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Impact of oral hygiene on oral health-related quality of life of preschool children

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Abstract: *Objectives:* To assess the impact of oral hygiene of preschool children and parental attitude on children's oral health-related quality of life (OHRQoL). *Methods:* In this cross-sectional study, 396 children of Shiraz kindergartens were selected by a randomized cluster sampling. Children's oral hygiene was assessed using the Simplified Debris Index (DI-S) and a self-made questionnaire about oral hygiene habits. Children's OHRQoL was evaluated by the Farsi version of Early Childhood Oral Health Impact Scale (F-ECOHIS). The effect of oral hygiene determinants on OHRQoL was measured using Pearson and Spearman correlation, independent-sample *t*-test and ANOVA. *Results:* Children's mean DI-S and F-ECOHIS scores were 1.19 (± 0.77) and 19.36 (±8.42), respectively. Only 75% of the children had their teeth brushed once a day or more, and in 28%, toothbrushing had started before 2 years of age. DI-S values ($P < 0.001$) and frequency of toothbrushing ($P < 0.001$) had a statistically significant impact on OHRQoL of the children. Children's OHRQoL was also significantly associated with parents' attitude towards the importance of brushing deciduous teeth ($P = 0.002$). *Conclusions:* Oral health status of preschool children in Shiraz was less than optimal and had a significant impact on their OHRQoL. Therefore, improvement of children's OHRQoL could be achieved by improving their home dental care. Strategies promoting parental attitude about the importance of children's toothbrushing may significantly influence children's oral hygiene and are highly recommended.

Key words: Early Childhood Oral Health Impact Scale; Oral health-related quality of life; oral hygiene; Simplified Debris Index

Introduction

Oral health-related quality of life (OHRQoL), which is the impact of oral health on one's quality of life (1), is a relatively new but fast-growing concept in dentistry literature. Oral diseases can have a significant impact on individual's physical, social and psychological health (2). As a result, there has been a great clinical focus on the improvement of OHRQoL as a major, if not the primary, outcome of dental care (3).

Assessment of OHRQoL is especially important in young children because their oral health status can affect their overall growth and development, self-esteem, social activities and learning abilities (4). Children's oral problems may also have a negative impact on normal daily activities of both children and their parents/caregivers (5).Therefore, an Early

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Childhood Oral Health Impact Scale (ECOHIS) questionnaire was specifically developed and validated to assess the OHRQoL in young children (6). This questionnaire has been translated and validated into different languages including Farsi (F-ECOHIS) (7).

Early childhood caries has been found to have a negative impact on ECOHIS score (8). Caregivers of young children with oral diseases also had a poorer quality of life (9). Some factors reported to have a significant association with poor OHRQoL in children are family income, mother's education, number of siblings, alcohol and drug abuse, perception of general and oral health, and orthodontic treatment needs (10). However, no significant association has been found between maternal dental anxiety and ECOHIS score (11). Children's OHRQoL has been reported to be improved after dental treatment (12). The impact of dental fear after treatment under general anaesthesia on OHRQoL was also evaluated, and it was shown that children's OHRQoL had improved after the treatment under general anaesthesia (13).

Proper oral hygiene has an important role in prevention of oral diseases (14). Parental belief is a predicator of their children's oral hygiene because improper parental attitude towards the importance of the deciduous teeth would delay early preventive dental care of children (15). Yet, little is known about parents' attitudes towards the importance of oral hygiene practices for their children and the impact of children's oral hygiene on their OHRQoL (16). Therefore, the aim of this study was to evaluate the impact of oral hygiene of preschool children and parental attitude on children's OHRQoL.

Study population and methodology

Setting and sampling

This analytic cross-sectional study was conducted in kindergartens in Shiraz, Iran, in 2013. A randomized cluster sampling was employed. Sample size was determined based on the results of a pilot study performed on 30 preschool children in four different kindergartens. The sample size was calculated based on correlation coefficients between different variables and F-ECOHIS scores considering $\alpha = 0.05$ and power = 90%. Although the largest sample size calculated was 363, we increased the sample size to 453 in order to compensate the possible exclusion of some children from the study for different reasons. Of 147 kindergartens, 10 were chosen using a balloting technique. All children aged 3–6 years registered in the 10 kindergartens (453) were recruited in the study. Children who were uncooperative or absent at the examination day, did not have any teeth, did not have parental consent or their parents did not respond to more than five questions of the F-ECOHIS questionnaire were excluded from the study.

Instruments

Children's oral hygiene was assessed using the Simplified Debris Index (DI-S), the debris component of Simplified Oral Hygiene Index (OHI-S) (17, 18). In each child, four labial and two lingual surfaces of the following index teeth 51, 55, 65, 71, 75 and 85 were examined for visible debris. Each surface was scored from zero to three based on the inciso-/occlusocervical extent of the debris as follow:

0 No debris or stain presented.
1 Soft debris covering not more than one-third of the tooth surface or the presence of extrinsic stains without debris, regardless of the surface area covered.
2 Soft debris covering more than one-third but not more than two-thirds of exposed tooth surface.
3 Soft debris covering more than two-thirds of exposed tooth surface.

The DI-S of each child determined as mean scores of the six teeth surface were from zero to three.

For evaluating children's oral hygiene, we also designed a questionnaire about oral hygiene habits. This self-made questionnaire was prepared by evaluating and incorporating the questionnaires of previous studies (19, 20). The questionnaire's content was reviewed by some of Shiraz dentistry professors, approving the face validity of the questionnaire. The questionnaire included three parts: demographic information (eight questions), children's oral hygiene (seven questions) and parents' attitude about the importance of brushing of deciduous teeth (one question). Questions regarding children's oral hygiene asked parents about frequency and time of toothbrushing, the age toothbrushing had been started, parents' satisfaction of their children's dental cleaning, preventive dental procedures such as fissure sealant and fluoride therapy, dental visits, and parents' evaluation of their children's oral health status. The questions were multiple choice, and parents were asked to select the most suitable answer.

The reliability of the questionnaire was checked by a pilot study with 30 parents of kindergarten children. The parents filled out the questionnaire twice, 2 weeks apart. The test–retest reliability was calculated by Spearman correlation. The coefficient values were all acceptable and highly significant (range: 0.572–0.833).

Children's OHRQoL was evaluated using F-ECOHIS questionnaire (7), which included 13 questions categorized into two groups: child impact (nine questions) and family impact (four questions). Each question was scored between one and five (1 = never, 2 = hardly ever, 3 = occasionally, 4 = often and 5 = very often). The response of 'I don't know' was considered as a missing value. A value equal to the subject's average score was given to the missing answers. Parents with more than five missing responses were excluded from the analysis. The F-ECOHIS score of each child was calculated as the sum of the 13 questions scores. The scores had a possible range from 13 to 65; the higher the score, the worse the OHRQoL.

Data collection

The study was reviewed and approved by the Research Ethics Committee of Shiraz University of Medical Sciences. A senior

dental student was trained by two university professors on how to measure DI-S and dmft indices in children. Later, the student examined 30 children and calculated their DI-S and dmft twice. The intraclass correlation coefficient (ICC) showed high agreement between the two measures (ICC = 0.97, $P < 0.001$ for dmft; and ICC = 0.98, $P < 0.001$ for DI-S). An information letter explaining the objectives and methods of the study was sent to the parents in the participating kindergartens. Upon receiving an informed consent, the calibrated student performed all dental examinations for the children in each kindergarten using a probe, a disposable dental mirror and a headlight. The probe was placed on each tooth and moved along the surface to detect inciso-/occlusocervical extent of the debris. The F-ECOHIS and self-made questionnaire were sent to children's home to be completed by the parents.

Data analysis

The collected data were entered into the SPSS version 18 to determine the mean children's DI-S and F-ECOHIS scores. Independent-sample *t*-test, ANOVA (with Tukey's post hoc test), and Pearson and Spearman correlation were used to estimate the impact of children's oral hygiene on their F-ECOHIS scores. For controlling the confounding effect of children's dental caries, children's dmft and DI-S were entered into a multiple linear regression model with F-ECOHIS scores as dependent factor. An alpha level of 0.05 was considered as statistical significance.

Results

Description of the participants

Of the 453 selected children, 396 completed the study (87%). Fifty-seven children were excluded from the study due to uncooperative behaviours (11 children), absence at the examination day (3 children), not having parental consent to participate in the study (19 children), not returning the questionnaires (21 children) and incomplete questionnaires (three children).

The median age of the participating children was 64 months, and almost half of them were girls. The median number of the children in each family was two, and 226 (57.1%) of them were the first-born child in the family (Table 1).

Table 1. **Characteristics of studied preschool children – Shiraz, 2013 (*N* = 396)**

Characteristics	Values
Age (M), median (min–max)	64 (34–72)
Gender, *N* (%)	
Male	202 (51)
Female	194 (49)
Father's education, *N* (%)	
High school or less	225 (56.8)
University degree	171 (43.2)
Mother's education, *N* (%)	
High school or less	236 (59.6)
University degree	160 (40.4)
Father's job, *N* (%)	
Self-employed	258 (65.2)
Employee	138 (34.8)
Mother's job, *N* (%)	
House keeper	289 (73)
Employed	107 (27)
Number of the children in the family, Median (min-max)	2 (1–6)
Child priority in the family, *N* (%)	
First	226 (57.1)
Second or more	170 (42.9)

M, month; *N*, number.

Children's oral health status

Almost two-thirds of the parents (75.7%) stated that they brushed their child's teeth once or more a day; 114 parents (28.7%) had started brushing their child's teeth before the age of 2 years. About half of the children (52.3%) had visited a dentist prior to the examination; among them, 77 (19.4%) were for check-up. Only a few children (12.9%) were reported to have some preventive dental treatments such as fissure sealant or fluoride therapy. A total of 219 parents (55.3%) evaluated their children's oral health status as good and very good, and 226 parents (57.1%) were satisfied with the cleanness of their child's teeth (Table 2). In the dental examination, children's DI-S varied from zero to three with a mean of 1.19 (± 0.77).

Children's oral hygiene and their OHRQoL

Children's F-ECOHIS scores were between 13 and 48 with a mean of 19.36 ± 8.42. While 143 parents (36.1%) reported that their child never had any complaint listed in the F-ECOHIS questionnaire (F-ECOHIS score = 13), 253 parents (63.9%) indicated that their child had at least one complaint (F-ECOHIS score > 13). The means of the child and family impact scores of F-ECOHIS were 12.29 (±5.02) and 6.79 (±3.76), respectively. There was no statistically significant difference between F-ECOHIS scores of boys and girls (19.12 ± 8.43 vs. 19.61 ± 8.43, $P = 0.557$), but the mean score of first children was significantly lower than that of the others (18.28 ± 7.41 vs. 20.80 ± 9.44, $P = 0.004$).

The associations between several indices used for evaluating children's oral hygiene and their OHRQoL are presented in Tables 3 and 4. A statistically significant correlation was found between DI-S and F-ECOHIS scores in univariate analysis ($P < 0.001$). In multiple linear regression performed for adjusting the impact of oral hygiene by dental caries, we still found a significant association between DI-S and F-ECOHIS (β=2.47, $P < 0.001$). In addition, there was a statistically significant relationship between dmft and F-ECOHIS (β=0.62, $P < 0.001$) (Table 5).

Similarly, frequency of toothbrushing was significantly associated with F-ECOHIS score ($P < 0.001$). Nonetheless, no statistically significant correlation was found between the age

Table 2. **Oral health status of the studied children (*N* = 396)**

Oral health status	Frequency	Percentage
Frequency of toothbrushing		
More than once a day	88	22.2
Once a day	212	53.5
Two to five times per week	85	21.5
One time per week	8	2.0
Less than one time per week	3	0.8
The time of toothbrushing		
After waking up	38	9.6
After a meal	105	26.5
After each meal	27	6.8
Before sleeping	226	57.1
The age toothbrushing had been started		
Before 1 years old	35	8.8
1-2 years old	79	19.9
2-3 years old	109	27.5
3-4 years old	112	28.3
After 4 years old	61	15.4
Parents' satisfaction of their children's dental cleaning		
Yes	226	57.1
No	103	26.0
Don't know	67	16.9
Preventive dental procedures		
Yes	51	12.9
No	345	87.1
Dental visits		
No dental visits	189	47.7
For check-up	77	19.4
For pain and other oral problems	130	32.8
Parents' evaluation of their children's oral health status		
Very good	55	13.9
Good	164	41.4
Moderate	85	21.5
Bad	61	15.4
Very bad	26	6.6
Don't know	5	1.3

Table 3. **The correlation between quantitative oral hygiene variables and F-ECOHIS score in preschool children – Shiraz, 2013 (*N* = 396)**

Variable	r	*P*
DI-S	0.43	<0.001*
Frequency of toothbrushing	−0.17	<0.001**
The age toothbrushing had been started	0.08	0.115**
Parents' attitude about the importance of deciduous teeth brushing	−0.16	0.002**
Parents' evaluation of their children's oral health status	−0.52	<0.001**

*Pearson correlation test DI-S= Simplified Debris Index.
**Spearman correlation test.

that toothbrushing had started ($P = 0.115$) or the time during the day that toothbrushing had been performed for the child ($P = 0.218$) and the F-ECOHIS scores (Tables 3 and 4). In addition, we could not show a statistically significant difference between F-ECOHIS scores of children who had received preventive dental treatments before and those who had not ($P = 0.257$); however, it should be considered that preventive dental procedures had been performed only for a few children (12.9%). While a statistically significant relationship was found between dental visit and F-ECOHIS score ($P < 0.001$), Tukey's post hoc test could not show a significant difference between F-ECOHIS scores of the children with no dental visits before and those visited by a dentist for check-up ($P = 0.244$). On the contrary, children visited by a dentist due to toothache or other oral problems had the highest F-ECOHIS scores (the worst quality of life) ($P < 0.001$).

Parental attitudes and children's OHRQoL

Parents' attitude towards the importance of brushing the deciduous teeth had a significant impact on child's OHRQoL so that a more positive attitude resulted in a higher quality of life ($P = 0.002$). In the same way, children whose parents were satisfied with their home dental care had the lowest F-ECOHIS scores (the best quality of life) ($P < 0.001$). Parents' evaluation of their child's oral health status was also found to be a good predictor of child's OHRQoL ($P < 0.001$) (Table 3).

Discussion

According to the American Academy of Pediatric Dentistry (AAPD), toothbrushing should be performed for children twice daily (21). In our study, 75% of children brushed their teeth once or more per day, and the brushing frequency was rather similar to that of other developing countries (22, 23). Nonetheless, the onset of toothbrushing for the majority of our children was later than the AAPD recommendation (21). The onset of toothbrushing for 70% of Saudi Arabia children was also after 12 months old (24). Similarly, the DI-S of our participating children was close to values reported in Kuwait (25) and Saudi Arabia (26); however, it was worse than the reported status for Japanese preschoolers (27). Correspondingly, only 20% of the preschool children in our study had been visited by a dentist for routine check-up, and only 13% of them had taken some preventive dental procedures; the percentages were much lower than the corresponding reports from some developed countries. For example, an US study stated that 31% of children had one dental visit by the age of 3 and 19% had at least one fluoride treatment (28). Overall, oral hygiene status of preschool children in our study was somewhat similar to that of other studies in developing countries. On the contrary, it was not optimal in comparison with that of the developed countries. Therefore, interventional programmes on oral health promotion of preschool children should be emphasized.

Like a previous Iranian study (7), the mean F-ECOHIS, child impact and family impact scores of children in our study were higher than those in the other countries (29, 30) even though our scores ranged from 13 to 65 vs. 0 to 52 used by those studies.

These results indicating the low OHRQoL of Iranian children emphasize an urgent need for establishing interventions changing factors that impact OHRQoL. According to our result, these interventions are necessary for both sexes, but they should focus on non-first children more.

Table 4. **The relationship between qualitative oral hygiene variables and F-ECOHIS score in preschool children – Shiraz, 2013 (*N* = 396)**

Variables	Mean	Standard deviation	*P*-value
Parents' satisfaction of their children's' dental cleaning			
Yes	16.55[a]	5.65	<0.001*
No	24.14[b]	9.57	
Don't know	21.52[b]	10.35	
The time of toothbrushing			
After waking up	16.93	6.05	0.218*
After a meal	19.92	8.86	
After each meal	18.18	7.80	
Before sleeping	19.66	8.59	
Preventive dental procedures			
Yes	20.61	8.76	0.257**
No	19.18	8.37	
Dental visits			
No dental visits	16.52[a]	6.01	<0.001*
For check-up	18.19[a]	6.93	
For pain and other oral problems	24.20[b]	10.00	

*One-way ANOVA.
**Independent-sample t-test.
Different letters show statistically significant differences.

Table 5. **Multiple linear regression model for adjusting the impact of oral hygiene on oral health-related quality of life by dental caries**

Variable	β	Standard error	*P*-value
dmft	0.62	0.14	<0.001
DI-S	2.47	0.70	<0.001

We found a statistically significant correlation between F-ECOHIS scores and two variables indicating children's oral hygiene, that is toothbrushing frequency and DI-S. Similarly, Nucã *et al.* reported a positive relationship between OHI-S and OHRQoL (31), and Paula *et al.* showed that another indicator of oral hygiene, bleeding on probing, was associated with worse OHRQoL (10). In contrast, we could not show a statistically significant correlation between preventive dental treatments, that is fissure sealants or fluoride therapy, and F-ECOHIS score. Likewise, there was not a significant difference between OHRQoL of children with and without routine check-up. Preventive dental treatments have been proved to be important for caries prevention (32). Yet, our results emphasize the importance of developing community-based programmes that will focus on improvement of toothbrushing in preschool children along with reinforcing the preventive dental treatments. The inconsistency between our results and other's reports may be due to inappropriate conduction of dental check-ups and preventive dental procedures in Iran. Actually, another study in Shiraz which evaluated sealants placed on permanent molars for school children showed that a high percentage of the sealants were lost and stated that these programmes in Iran need to be implemented more carefully (33). In addition, the low percentage of children who received these procedures in our study may be another reason for this result. For a better evaluation of this observation, longitudinal studies with larger sample size are recommended.

In our study, children whose parents had better attitude towards the importance of brushing deciduous teeth had better OHRQoL. This finding may be due to the fact that caregivers who recognize the importance of deciduous teeth would practise a better oral hygiene for their children, which in turn reduces the risk of developing caries in their teeth (34); consequently, a better OHRQoL will result. The findings of other studies also support our result; they have shown that oral health status of young children was greatly influenced by their parent's attitudes and practices (15, 16) so that children whose parents believed that deciduous teeth were important had fewer decayed teeth (35).

Moreover, our study showed that the OHRQoL in children whose parents were satisfied about their dental cleaning was significantly better than that of those whose parents were not. Parents' evaluation of their children's oral health status was also significantly correlated to F-ECOHIS score. Perhaps parents who cared more about their children's teeth were more aware of their oral health status and were also more concerned about brushing their children's teeth sufficiently, which would result in more satisfaction of their child's dental condition. These findings highlight the fact that for improving children's oral health, the authorities have to design appropriate strategies to change the parents' attitude about the importance of deciduous dentition and home-care preventive measures. In Iran, a large number of preschool children attend kindergartens, so oral health authorities can implement these educational programmes in kindergartens for the parents. It is worth mentioning that several programmes have so far been performed in Iran to achieve this aim; however, our results suggest that they are not sufficient.

This study had some limitations that need to be acknowledged. First, a cross-sectional study may not be an ideal design to evaluate the impact of oral hygiene on OHRQoL as well as to assess the confounding factors. A cohort study would

be a more reliable study design for such a project. Second, only children registered in the kindergartens participated in this study. Although the majority of 3- to 6-year-old children in Shiraz attend the kindergartens, the study population did not include all of the 3- to 6-year-old children in Shiraz. Third, we only collected the parents' reports regarding children's toothbrushing and did not evaluate the parents' brushing skills. For a better assessment of children's dental cleaning, further research is required to measure parent's toothbrushing skills and the effectiveness of this home-based preventive tool on oral hygiene status of young children.

Conclusions

Overall, our participating preschoolers had a less than optimal oral hygiene status which was significantly associated with their OHRQoL. Moreover, parents' attitude about the importance of deciduous teeth was found to be a determinant of children's OHRQoL. Therefore, improvement of preschool children's OHRQoL can be achieved by educating parents about the importance of primary teeth and home-care preventive measures.

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