

## Assessing Oral Health Status and Behaviors in 6-Year-Old School Children in Rural and Urban Areas of Shiraz, Southern Iran

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### Abstract

**Background:** Poor oral health can affect general health and quality of life in the school children. Tooth brushing and regular dental checkups can promote oral health status. In Iran, few studies have assessed oral health status, and oral health behaviors and their association in primary school children.

**Objectives:** The present study was conducted to assess the oral health status and behaviors among 6-year-old school children in Shiraz, south-west of Iran.

**Patients and Methods:** This analytic cross-sectional study was conducted during the 2014-2015 school year using a multi-stage stratified sampling method to select 830 first grade school children. Oral examination was performed to register simplified oral hygiene index (OHI-S). Oral health behaviors including tooth brushing frequencies and reason for using oral health services were assessed by completing a questionnaire. Independent-samples t-test, chi-square, one-way ANOVA and logistic regression were used to analyze the data.

**Results:** A total of 801, 6-year-old school children, including 421 boys and 380 girls, and their parents participated in the study, with the response rate of 96.5%, and an overall mean OHI-S score of  $0.59 \pm 0.4$ . The OHI-S scores in rural areas were higher than those of urban areas ( $P < 0.001$ ). The frequencies of tooth brushing were different among rural and urban children ( $P = 0.005$ ). The percentage of children who brushed their teeth once a day or more was fewer in rural than in urban children. The OHI-S scores were significantly different in children with different tooth brushing frequencies ( $P < 0.001$ ). The reasons for dental attendance were different in urban and rural areas ( $P < 0.001$ ), where regular dental visits were more frequent in urban children. The OHI-S scores were different in children with various reasons for visiting a dentist. Children who never visited a dentist, regarding toothaches or regular checkups, had the highest OHI-S scores in comparison to other groups. Frequency of tooth brushing and reason for visiting a dentist both had impacts on OHI-S scores ( $P < 0.001$ ).

**Conclusions:** Oral health behaviors such as daily tooth brushing and regularly visiting a dentist can improve the oral health status. Therefore, improving oral hygiene behaviors in schools, especially in rural areas, can promote children's oral health status.

**Keywords:** Oral Health, Oral Hygiene Index, Child, School, Tooth Brushing

## 1. Introduction

Oral health is an issue of increasing importance worldwide (1). Poor oral health has great impact on children's overall health and quality of life. Oral diseases can affect speaking, chewing ability, smiling and social communications in all age groups, especially young children (2). The high prevalence of oral diseases in school children has been a major and global health concern (3). School children's diet, growth, and school attendance can be affected by their oral health (4). Therefore, school children should be considered as the primary targets for oral health promotion programs.

In order to prevent oral diseases, such as dental caries and periodontal problems in childhood, maintaining good oral hygiene is proved essential (5, 6). Schools are the best places for educating and developing oral

health behaviors (7-9). Changing health-related behaviors, although difficult, can affect children's entire life-time (7, 10).

Regular checkups can help prevent dental caries and periodontal problems in early stages in children (11, 12). Moreover, regular dental visits in the childhood can develop children's and parents' knowledge, beliefs and skills in preventing oral diseases and improving oral health-related behaviors (13). Poor children experience more oral diseases (2) and are unfortunately the population with least access to oral health settings and dental visits (14, 15). Therefore schools can provide oral services for disadvantaged school children through school health facilities (16).

Several studies suggest that tooth brushing and main-

taining good oral hygiene can decrease oral diseases (17-20). In Portugal, for example, improving oral hygiene behaviors have significantly decreased oral diseases in 6-year-old children. Moreover, receiving preventive regular dental care has significant impact on oral health of children (21). Regular dental visits and good oral hygiene can significantly predict the oral health status(22). Similar study in Thailand revealed that dental visits, regarding all oral health behaviors, were the main oral health predictor (23). Another study in Poland found that dental services had profound impact on oral health behaviors of children (24).

Previous studies in Iran revealed that children's tooth brushing frequency was not satisfactory. For example, in a cross sectional study in Tehran, only 5% of 1- 3 year-old children brushed their teeth twice a day (25). In Tehran, only 26% of 15-year-olds brushed their teeth twice daily and had less visible dental plaque. Among 15-year-olds, 6% of non-smokers had never brushed their teeth (26). Another study conducted in Kermanshah on 1050 school children aged 6 to 12-years showed that 36.7% brushed their teeth twice daily or more, 41.8% brushed once a day and 21.6% had never brushed their teeth (27). The mean simplified oral hygiene index (OHI-S) among 12-year-old school girls in Kashan was  $1.46 \pm 0.42$  (mean  $\pm$  SD) (28). In Tehran OHI-S was  $1.20 \pm 0.53$  among 11 - 14 year-old school children (29). The mean OHI-S among 15-year-old students in Ahvaz was  $1.067 \pm 0.976$  in girls and  $1.479 \pm 1.09$  in boys (30). Another study in Zahedan city conducted on 12-year-old students demonstrated that the frequency of tooth brushing impacted OHI-S, with mean OHI-S  $1.43 \pm 0.72$  (31).

Studies on frequencies of and reasons for dental visits showed that regular dental attendance in school children were scarce in Iran. In Shariar city, about half of the rural and urban 11 to 14 year-old guidance school children never had dental visits. Moreover, 33.8% of guidance school children had dental visits only in emergency conditions and only 14% had regular dental check-ups (32). In 2008, among high school students in Shahrekord City, only 7% of school children had regular dental visits (33). A similar study in Hamedan showed that 5.7% of 2 - 5 year-old children had annual dental visits and 62% never had dental attendance (34).

To the best of our knowledge, few studies have been performed to investigate the association between service utilization, oral health behavior and oral hygiene status in regard to primary dentition in urban and rural school children in Iran in comparison with developed nations. In 6-year-old school children, assessing the association amongst OHI-S in primary dentition, dental attendance and tooth brushing frequency have not yet been assessed simultaneously in urban and rural areas in Iran. The policy makers in ministry of health and medical education should consider it essential to focus attention on basic knowledge about the oral hygiene status in deciduous teeth, tooth brushing

frequency and use of oral health services in school children. After analyzing the oral health status and behaviors in urban and rural areas, policy makers can better implement oral health promotion programs in disadvantaged schools.

## 2. Objectives

Having considered the aforementioned statements, this study was conducted to analyze the association between oral hygiene status, oral health behaviors and reasons for providing oral health services among first grade school children in Shiraz city.

## 3. Patients and Methods

This cross-sectional study was designed and implemented during the 2014-2015 school year on the 6-year-old first grade school children in Shiraz, the capital city of Fars province south of Iran. Ethical permission was obtained from Shiraz university of medical sciences and the educational head office of the Fars province. Using a simple randomization, the sample size of 385 children was determined based on the expected standard deviation (0.72) of OHI-S score in target population (31), with precision 0.072 (10% of SD), and confidence level of %95. However, the sample size was doubled ( $n = 770$ ) by employing multi-stage stratified sampling method, but the final sample size was 830 to overcome possible missing responses.

The area of study was divided into four educational zones by the educational head office. The number of first graders was used to calculate the sample size of each sex in each educational zone. In each zone, about four percent of boys' and girls' primary schools were selected randomly ( $N=35$  schools). The numbers of first graders needed in each school were selected by simple randomization, using the school register and table of random numbers.

The study included all primary schools in Shiraz except schools for children with special needs, and those with mental and/or physical disability. In addition care givers who have not lived with the child for a period of more than 6 months were excluded from the study. Also the study did not include the subjects who did not provide written consent and those who did not cooperate during the study.

Having briefed the parents about the aim of the study, they were asked to give their written consent to participate in an interview and oral examination of their children. Both interview and oral examination were performed inside schools. A questionnaire was designed to assess oral health behaviors. Information on the use of oral health services and oral hygiene behaviors were collected by interviewing parents or care givers. In order to assess tooth brushing with fluorinated toothpaste, the parents were asked about the frequency of tooth brushing with fluorinated toothpaste by their children. The answers given included, more than once

a day, once a day, less than once a day and never. Additional question asked of the parents, was under which situation did they take their child to the dentist? The answers given were never, when they had pain, or if they felt their children needed dental visit and regular annual dental check up.

During the examinations, which was conducted after the interview, necessary and practical oral hygiene instructions were taught to improve children's knowledge. Intra-oral examinations were carried out by a qualified examiner. Clinical examinations were carried out in the medical room of the schools, with the aid of headlight and disposable dental mirrors and tongue blade. The OHI-S index which included the debris index and the calculus index was used to assess children's debris and calculus status (35). The debris index or calculus index measures the extent of debris or calculus on selected teeth surface. The debris/calculus scores are from 0 to 3. The 0 score indicates no debris/calculus and the 3 showed debris/calculus covering more than two third of tooth surface (35). The modified version of OHI-S by Miglani et al. was used for deciduous teeth (36). This checked the presence of plaque and calculus on the buccal surface of 6 index teeth, the upper right second deciduous molar, the upper right central deciduous incisor, the upper left second deciduous molar, the lower right second deciduous molar, the lower left central deciduous incisor, and the lower left second deciduous

molar. The extension of debris and calculus on the teeth were checked by direct clinical examination and with the aid of headlight, dental mirror and tongue blade. The results of clinical examinations and questions as well as the frequency of children's tooth brushing and oral hygiene scores were registered in a chart for each student.

Data were entered into SPSS (version PASW 18.0) software for analysis. The association between oral hygiene behavior and of oral health services with S-OHI was investigated by independent-samples t-test, chi-square, one-way ANOVA and Tukey Post Hoc. Finally, all variables were entered in a regression model to adjust for confounders.

#### 4. Results

A total of 801, first grade 6-year-old school children and their parents participated in this study (response rate = 96.5%). The participants were 421 (52.6%) boys and 380 (47.4%) girls. The distribution of students in 4 educational districts is shown in Table 1.

More than half of the children brushed their teeth less than once a day and 42 children had never brushed their teeth (Table 2). Only 3.6% of pupils had regular dental visits, and approximately one-third visited a dentist when they felt pain. The frequencies of the reason for using oral health services by the study population are demonstrated in Table 3.

**Table 1.** Students' Distribution and Related Variables in 4 Educational Districts

Educational Districts	Frequency No. (%)	Location		Gender	
		Urban	Rural	Male	Female
1	237 (29.6)	228	9	134	103
2	177 (22.1)	139	38	84	93
3	196 (24.5)	152	44	103	93
4	191 (23.8)	145	46	100	91
<b>Total</b>	<b>801 (100.0)</b>	<b>664</b>	<b>137</b>	<b>421</b>	<b>380</b>

**Table 2.** Frequency and Association of Tooth Brushing With OHI-S in 6-Year-Old Students in Urban and Rural Areas<sup>a</sup>

Frequency of Tooth Brushing	Frequency, No. (%)	OHI-S <sup>b</sup>	Total OHI-S <sup>b</sup>
<b>Twice a day or more</b>			$0.40 \pm 0.35$
Urban	52 (7.8)	$0.37 \pm 0.34$	
Rural	7 (5.1)	$0.66 \pm 0.34$	
<b>Once a day</b>			$0.47 \pm 0.35$
Urban	260 (39.2)	$0.44 \pm 0.34$	
Rural	37 (27)	$0.67 \pm 0.37$	
<b>Less than once a day</b>			$0.69 \pm 0.42$
Urban	315 (47.4)	$0.62 \pm 0.39$	
Rural	88 (64.2)	$0.92 \pm 0.43$	
<b>No brushing</b>			$0.83 \pm 0.34$
Urban	37 (5.6)	$0.80 \pm 0.33$	
Rural	5 (3.6)	$1.03 \pm 0.35$	

<sup>a</sup>Mean values of each of Twice a day or more and Once a day were statistically different from mean values of each of Less than once a day and No brushing (Tukey Post Hoc test).

<sup>b</sup>Values are presented as mean  $\pm$  SD.

**Table 3.** Frequencies and Association of the Reason for Using Oral Health Services with OHI-S in 6-Year-Old Students<sup>a</sup>

Reason for Using Oral Health Services	Frequency, No. (%)	OHI-S <sup>b</sup>	Total OHI-S <sup>b</sup>
<b>Never</b>			0.77 ± 0.42
Urban	180 (27.1)	0.70 ± 0.39	
Rural	79 (57.7)	0.92 ± 0.44	
<b>Feel pain</b>			0.60 ± 0.36
Urban	232 (34.9)	0.57 ± 0.35	
Rural	36 (26.3)	0.78 ± 0.39	
<b>Felt need</b>			0.43 ± 0.36
Urban	225 (33.9)	0.41 ± 0.36	
Rural	20 (14.6)	0.65 ± 0.34	
<b>Regular annual/semiannual check-up</b>			0.36 ± 0.31
Urban	27 (4.1)	0.32 ± 0.28	
Rural	2 (1.5)	0.91 ± 0.12	

<sup>a</sup>Mean value of Never was statistically different from mean value of Feel pain and each of Felt need and Regular annual/semiannual check-up (Tukey Post Hoc test).

<sup>b</sup>Values are presented as mean ± SD.

#### 4.1. Tooth Brushing in Rural and Urban Areas and OHI-S

The overall mean OHI-S score was  $0.59 \pm 0.4$ , with no gender difference between the mean OHI-S scores ( $P = 0.546$ ). The tooth brushing frequencies were different among rural and urban children (chi-square, 12.83;  $P = 0.005$ ). About 47 % of urban and 32.1 % of rural children brushed their teeth once a day or more. The percent of rural children who brushed their teeth less than once a day (64.2 %) was higher than those in urban areas (47.4 %). The mean OHI-S scores in urban and rural areas were  $0.54 \pm 0.38$  and  $0.84 \pm 0.42$ , respectively. An independent-samples t-test was used to compare OHI-S scores for urban and areas. A significant difference was found in the OHI-S scores between urban and rural areas ( $P < 0.001$ ). The frequency of OHI-S scores of tooth brushing in children of urban districts was significantly lower than that of rural children in the same group (Table 2). The association between the frequency of tooth brushing with fluorinated toothpaste and OHI-S is illustrated in Table 2. There was a significant difference in OHI-S between different tooth brushing groups ( $P < 0.001$ ). The difference between two groups was measured by Post Hoc Test (Tukey). There was a significant difference in the OHI-S mean between children brushing their teeth once a day and less than once a day ( $P < 0.001$ ). Those brushed their teeth twice a day or more had fewer score than children who never brushed their teeth ( $P < 0.001$ ). In addition children brushing their teeth twice a day or more had less score than those who brushed less than once a day ( $P < 0.001$ ). The school children that never brushed their teeth had higher scores than those who brushed their teeth once a day ( $P < 0.001$ ). In summary,

all differences between groups were significant except the differences between those who brushed their teeth twice a day or more than once a day ( $P = 0.65$ ) and children who brushed their teeth less than once a day and never ( $P = 0.11$ ) (Table 2). As shown in Table 2, there was a gradient among tooth brushing frequencies and OHI-S scores in both rural and urban areas. An inverse relationship was found between the frequencies of tooth brushing and OHI scores.

#### 4.2. The Reason for Dental Visits in Rural and Urban Areas in Relation to OHI-S

The reasons for dental visits were different among rural and urban children (chi-square, 51.28;  $P < 0.001$ ). In rural areas, 57% of children never visited a dentist and 1.5 % had regular dental visits. While, in urban schools only 27% of children never had dental attendance and 4.1% had regular dental visits. Regarding dental visit, in comparable groups, children in rural areas had higher OHI-S scores than those in urban districts (Table 3). In urban areas, the OHI scores increased as the children visited dentists in pain or never. The OHI-S scores for students with different reasons for visiting a dentist had significant difference ( $P < 0.001$ ). The difference between the two groups was determined by Post Hoc Test (Tukey). Children that had regular dental attendance had the lowest OHI-S scores. A significant difference was observed in the mean OHI-S difference between children who never visited the dentist and those having regular dental visit ( $P < 0.001$ ) or children having dental appointments, the need for which was felt by the parents ( $P < 0.001$ ). Those visited a dentist in pain had less OHI-S scores than children that never visited the dentist ( $P < 0.001$ ). Children that visited a dentist in pain had higher

scores than those

**Table 4.** Regression Analysis Results; the Association Between Sex, Tooth Brushing Frequency and Reason for Using Oral Health Services with OHI-S (as Dependant Variable)

	<b>β</b>	<b>SE</b>	<b>P Value</b>
<b>Constant</b>	0.922	0.062	0.000
<b>Gender</b>			
Male	NA	NA	NA
Female	-0.029	0.027	0.281
<b>No brushing (tooth brushing)</b>	NA	NA	NA
<b>Twice a day or more (tooth brushing)</b>	-0.297	0.078	<0.001
<b>Once a day (tooth brushing)</b>	-0.249	0.064	<0.001
<b>Less than once a day (tooth brushing)</b>	-0.098	0.061	0.109
<b>Never (reason for use of oral health services)</b>	NA	NA	NA
<b>Feel pain (reason for use of oral health services)</b>	-0.150	0.033	<0.001
<b>Felt need (reason for use of oral health services)</b>	-0.276	0.036	<0.001
<b>Regular annual/semiannual check-up (reason for using oral health services)</b>	-0.335	0.075	<0.001

Abbreviation: NA; not available.

visited dentist regularly ( $P = 0.01$ ). Children that met the dentist if their parents felt they need a dental visit had less OHI-S scores than children visiting a dentist in pain ( $P < 0.001$ ). As mentioned above, all groups showed significant differences in their OHI-S, except between children who regularly visited the dentist and those urged by their parents to visit the dentist ( $P = 0.78$ ).

#### 4.3. Tooth Brushing, Reason for Dental Visits and OHI-S

Logistic regression has been used to assess the impact of all variables on OHI-S in a model (Table 4). Sex had no impact on OHI-S ( $P = 0.281$ ). The OHI-S score in children who brushed their teeth twice a day or more was 0.297 lower than those who never brushed their teeth ( $P < 0.001$ ). The OHI-S score of children which brushed their teeth once a day was 0.294 lower than those who never brushed their teeth ( $P < 0.001$ ). There was no significant difference in the OHI-S score between children that brushed their teeth less than once a day and those that never brushed their teeth ( $P = 0.109$ ).

The OHI-S score of children with regular dental check-up was 0.335 lower than those who never visited a dentist ( $P < 0.001$ ). The OHI-S score of children urged by their parents to refer to the dentist was 0.276 lower than those that never visited a dentist ( $P < 0.001$ ). Finally, the score of children that referred to the dentist when they felt pain was 0.150 lower than those that never visited a dentist ( $P < 0.001$ ).

### 5. Discussion

The overall mean OHI-S score among 6-year-old school children was  $0.59 \pm 0.4$ . Urban children had lower OHI-S

scores than those in rural areas. The tooth brushing frequencies were different in urban and rural children. The reasons for dental visits were different in urban and rural children.

This study showed significant differences in the OHI-S scores among 6-year-old children with different tooth brushing frequencies. Moreover, the mean OHI-S was different in school children with various reasons for visiting a dentist. The sample in this study was selected from all urban and rural schools in four educational districts of Shiraz, thus representing the oral health status and behaviors spectrum in almost all the children.

Having regular dental attendance can promote oral hygiene behaviors. So, children with regular dental attendance had the lowest OHI-S score among all children examined in the present study. This finding was in line with previous studies in Thailand and Poland (23, 24). In Shahriar district in Iran, the OHI-S score was significantly different among students with regular dental check-up, emergency dental visits and those who never visited a dentist (32). In this study only 3.6% of children had annual/semiannual dental visits. Therefore, most parents did not pay enough attention to oral health and dental attendance in both rural and urban areas. Children in rural areas had fewer dental visits than urban children. A study conducted across provinces in Iran, revealed that dentists were not evenly distributed and social disparities were obvious in this regard (37). Therefore, rural and disadvantaged areas had less access to oral health services.

About half of the children who participated in the study brushed their teeth less than once a day. Moreover, the tooth brushing frequency was fewer in rural areas. According to this study oral health behaviors were not satisfactory among 6-year-old school children, especially in

rural areas.

The rate of twice daily tooth brushing in the current study was higher than the previously reported ratio in 1 - 3 year-old children in Tehran (25). This may be due to the toddlers' disability to brush their own teeth. The rates of twice daily tooth brushing in school children of Kermanshah were much higher (36%) than the present study (7.3%) (27). In Kermanshah the participants were only from urban areas that could account for increasing tooth brushing frequencies compared to that of the current study. In addition, children in their study aged between 6 to 12 years, which were higher than those taking part in the present study. Children brush their teeth more frequently as they develop and grow older.

In the current study, assessing the mean OHI-S among children with different tooth brushing frequencies revealed a great impact of regular tooth brushing on oral health status. This finding was in line with previous studies in Iran and other countries (20-22, 31). In a similar study in Sardasht city, Iran, tooth brushing frequency was not associated with oral health status, which was affected by the time spent for tooth brushing (38). Therefore, future studies should consider the time spent on, the mode and frequency of tooth brushing in order to assess the oral health behaviors. Only 3.6% of the 6 year-old school children of the current study had regular dental visits, which was in agreement with the result of similar studies in Iran indicating the low percentage of children with regular dental visits (32, 33). In Ahvaz, south west of Iran, 7.8 % of 15-year-old students had regular dental visits (30). In Shahriar city, in Iran about half of the students never referred to a dentist (32). Compared with results of the present study, the higher rates of students with no dental visits in Shahriar may be due to limited access to oral services.

In the present study the primary dentition were assessed for OHI-S. The majority of similar studies were carried out on permanent dentition (28-30). The difference between mean OHI-S score of this study (0.59) and similar studies (1.46 in Kashan (28), 1.20 in Tehran (29)) can be due to possible differences in primary and permanent dentition. As most oral health behaviors stabilize in early life, it would be essential to assess them from early age. Moreover, schools provide a good opportunity for dental professionals to work on children's behavior (9). The sample in the current study was a viable representative of 6-year-old school children in Shiraz. Furthermore, similar studies in Iran did not assess both the rural and urban oral health status regarding oral health disparities in children with primary dentition.

Children younger than 7 years of age may have difficulty to recall the exact time of events (39). Therefore parents or caregivers answered the questions concerning their dental attendance and oral hygiene behaviors. One limitation of this study was that some parents might have given inaccurate information. Since, some of them were not really aware of their children's oral hygiene behavior or were embarrassed to tell the truth. For example, in ru-

ral districts the mean OHI-S score for children with regular dental visits was 0.91, which was much higher than those that visited dentist because of pain or need. This might be due to inaccurate reports given by the parents on their dental attendance. Another limitation of the current study is that the sample was not representative of the children's oral health profile of across the country, bearing in mind that cross sectional studies has some limitations. Future longitudinal studies should be conducted to register more exact information.

Rural children with the same tooth brushing frequency or reason for visiting a dentist had higher OHI-S scores than urban children, a condition probably arising from some socioeconomic and environmental factors which should be considered in future studies.

Similar studies should be conducted to evaluate oral health status of school children in other important dental stages comprising 9 and 12 years-old school children. Based on the results of current study and several similar investigations in Iran (30, 32, 33), the reasons for not having regular dental checkups in children should be investigated in future studies. The low rate of regular dental attendance in rural areas should motivate the policy makers to facilitate oral health service utilization for school children in disadvantaged areas. Finally, in order to promote oral health status of school children, school-based programs should focus on improving oral health behaviors such as tooth brushing and regular dental attendance.

The findings of this study revealed that both the frequency of tooth brushing and the reason for dental visits affected the impact on OHI-S. Tooth brushing once a day or more can improve the OHI-S. Regular dental attendance can significantly decrease the OHI-S scores. Therefore, improving oral hygiene behaviors in school children can promote their oral health status.

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## Footnotes

**Authors Contribution:** Study concept and design: Arghavan Behbahani Rad, Ali Golkari and Hassan Joulaei; data collection: Arghavan Behbahani Rad; analysis and interpretation of data: Arghavan Behbahani Rad, Mehrdad Vossoughi; drafting of the manuscript: Arghavan Behbahani; critical revision of the manuscript for important intellectual content: Ali Golkari and advising of Hassan Joulaei and Mehrdad Vossoughi.

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