



Oral health related quality of life and decay-missing-filled teeth in children with attention deficit hyperactivity disorder

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Abstract

Introduction: Children with Attention Deficit Hyperactivity Disorder (ADHD) exhibit a kind of negligence in performing their daily tasks and activities, which also affects the maintenance of oral health. Due to the low quality of life in these children, it is doubtful that the Oral Health-Related Quality of Life (OHRQoL) will be affected compared to healthy children.

Materials and Methods: In this study, 106 untreated ADHD children referred to the clinic of Taleghani Hospital in Gorgan City, Iran, in 2018-2019 were selected through the convenient sampling method. Data were gathered using the Child-Oral Impacts on Daily Performance (Child-OIDP) and Clinical Examination Questionnaires. Data were analyzed through SPSS-18, descriptive statistics indexes, the Mann-Whitney test, the Shapiro-Wilk test, and the Spearman correlation test.

Results: The most common self-expression problem of ADHD children was decay (88.6%), followed by pain, erupting, and tooth sensitivity, respectively. The OHRQoL score of these children was 12.79, which OIDP obtained. The index and the decay score of these children were 6.62, obtained by the Decay, Missing, and Filled Teeth (DMFT) index—the correlation between total DMFT and OIDP. The index score was positive and significant ($r=0.256$, $P=0.008$). A significant inverse correlation existed between the total DMFT score and parents' education level ($r=-0.271$, $P=0.005$) and ($r=-0.283$, $P=0.003$), respectively.

Conclusion: There is a significant relationship between oral health and tooth decay index. Better oral health and decay, missing, and filled teeth index are associated with a higher quality of life.

Keywords: Attention deficit hyperactivity disorder, Children, Decay, Oral health, Quality of life

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Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is a childhood developmental neurological disorder characterized by unusual hyperactivity, low tolerance, impulsive behaviors, poorly organized behaviors, distraction, and inability to concentrate (1-4). Symptoms are usually diagnosed before 12 and should be observed consistently at school and home for at least six months. The disease can also cause problems in adulthood, requiring more complex treatments (5). This disorder is reported to be 3-6 times more common in boys than in girls (6) and may indicate that because affected girls are less hyperactive, the disease is hidden from parents and, therefore, less likely to be referred for treatment (6,7).

Tooth decay is a widespread and important chronic disease in children and adults that affects about 60% -90% of children worldwide (8-10). The level of decay varies significantly in different countries, but children with poor socioeconomic status are more likely to have decay than children with higher socioeconomic status (11,12). This disease imposes much pain and costs on the affected people and the health care service (9). According to many available articles, children with ADHD are more likely to have tooth decay and oral problems. These children have poorer oral health, leading to a higher prevalence of oral disease (13-15). Nowadays, with the importance of a patient-centered approach in clinical decisions, attention to Oral Health-Related Quality of Life (OHRQoL) has found a unique role in dentistry (16). Increasing attention to OHRQOL is because oral problems, especially decay, can significantly impact people's physical, social, psychological, and personality aspects in daily life (17). ADHD can widely affect health-related quality of life parameters such as education, behavior in school and community, and communication with peers and family (18).

Various studies have shown that children with ADHD and their families face many problems. These children show a kind of negligence in performing their daily tasks and activities. They are not responsible for their personal affairs, affecting their oral health. On the other hand, due to the many problems of these children in medicine, poor education, and communication with others, this disease imposes high costs on the families of these children. Usually, parents pay less attention to their children's oral health. Also, due to the low

quality of life in children with ADHD, it is suspected that the OHRQoL will also be affected compared to healthy children. Regarding the lack of similar studies in this case and the availability of little information on oral health and its impact on life quality in these children (19), in this study, we decided to estimate the Decay, Missing and Filled Teeth index (DMFT), and Oral Health-Related Quality of Life (OHRQoL) in affected children so that the results can be used in planning health programs and offering a comprehensive treatment.

Materials and Methods

The present study is a descriptive-analytical and cross-sectional study. The samples were selected from children aged 8-14 years with ADHD referred to the clinic of Taleghani Hospital in Gorgan (Golestan University of Medical Sciences) in 2018-2019. So, 106 children with ADHD diagnosed by a child and adolescent psychiatrist and referred to the researcher for evaluation who were selected through the convenience sampling method.

Inclusion criteria were ADHD patients with uncontrolled ADHD in the age group of 8 to 14 years. These people with ADHD did not have any other physical or mental disabilities or common childhood disorders such as depression, anxiety, oppositional defiant disorder, etc. The exclusion criteria were missing records and refusal to participate.

According to the study of Hidas et al. (20) and considering the mean of 0.784 and the standard deviation of 0.43 in children with ADHD and the type I error of 5% (95% confidence interval) and the maximum error of estimation of 0.086, the sample size was obtained to be 96, which was determined to be 106, considering the 10% probability of falling.

Research instruments

A) *Child-Oral Impacts on Daily Performance (Child-OIDP)*: In this study, a translated version of the Child-OIDP questionnaire was used to evaluate the oral-health-related quality of life. In the study by [Younessian](#) et al. its validity and reliability in 11-14-year-old children have been evaluated and approved (21). However, due to the small number of samples available in this age range, we decided to make this questionnaire appropriate for 8-11-year-old children with a few minor changes. Finally, three options were added to oral

problems in the first part of the questionnaire, and its validity was evaluated and approved by pediatric dentists. Then, a group of 20 children aged 8-11 years old completed this questionnaire in two stages, with an interval of two weeks, and its reliability was assessed by paired sample t-test and Pearson correlation tests as follows:

In paired sample t-test, the mean score of quality of life in the first and second stages was compared, with a mean of 8.54 in the first stage and 8.96 in the second stage ($P= 0.33$). It indicates that there is no significant difference in the mean OI DP score of the two stages, which indicates the reliability of the questionnaire. Also, with the Pearson correlation test, the correlation coefficient of the mean score of quality of life in the first and second stages was calculated at 0.979, which indicates a high correlation and high reliability of the questionnaire. Finally, after confirming the validity and reliability, this questionnaire was used in the 8-11-year-old children.

The final version of the Child-OI DP questionnaire was completed in two steps:

In the first stage, demographic information such as age, sex, occupation, parents' educational level, and oral problems of the child during the last three months were identified among the 23 questionnaire options by asking the child.

In the second stage, the table related to the Child-OI DP index was completed during a face-to-face interview. The child was first asked to identify the daily functions that have been impaired during the last three months due to his/her oral problems among the eight daily functions presented in the questionnaire (eating, talking, brushing teeth, sleeping, staying calm, smiling without embarrassment, doing homework, and socializing). The child was then asked to rate each problem on a Likert scale: 1-low effect, 2- medium effect, and 3-high effect. Also, specify the duration of the dysfunction with the numbers 1-3.

Finally, the child identified the cause of his/her daily dysfunction among the oral problems (23 options on the first page of the questionnaire) for the interviewer. The Child-OI DP number for each daily activity was calculated by multiplying the intensity and duration of recorded scores, which ranges from 0 to 9 for each activity. The Child-OI DP index is calculated by summing the daily functions

data (days 0 to 72), dividing it by 72, and multiplying by 100.

B) Tooth Decay Clinical Examination Questionnaire: The researcher (a general dentistry final-year student) explained this questionnaire to the parents and children, and the child completed it in the researcher's presence. After completing it, the child, a general dentistry final-year student, completed the Tooth Decay Clinical Examination Questionnaire based on the Decay, Missing, and Filled Teeth index (DMFT/dmft¹). Children were clinically examined to determine the decay index. For the clinical examination, the child was first asked to wash his/her mouth with water and dry teeth with gauze. Then, the teeth were observed using a mouth mirror and a dental probe under the dental unit light, and the index (dmft/DMFT) was recorded according to the World Health Organization definition mentioned earlier. After entering the data in the SPSS-18, descriptive statistics indexes such as mean, standard deviation, frequency, and percentage and graphs were used to describe the data. In the sub-objectives, the Mann-Whitney test was used to compare the DMFT/dmft index and quality of life between the two sexes due to the abnormality of the data. Also, the Shapiro-Wilk test was used to evaluate the normality of the data, and the significance level in this study was considered 0.05. Also, the correlation between the total DMFT score (DMFT + dmft) and OI DP index was evaluated using the Spearman correlation test due to the abnormality of the data.

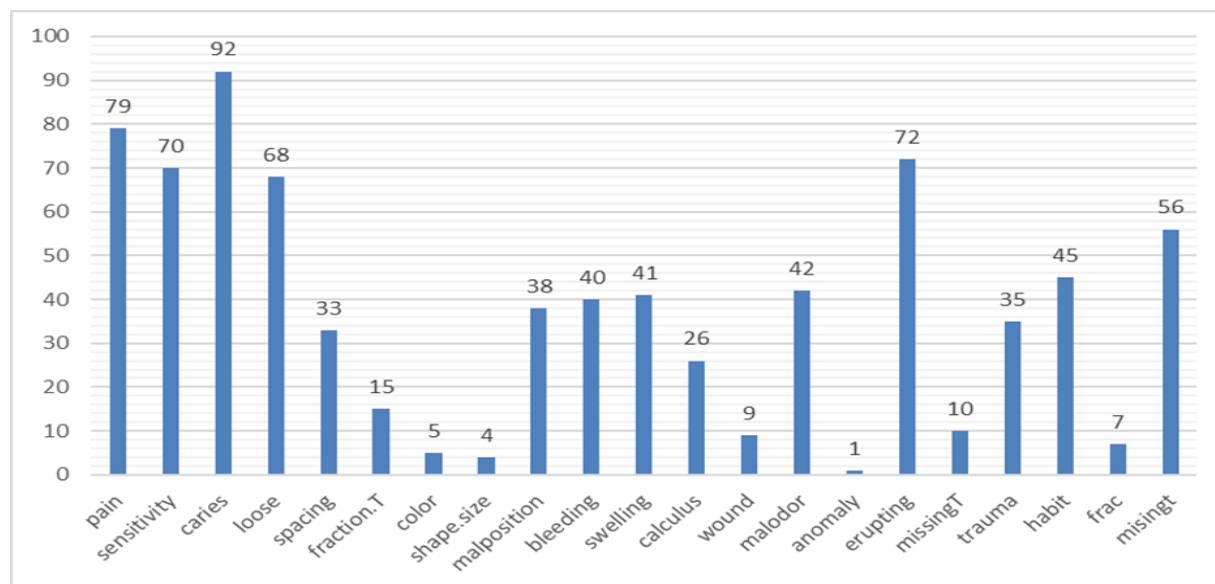
Results

The mean age of children in this study was 10.77 ± 1.81 years, the minimum age was 8 years, and the maximum age was 14 years. Among them, 27 (25.5%) were girls, and 79 (74.5%) were boys. Findings related to children's oral and dental problems were evaluated, the most common of which was tooth decay (caries), which was seen in 86.8% of cases, followed by pain in 74.5%, erupting (permanent teeth growing) in 67.9%, and dental sensitivity in 66% of cases.

The mean, median, and standard deviation of DMFT, dmft, DMFT + dmft, and OI DP are presented in Table 1. The index is based on gender in ADHD children. According to the Mann-Whitney test, DMFT and OI DP index scores were significantly higher in females ($P=$

0.018 and $P=0.025$, respectively). Total DMFT and DMFT scores were significantly higher in males ($P=0.041$ and $P=0.001$, respectively).

The frequency of findings related to oral problems in the self-expression of children with ADHD is shown in Figure 1.



¹DMFT is related to permanent teeth, dmft is related to baby teeth

Figure 1. Describing the frequency of findings related to oral problems in the self-expression of children with ADHD

Table 1. Comparison of mean and standard deviation of DMFT, dmft, DMFT+dmft, and OIDP index based on gender in ADHD children

Variable	Total median	Gender	Median (SD)	Total Mean (SD)	Gender	Mean (SD)	Lower-Upper	P
DMFT	3.0000 (3.11229)	Male	3.0000 (2.24563)	3.7264 (3.112)	Male	3.21(2.24)	(00.00-12.00)	0.018
		Female	4.0000 (4.56857)		Female	5.22(4.56)	(00.00-20.00)	
dmft	2.5000 (2.96152)	Male	4.0000 (3.02387)	2.9717 (2.962)	Male	3.58(3.02)	(00.00-12.00)	0.001
		Female	.0000 (1.88184)		Female	1.18(1.88)	(00.00-06.00)	
DMFT+dmft	6.5000 (3.15374)	Male	7.0000 (2.76136)	6.6981 (3.217)	Male	6.79(2.76)	(00.00-13.00)	0.041
		Female	6.0000 (4.14413)		Female	6.11(4.30)	(00.00-20.00)	
OIDP index	8.3300 (12.66536)	Female	8.3300 (9.27399)	12.7883 (12.665)	Male	10.47(9.27)	(00.00-36.11)	0.025
		Female	16.6700 (18.05908)		Female	19.54(18.05)	(00.00-65.28)	

The correlation between total DMFT and OIDP index scores in children with ADHD is shown in Figure 1. The correlation between the total DMFT score and the OIDP index was assessed using the Spearman correlation test, which was positive and significant ($r=0.256$, $P=0.008$). This correlation was also evaluated based on gender, which was insignificant in females ($r=0.120$, $P=0.550$) and a positive and significant correlation in males ($r=0.398$, $P=0.001$). The analysis of parental education level and

variables was conducted using Spearman correlation, in which only the total dmft was significant and had an inverse correlation. So, the higher the parental education level, the lower the dmft. The mean and standard deviation of the total DMFT score for parents' education level are presented in Table 2. ANOVA is significant among educational levels, and Tukey's post hoc test between uneducated or low-educated and college-educated is significant ($P=0.018$).

Table 2. Comparison of total DMFT score and parents' educational level

Educational level	DMFT score			
	Father		Mather	
	N	Mean (SD)	N	Mean (SD)
Uneducated or low educated	45	7.6000 (3.4994)	33	7.9697 (3.6953)#
6-12 y schooling	10	6.9000 (1.5239)	6	5.5000 (1.3784)
Diploma (12 years schooling)	28	6.0714 (2.7343)	41	6.5609 (2.4602)
College	22	5.6363 (3.1403)	26	5.5769 (3.2271)#
Total	105	6.7143 (3.1645)	106	6.6981 (3.1537)
ANOVA		P= 0.061		P= 0.020

#Tukey's post-hoc test is significant (P= 0.018)SD= standard deviation

Discussion

The present study evaluated the Oral Health-Related Quality of Life (OHRQoL) and the Decay, Missing, and Filled Teeth (DMFT/dmft) index in ADHD children aged 8 to 14 at Gorgan Taleghani Hospital.

Escobar et al. showed that the quality of life in children with ADHD is lower than in healthy children in most physical and mental health fields and reported ADHD as an interference factor in children's daily lives (22). Also, ADHD affects children's health-related quality of life (19). In this study, the average oral health quality of life in children with ADHD was measured by the OIDP index.

The result was 12.79, which cannot be compared with other cases because there is no similar study on this subject. However, due to parental complaints and children's self-reported problems, we have seen that this disorder has affected the oral health-related quality of life index in different fields. However, it is necessary to compare this with the OIDP index score of a healthy sample for assurance. The control group should be completely unified with the patient group in terms of age, sex, family economic status, cultural and educational status of parents, etc., which is a very complex, time-consuming task and requires more extensive studies that did not fit in the form of a student dissertation and was removed from our study at the discretion of the research council.

Studies such as Todd Grooms et al. reported more primary tooth decay in children with ADHD than in the control group (13). The study by Escobar et al. also stated that the characteristics of these children could directly affect an individual's ability to maintain good oral and dental health. However, there was no clear evidence of whether this disease is a danger factor for oral and dental health. Escobar et al. stated that deciduous teeth have more decay in children with ADHD than in the

control group (22). In these two studies in our study, the decay index in these children was very high (total DMFT= 6.62), and many children complained of gingival problems (37.7% bleeding gums, 38.7% swollen gums), which, of course, could not be compared with a healthy sample.

The most common self-expression problem in children was tooth decay in 86.8% of cases, followed by pain, erupting, and tooth sensitivity, respectively. Also, 37.7% had bleeding gums, 38.7% had swollen gums, 33% had trauma, and 14% had trauma-induced fractures. Similar to our study, based on the evidence, this group of children experienced more oral and dental problems, such as tooth pain, dental sensitivities, bleeding gums, bruxism, and a history of trauma than the control group. However, there was no apparent difference in the rate of tooth decay in the control group (20). Considering the hyperactivity of these children can justify the possibility of more trauma in them, and effective medical treatment can reduce dental trauma by reducing these activities and high-risk behaviors (23,24).

In our study, the OIDP index score was significantly higher in females, especially in social relationships and self-esteem fields. This is probably because girls are more sensitive to their appearance. However, since no similar study is available and this score is reported for the first time in this study, it is not possible to compare it with other studies, and we hope that this study will be the beginning of more extensive research on oral health-related quality of life in children with ADHD.

On the other hand, the total DMFT score in males was significantly higher, consistent with the findings of previous studies such as Kavand (25). The correlation between total DMFT and OIDP index scores was positive and significant. With the increase in the tooth decay index, these children's oral health-related quality of

life decreases. Klassen et al. by examining the health-related quality of life in children with ADHD, showed the significant impact of disease on the quality of life of these people. Various mental and physical health fields, including oral health, are also affected by this disease, and quality of life has reduced these people (26,27).

In our study, we first addressed the issue of oral health-related quality of life for these children. Like Klassen et al. (26) we indicated the impact of this disease in the field of oral health, but more accurate results require future studies and comparison with the control group. In a study about healthy children, Kumar et al. stated that OHRQoL decreased due to tooth decay. The increase in the DMFT index harmed children's quality of life (28,29), similar to our results. In our study, there was a significant inverse correlation between the total DMFT score and parental education level. Also, the studies showed that parental education significantly promotes oral health and improves children's quality of life (30,31).

Therefore, according to our study and recent studies (32), increasing the level of education of parents and their awareness of how to maintain oral health by using educational classes and tools such as pamphlets can be practical, which is suggested to be addressed further in future studies (32).

The results of the studies may be based on differences in the number of samples examined, the study design method, the sampling method, the unification of samples, and the method of assessing the oral health-related quality of life. However, the results of this study provide valuable information in the field of oral health and its impact on the quality of life of children with ADHD and emphasize the need for further studies in this field, as Sischo and Broder in a systematic review study of 300 articles, showed that patient-centered data such as OHRQoL increase clinicians' understanding of the relationship between oral and dental health and general health, and explained that the quality of life improves with the treatment of dental problems. Sischo and Broder describe the use of this tool as a new horizon in dentistry (33).

The small sample size and lack of control over all confounding factors are some limitations that should be controlled in future studies.

References

Conclusion

This study showed a significant relationship between oral health and the Decay, Missing, and Filled Teeth (DMFT) index. Better oral health and DMFT index are associated with a higher quality of life. Also, parents' higher education and greater awareness can play a significant role in promoting the oral health of these children and reducing their tooth decay. Considering the effect of parents' education on improving children's oral health and quality of life, it seems necessary to train parents about the nature of ADHD and its effect on general health, especially oral health.

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Conflict of Interests

The authors declare no conflicts of interest.

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Ethical Considerations

This article results from a research project for a doctoral dissertation in general medicine. All cases participated voluntarily and reassured that responses would remain confidential. In addition, informed written consent was obtained from all participants who filled out the questionnaires.

Code of Ethics

The study was approved by the ethics committee at Golestan University of Medical Sciences (IR.GOUMS.REC.1399.201).

Authors' Contributions

Study concept and design: Firoozeh Derakhshanpour and Shiva Zamaninejad. Interpretation of data: Elahe Yousefi; Data collection: Najmeh Shahini, Elahe Yousefi, and Aazam Sadat Heydari Yazdi. Drafting of the manuscript, and final approval the article: Najmeh Shahini and Aazam Sadat Heydari Yazdi; Statistical analysis: GholamReza Vaghari and Nasser Behnampour

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