OHRQOL. Two SEM models were selected for our purpose. Both models were statistically suitable, but the model in which anxiety directly impacted dmft and directly or indirectly influences oral health-related quality of life was clinically justified and was selected as the final model.

**Conclusion:** Anxiety directly affects oral health (DMFT) and has a direct and indirect effect on the quality of life related to the oral health of preschool children.

**Keywords:** anxiety, oral health-related quality of life (OHRQOL), oral health, children.

## Introduction

Despite the improvement of oral health indicators in recent decades, oral diseases are still among the most common chronic diseases. These diseases are important issues related to the health of the global community due to their high prevalence, e.g., toothache 33%<sup>1</sup>, dental caries 94.30%<sup>2</sup>, and periodontitis 84.37%<sup>3</sup> in 14-year-old children, their impact on people's lives, and the costs imposed by their treatment<sup>4</sup>. To understand societal needs, identify the difference between the wishes of individuals and the needs that officials consider for them, and plan for services in the field of oral health, it is necessary to examine the quality of life index in different age groups<sup>5</sup>.

Quality of life related to oral health is a broad concept in which the effect of oral diseases on people's daily lives is identified according to the aspects of physical health, mental state, independence, social interactions, personal attitudes, and relationship with the noticeable attributes of the environment<sup>6, 7</sup>. In addition to the oral cavity, oral health also affects children's physical and mental condition<sup>8</sup>. Tooth decay also affects a child's nutrition and sleep patterns due to their diet and the metabolic processes. Disrupted sleep lowers children's quality of life in a variety of ways, including effects on glucocorticoid production and decreased production of red blood cells and haemoglobin<sup>9</sup>.

Anxiety disorders are the most common psychiatric disorders in childhood. About 5% of children fall under the diagnostic criteria of anxiety disorders, and more than 20% of people face issues of clinical anxiety before they are 16<sup>10</sup>. Moraes et al. have shown that fear and anxiety are related. Although fear a developmental factor and is generally transient, it may persist a long time. On the other hand, anxiety is related to responding to conditions where source of threat is unknown and requires strategies to be prevented or eliminated<sup>11</sup>. The risk of oral disease is higher in individuals with symptoms of depression or anxiety<sup>12</sup>.

Numerous studies have shown that anxiety is associated with increased plaque, gingivitis, periodontal disease, and, possibly, reduced oral care<sup>13, 14</sup>. Many psychological disorders are associated with physical disorders. Increased risk of tooth decay and loss can have significant consequences for people's quality of life. Toothaches, unpleasant tooth appearance, or missing teeth can aggravate social separation, isolation, and low self-esteem and cause speaking and eating problems<sup>15</sup>. With proper treatment, a child with psychological problems, such as anxiety, will be protected from further problems in adolescence and adulthood. If no action is taken, not only will the child's problems not be resolved, but more serious problems will be caused for the individual and the family due to the increased vulnerability during different stages of development<sup>16</sup>.

The increasing livelihood issues in Tehran and, consequently, changes in relationships between family members, lack of proper planning to develop oral health and identify psychological problems of preschool children, lack of attention to the quality of life and related indicators at an early age, and the lack of appropriate research related to anxiety, oral health and quality of life related to oral health in preschool children led us to the present study entitled "determining the relationship between anxiety and quality of life and oral health of 4–6-year-old children in Tehran."

## **Method**

This study was performed on a population of 600 children aged 4–6 years in Tehran kindergartens. The General Education Department of Shahid Beheshti University of Medical Sciences issued a reference letter to obtain a license from the Welfare Centre and its branches, including Shemiranat Welfare (covering kindergartens in the north of Tehran), Tehran City Welfare (covering kindergartens in the east, west, and centre of Tehran), and Rey Welfare (covering the south of Tehran). An average of 10 kindergartens were selected

from each sector by cluster sampling by the research officer of the associated welfare centre. On average, 20 children aged 4–6 years were randomly selected from each kindergarten.

The F-ECOHIS questionnaire was used to assess the quality of life related to oral health. This questionnaire has 2 subscales and 15 items that the child's parents complete. This questionnaire is formulated on a five-point Likert scale. In the study by Jabbari Far et al. on children aged 2–5 years, this tool's formal and content reliability and validity have been confirmed<sup>17</sup>. To assess anxiety, the Preschool Anxiety Scale (PSA) questionnaire by Spence et al. was selected. The questionnaire has 28 items and measures children's anxiety based on a five-point Likert scale with questions such as "Is it difficult for him/her to stop feeling anxious?". Child Anxiety refers to the score that respondents give to the 28-item Child Anxiety Questionnaire. The validity and reliability of this questionnaire have been confirmed by a study conducted by Ghanbari and Khanmohammadi in 2014<sup>18</sup>.

In the first stage of the research, the questionnaires were given to the children's parents along with informed consent. Demographic information was determined by predetermined questions, including parents' age, gender, and education. In the second session, the children whose parents had signed the consent form (443 people) were examined by a dentist to measure oral health and the DMFT index. An intraoral examination was performed to assess the oral health of the study population. The examination was performed using a mirror, dental catheter, disposable gloves, mask, and sterile gauze in a room with adequate light (medical penlight) and in a sitting position, observing the hygiene principles, including changing gloves, mirrors, and catheters, and proper disposal of waste. The diagnosis of dental caries was made according to the criteria of the World Health Organization in 1997, which include the presence of obvious caries in the occlusal cavities and smooth dental surfaces, the presence of undermined enamel, the presence of soft tissues in the pulpal or occlusal grooves and smooth dental surfaces, temporary restorations, and recurrence of caries in the sealed or restored teeth<sup>19</sup>.

The Shapiro-Wilk test evaluated the data distribution normality. Spearman's correlation coefficient was evaluated to confirm the relationship of D, M, F, and DMFT with OHQOL and anxiety according to the data distribution. The reliability of OHQOL and anxiety tools was evaluated and confirmed using Cronbach's alpha coefficient. Structural equation modelling (SEM) is a statistical tool that allows the simultaneous testing of complex interrelationships between the variables specified in the proposed model. The tool was used to identify direct and indirect relationships between PAS anxiety, ECOHIS oral health-related

quality of life, and DMFT oral health. The causal relationship between the variables was examined and confirmed using this tool and the  $X^2/df$ , GFI, CFI, NNFI (TGF), and RMSEA indices.

## Results

The study population included 443 children aged 4–6 years who went to officially licensed kindergartens in the centre of Tehran province. In terms of distribution, 158 individuals (35.7%) were from kindergartens under the supervision of Shemiranat Welfare, 149 (33.6%) were from kindergartens under the supervision of Tehran Welfare, and 136 (30.7%) were from kindergartens under the supervision of Rey Welfare. In terms of gender distribution, 235 (53%) were girls, and 208 (47%) were boys, of which 228 (51.5%) were 4–5 years old, and 215 (48.5%) were 5–6 years old. This population was randomly selected from 32 kindergartens with official licenses from the Welfare Centre of Tehran Province. The distribution of parents' education and employment status is shown in Table 1.

According to the results obtained on the educational status of parents, 60.3% of mothers and 63.3% of fathers had educations higher than high-school diploma, and 3.5% of mothers and 4.5% of fathers were undergraduates. Also, the results of parents' employment status showed that 78.1% of mothers were employed.

After examining the children, the number of decayed (D), missing (M), and filled (F) teeth were measured. The mean DMFT, calculated by components and gender of the studied children, is shown in Table 2.

Cronbach's alpha coefficient, used to evaluate the internal reliability of the PAS and F-ECOHIS instruments, was 0.875 and 0.897, respectively, indicating that by removing any questions, the reliability coefficient of these instruments will not increase significantly. Therefore, all the questions in these tools are necessary, and they form a set of instrumental questions with appropriate internal consistency (reliability).

Based on the information obtained from the oral health quality of life questionnaire (F-ECOHIS) and the Preschool Anxiety Scale (PAS), the mean scores of the study population 40.20 (SD = 8.895) were in the range of 15–53 for quality of life, and in the range of 30–90 for anxiety 61.13 (SD = 12.486).

Spearman's correlation coefficient was used to examine the relationship between oral health-related quality of life (OHQOL), anxiety, and the oral health (DMFT) variables, including caries (D), missing teeth (M), and filled teeth (F), the results of which are shown in Table 3.

According to Table 3, there is a significant relationship between anxiety and quality of life ( $r_s = -0.659, P < 0.001$ ), which means that increased anxiety is associated with decreased quality of life. Also, increased anxiety and increased DMFT were significantly in a positive direction, meaning that increased anxiety was associated with increased DMFT (decreased oral health) ( $r_s = 0.536, P < 0.001$ ). There was a significant negative relationship between DMFT and quality of life, which means that increased DMFT (decreased oral health) was associated with decreased quality of life ( $R_s = -0.566, P < 0.001$ ).

The following model was used to investigate the simultaneous effect of anxiety and oral health variables on quality of life related to oral health (pictures of the models are presented at the end of the article).

The fitting results for this model are given in Table 4.

Based on the results of Table 4, both models show a good fit as the  $X^2/df$  index is below 3 in both models, the CFI and NNFI indices are often above 0.8, and, especially, the 90% confidence interval of the RMSEA index is below 0.1. However, Model 2 was used since this model has a better clinical interpretation. The results of the evaluation of direct and indirect impacts are interpreted in this model, and the results are shown in Table 5.

According to Table 5, the relationships between (anxiety, DMFT and OHQOL) and (DMFT and OHQOL) are significant, confirming previous results. In addition, each unit of increase in anxiety score decreases OHQOL by approximately 0.2 units. Also, each increase in DMFT reduces OHQOL by 0.01 units. Comparison of standardized coefficients shows that the effect of anxiety on OHQOL (0.756) is greater than its effect on DMFT (0.580). Also, compared to anxiety and DMFT, anxiety has a greater effect on OHQOL. In addition, anxiety has both a direct and indirect effect on OHQOL, whereas DMFT has only a direct effect.

## Discussion

Based on the present study results, anxiety directly affects the oral health of preschool children aged 4–6 years (which was determined in this study by the DMFT index). Anxiety also, directly and indirectly, affects the quality of life related to oral health in children.



The anxiety score of the study population was 61.13 (SD = 12.486) and in the range of 30–90, as measured by the PAS questionnaire. The obtained results are consistent with the scores of this questionnaire in studies by Mousavi et al. (2015) in the Shemiranat area of Tehran in the 5–6 years age group ( $58.6 \pm 2.6$ )<sup>20</sup> and Nigam et al. (2013) in India in the 3–5 year age group (76.29)<sup>21</sup>, but is different from the results obtained in studies by Ghanbari et al. on 277 children aged 2–6 years in Tehran in 2011 ( $23.72 \pm 14.13$ ) and 2012 ( $47.80 \pm 9.79$ )<sup>22</sup> and Idrisi et al. (2015) on 56 preschool children aged 4–6 years in Tehran ( $45.82 \pm 6.93$ )<sup>23</sup>. One of the reasons for the discrepancy in the anxiety score obtained in this study with the above studies is the difference in the statistical population, considering that the study population in this study is from different areas of Tehran and among the population of preschool children going to kindergartens (not clients of dental treatment centres).

The mean score obtained from the Child Mental Health Quality of Life Questionnaire (F-ECOHIS) in this study ( $40.20 \pm 8.895$ ) was higher and in conflict with the results of studies by Jabbarifar et al. in 2009 on 246 children aged 2–5 years in Tehran ( $25.7 \pm 10.16$ ) [18], Gisoureh et al. in 2015 on 280 5-year-old children in Kerman ( $21.89 \pm 7.86$ )<sup>24</sup>, Shabestari et al. in 2015 on 140 children aged 3–7 years in Zanjan ( $22.46 \pm 6.13$ )<sup>25</sup>, Behbahani Rad et al. in 2015 on 830 6-year-old children in Shiraz ( $7.95 \pm 7.45$ )<sup>26</sup>, and a systematic review study by Kumar et al. on children aged 2–6 years in Brazil, China, and Thailand (31-28)<sup>27</sup>. The increase in recent livelihood issues in Tehran and the consequent change in peace and relations between family members seems to be one of the reasons for this discrepancy.

The value of DMFT was estimated to be  $3.45 \pm 1.964$  in the study population, which was in agreement with the results of studies by Movahed et al. in the national survey on children ( $3.6 \pm 0.9$ )<sup>28</sup>, Shahrabi et al. on children aged 3–5 years in Tehran (3.48)<sup>29</sup>, Nabipour et al. on 3–6-year-old children in Varamin (3.99)<sup>30</sup>, and Boroumand et al. on children aged 3 to 6 years (3.17)<sup>31</sup>. It was different from the results by Kandahari et al. on 3–5-year-old children in Tehran (2.45)<sup>32</sup>, Ghasemianpour et al. on 6-year-old children in Tehran (4.71)<sup>33</sup>, and Kalantari et al. on 6–7-year-old children in Shemiranat (2.46)<sup>34</sup>. Differences in cultural and social status, level of health, oral health indicators in Tehran and other cities, and differences in the sample size can be mentioned as reasons for the discrepancy in quality of life scores related to oral health and DMFT.

Various studies have shown that psychological factors such as anxiety affect oral health<sup>14, 16-18, 20, 35</sup>. Also, anxiety and oral health affect the quality of life related to oral health<sup>15, 19, 26, 27, 29-31, 33-35</sup>.



The environment and family in which children live and grow up is an effective factor in health behaviours, psychological problems, and children's perception of oral health. The affluent sections of society have more access to dental services. Therefore, oral diseases in the weaker sections of society cause the child to be absent from school and the parents to be absent from work more than other groups. In Iran, unlike Western countries, a small percentage of families, who are usually specific sections of society, send their 2- to 5-year-old children to kindergarten or preschool. This makes it very difficult to access the appropriate statistical population in this age group, unlike school-aged children. It seems that in future studies, if the necessary facilities are available, samples can be found that are more actual representative of the whole community of preschool children, for example by selecting a larger sample size and referring to houses that have been randomly selected from different parts of the city. It is worth noting that the choice of this method will have its limitations and problems. False information may be obtained due to the multifactorial nature of oral diseases and the impact on different aspects of the patient's health. The desired samples should be selected with maximum similarity in socio-economic and psychological features. In previous studies, this effect was mostly investigated in adults. This study specially investigated the impact of anxiety level and its relation to quality of life and oral health of 4–6-year-old children.

### **Conclusion**

According to current and previous studies, anxiety directly affects oral health (DMFT) and directly and indirectly affects the quality of life associated with oral health in preschool children aged 4-6 years.

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## Tables

### 1. Frequency distribution of children's parents' education and employment status

Education rate	Fathers		Mothers	
	number	Valid percentage	Number	Valid percentage
High school	20	4.5	15	3.5
High school diploma	142	32.2	155	36.2
College education	279	63.3	258	60.3
Total	441	100	428	100
Missing	2	-	15	-
<b>Occupation</b>				
Clerk	189	44.3	167	41
Self-employed	216	50.6	124	30.5
Labourer	4	0.9	3	0.7
Homemaker	-	-	89	21.9
Other	18	4.2	24	5.9
Total	427	100	407	100
Missing	16	-	36	-



2. Average DMFT by components and gender of children

	Girl	Boy	DMFT	F	M	D
Average	3.26	3.65	3.45	1.23	0.25	<b>1.99</b>
Standard deviation	1.89	2.02	1.96	1.23	0.49	<b>1.56</b>

3. Spearman's correlation coefficients between the OHQOL, Anxiety, and DMFT variables (D, M.F)

D		M		F		DMFT		Anxiety		
Correlation coefficient	P-value	Correlation coefficient	P-value	Correlation coefficient	P-value	Correlation coefficient	P-value	Correlation coefficient	P-value	
<b>0.384</b>	0.000	0.147	0.002	0.294	0.000	0.536	0.000	-	-	Anxiety
<b>-0.411</b>	0.000	-0.135	0.004	-0.329	0.000	-0.566	0.000	-0.659	0.000	OHQOL

4. Results for fitting Models 1 and 2

<b>Model</b>	<b>RMSEA 90% CI</b>	<b>NNFI (TLI)</b>	<b>CFI</b>	<b>GFI</b>	<b>X<sup>2</sup>/df</b>
1	0.052 (0.049–0.055)	0.787	0.798	0.818	<b>2.213</b>
2	0.054 (0.050–0.057)	0.796	0.807	0.820	<b>2.27</b>

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5. Results of direct and indirect impact assessment based on Model 2 (fitted by SEM)

Independent and mediated variables	The dependent variables		
	Variable effect	OHQOL	DMFT
Anxiety	Direct	0.681 (0.196 ) <sup>*</sup>	<b>0.580 (1.781)<sup>*</sup></b>
	Indirect	0.075 (0.021)	<b>0.0 (0.0)</b>
	Total	0.756 (0.217)	<b>0.580 (1.781)</b>
DMFT	Direct	0.129 (0.012) <sup>§</sup>	-
	Indirect	0.0 (0.0)	-
	Total	0.129 (0.012)	-

\*:  $P < 0.001$ , §:  $P = 0.022$