

## Research Article

# Oral Health Status and Behaviors of Children Aged 6-12 Years Old: A Cross-Sectional Study

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**Abstract**

Dental caries is the most prevalent chronic disease affecting a large portion of children in Iran. The aim of present study was to investigate factors associated with dental caries among children. This cross-sectional study was conducted in Sardasht City, the northwest of Iran, enrolling 448 children aged 6-12 years old based on census method. Clinical examination was conducted and the World Health Organization (WHO) criteria were for caries diagnosis. Odds Ratio (OR) estimates for factors associated with dental caries using STATA software. The prevalence of dental caries was 49.3% and the mean DMFT score was 1.4 [95% CI: 1.2, 1.6]. Odds ratio indicated that older ages, time of tooth brushing and sugar consumption were associated with having dental caries after controlling for other variables. The effects of fathers' education, gender, accompanied disease and dry mouth were not significant on dental caries. In conclusion, dental caries in children aged 6-12 years old was prevalent in the studied district and found to be a public health problem. Sugar consumption, time spent tooth brushing, and older ages were important factors associated with dental caries. Comprehensive and effective strategies will be needed to reduce the sugar consumption among children.

**ABBREVIATIONS**

DMFT: Decayed Missing and Filled Tooth

**INTRODUCTION**

Dental caries is a major public health challenge worldwide [1] because of its high prevalence and concomitant risks of other diseases [2,3]. Based on oral health surveys in the past decades (1988-1998), it was found that 50% of the children aged 12 years old in Iran were affected by dental caries and there has been a decline in dental caries from DMFT of 4 to 1.5 [4]. However, the general level of oral health is still not satisfactory, particularly among children.

Previous epidemiological studies have reported that the incidence of dental caries is increasing gradually due to several factors including: the growing consumption of sugary substances, alcohol, substance abuse, cigarette smoking, poor oral hygiene,

poor oral care practices and inadequate health service utilization [5-7]. A recent epidemiological data [5] found early childhood dental caries is prevalent among the preschool children and caries experience is also associated with their oral health-related behaviours, socio-economic background, parental education and dental knowledge. In addition, other studies have found a significant relationship between parental education level and their children's oral health status [8,9].

Despite the fact that oral diseases, especially dental caries affect the majority of Iranian children, less is known about the extents and factors affecting the occurrence of dental caries, oral care practices and health care seeking behavior in most parts of the country particularly in the study area of Sardasht City. The aim of this study was to obtain baseline information on the dental caries situation of children aged 6-12 years old and the factors associated with their caries status that is necessary for planning of intervention programs in schools.

## MATERIALS AND METHODS

This cross sectional study was conducted in Sardasht City, the northwest of Iran, in 2012. Sardasht is a city in the north-west of Iran close to the Iraqi border with a population of 37,115 (2006 census). It was the first town in which civilians were attacked with chemical weapons by the Iraqi forces during the Iraq-Iran war. The local Human Subject Review Board of Urmia University of Medical Sciences approved this study and ethical approval was received.

There are three District Health Centers (DHC) in Sardasht City responsible for providing preventive and primary health care services to general population. Based on census method, all children aged 6-12 years old in the catchment area of the DHC's were invited to participate in this study. Informed consent was also obtained from each child's parents.

The children were clinically examined at the health center by a single trained dental therapist in an outdoor setting, under natural light with ball-point probes and mirrors, according to the recommendations of the World Health Organization (WHO) [10] and the presence of dental caries was recorded.

The parents were asked to complete the questionnaire specially designed for this study. The questionnaire consisted of two parts including: 1) The personal data and oral health-related behaviours (age, gender, educational level, residency, accompanied diseases, dry mouth, frequency and time spent tooth brushing, sugar consumption); 2) The child's socio-economic background: father and mother's education and number of children in the household.

All analyses were performed at the 5% significance level ( $P < 0.05$ ) using statistical software Stata 11 (Stata Corp, College Station, TX, USA). Descriptive statistics for the socio-demographic characteristics of children were calculated. Factors associated with dental caries were done using univariate and multivariate logistic regressions. Factors showing association lower than 0.2 were entered in a multivariate logistic regression model. Then, Odds Ratio (OR) estimates were summarized with 95% confidence interval (95% CI).

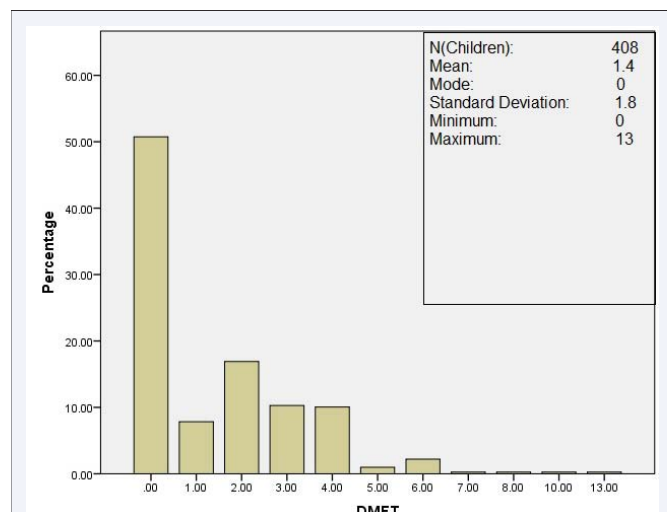
## RESULTS

Among total of 448 children in range 6-12years-old, 408 person of them accepted that to be participant into our study (response rate was 91%). Distribution of the children characteristics are summarized in Table 1. The sex ratio is approximately equal between male (52.2%) and female (47.8%) children. The overall mean DMFT score was 1.4 [95% CI: 1.2, 1.6] (DT: 1.32, MT: 0.02, and FT: 0.06) with decayed teeth accounting for around 92% of the dental caries experience. The prevalence of dental caries experience among children was 49.3%. Only 4.2% of the children had 5 or more teeth with dental caries experience. Figure 1 shows the frequency distribution of DMFT score with highly skewed and excessive zero score.

The crude and adjusted odds ratios for dental caries status according to the variables are summarized in Table 2. Age, educational level of children, residential location, time of tooth brushing, sugar consumption, mother's education and number of children in the household are significantly associated with dental

**Table 1:** Distribution of Children Characteristics.

Variable	No. (%)	Caries (%)	P value
Gender			
Girl	195(47.8)	47.7	0.543
Boy	213(52.2)	50.7	
Age group			
6-8yr	220(53.9)	25.9	0.001
9-10yr	104(25.5)	71.2	
11-12yr	84(20.6)	83.3	
Region			
Urban	398(97.5)	48.2	0.009
Rural	10(2.5)	90.0	
Education level			
Preschool	52(12.8)	25.0	0.001
Primary	309(75.7)	49.2	
Secondary	47(11.5)	76.6	
Number of children in the household			
1-3	36(8.8)	33.3	0.115
4-6	286(70.1)	50.0	
+6	86(21.1)	53.5	
Accompanied diseases			
None	388(95.1)	49.2	0.946
Yes	20(4.9)	50.0	
Dry mouth			
Yes	110(27.0)	48.2	0.790
No	298(73.0)	49.7	
Brushing frequency			
Never	166(40.7)	51.2	0.750
1-2 times	228(55.9)	48.3	
3 times	14(3.4)	42.9	
Time spent tooth brushing			
None	166(40.7)	51.2	0.011
1-2min	150(36.8)	55.3	
+3min	92(22.5)	35.9	
Father education			
Academic	158(38.7)	46.2	0.325
Non-academic	250(61.3)	51.2	
Mother education			
Diploma	136(33.3)	39.7	0.006
Under diploma	272(66.7)	54.0	
Sugar consumption (per day)			
None	45(11.0)	44.4	0.002
1-2	230(56.4)	43.0	
+3	133(32.6)	61.7	



**Figure 1** Frequency distribution of the DMFT score and summary statistics.

**Table 2:** The crude and adjusted odds ratios for dental caries according to the variables.

Variable	Unadjusted		Adjusted*	
	OR(95%CI)	P value	OR(95%CI)	P value
Gender				
Female	1.00	-	1.00	-
Male	1.13(0.76, 1.66)	0.543	ND	ND
Age group				
6-8yr	1.00	-	1.00	-
9-10yr	7.05(4.19, 11.87)	<0.001	7.67(3.58, 16.46)	<0.001
11-12yr	14.30(7.48, 27.34)	<0.001	25.38(6.10, 106.35)	<0.001
Region				
Urban	1.00	-	1.00	-
Rural	9.66(1.21, 76.93)	0.032	3.39(0.24, 48.44)	0.367
Education level				
Preschool	1.00	-	1.00	-
Primary	2.90(1.50, 5.65)	0.002	0.87(0.34, 2.22)	0.779
Secondary	9.82(3.90, 24.68)	<0.001	0.34(0.05, 2.04)	0.241
Number of children in the household				
1-3	1.00	-	1.00	-
4-6	2.00(0.96, 4.15)	0.063	2.30(0.56, 9.41)	0.244
+6	2.3(1.02, 5.18)	0.044	1.70(0.37, 7.87)	0.492
Accompanied diseases				
None	1.00	-	1.00	-
Yes	1.03(0.42, 2.53)	0.946	ND	ND
Dry mouth				
Yes	1.00	-	1.00	-
No	1.06(0.70, 1.64)	0.790	ND	ND
Brushing frequency				
No	1.00	-	1.00	-
1-2	0.89(0.60, 1.33)	0.562	ND	ND

3	0.71(0.24, 2.15)	0.550	ND	ND
Time spent tooth brushing				
1-2min	1.00	-	1.00	-
+3min	0.45(0.26, 0.77)	0.004	0.43(0.22, 0.82)	0.011
Father education				
Academic	1.00	-	1.00	-
Non-academic	1.22(0.82, 1.82)	0.326	ND	ND
Mother education				
Diploma	1.00	-	1.00	-
Under diploma	1.79(1.18, 2.71)	0.007	1.13(0.60, 2.19)	0.702
Sugar consumption (per day)				
None	1.00	-	1.00	-
1-2	0.94(0.50, 1.80)	0.862	1.12(0.41, 3.07)	0.818
+3	2.00(1.01, 3.98)	0.045	3.30(1.10, 9.88)	0.032

caries status ( $P < 0.05$ ) while gender, frequency of tooth brushing, dry mouth, father's education and accompanied diseases are not statistically significant in caries status.

Logistic regression was used to explore factors associated with dental caries and independent factors with  $P < 0.20$  in the bivariate analysis were considered for the model. The odds ratio results indicated that older ages, time of tooth brushing and sugar consumption are significantly associated with having dental caries after controlling for other variables.

## DISCUSSION

The results of our study revealed that approximately half (49.3%) of children aged 6-12 years old suffered from dental caries which was associated with some factors including age, urban/rural residency, number of children in the household, educational level, time of tooth brushing, mother's education and sugar consumption. Hence, our findings are in line with WHO and Federation of Dentistry International goals for 2000, i.e. 50% of 5-6-years old children should be caries free and the global average should be no more than 3 DMFT at 12 years of age [11]. Results of the present study (50.7%) also are relatively more than national mean value of 32.0% of 12-year-old caries-free [12]. On the other hand, the DMFT of our sample is calculated as 1.4, which illustrated a dramatic change in the oral health of the Iranian children and supported the effectiveness of the nationwide oral health care programs [12,13].

Our findings showed a strong negative association between caries development and time of tooth brushing practices in both crude and adjusted models (odds ratios of 0.45 and 0.43, respectively). Longer brushing time is associated with decreased caries experience. But, no statistically significant association was found between frequency of tooth brushing and dental caries experience. There is an important reason for this issue. We found that children (64.71%) who brushed their teeth three times a day has spent less time for brushing. Our result suggests that children should spend more time on brushing tooth. The results of previous surveys were inconsistent. For example, similar finding was reported in Hong Kong studies [5] and also in other regions [14] and another study has shown a relationship between frequency of brushing and dental caries [15]. A similar study conducted in Tehran [16], indicated that children who brushed their teeth once a week have almost 4 times the chance

of experiencing dental caries compared to those who brushed their teeth less than 2 times a day. Tooth brushing mode and lack of oral health education are the other most effective factors that have been previously shown to alternatively influence caries severity and the prevalence [16,17].

Sugar consumption has an important role in the disparity of oral health within and between countries [11]. Results of the adjusted and unadjusted analyses show a significant association between dental caries and sugar consumption which is in line with those of other studies [5]. A high frequency of sugar intake was seen among children who were in primary school as well as with low-educated parents. The frequency of sugar intake as a momentous factor in the complex a etiology of early childhood caries well known [18]. Thus, one of the most important ways to prevent of dental caries among children is the control of frequent sweet snack taking. In this regard, in a study to assess the prevalence of dental caries and associated factors among children mouth rinsing was found to be associated with caries [7]. The authors showed that mouth rinsing after meal is an important factor to reduce the dental caries [7]. Accordingly, this could be another way in preventing dental caries. A previous study has also addressed a non significant association between sugar consumption and dental caries [19].

In the present study, educational status of children's father was not shown to be significantly associated with dental caries, which inconsistent with previous findings [7,20]. Ayele et al reported that children whose father were above grade 12 had 63% lower odds to risk of dental caries compared to illiterates [7]. Similar to other studies on school children [5], we also found the educational status of children's mother to have a significant association with their child's dental caries. Parents especially mother play a central role to transfer health-related information and to support healthy behavior of their children [21]. Nourijelyani et al [9] in a study on an Iranian population to evaluate mothers' lifestyle behavior and its related to children's oral health reported that mothers' education is one of the variables influencing dental caries and health behavior in children. Another study also found the positive impact of an educational workshop on parental knowledge, attitude, perceived behavioral control, and intention regarding their child's oral health [22]. Our results, therefore, suggest that educational interventions should involve parents to improve oral health of children.

In this research, a strong significant difference in dental caries prevalence with regard to urban/rural residence was found. The crude significant association could probably be due to a small sample size in the subgroups of place. After controlling for other variables the significant association was not found. Similar findings have been reported by other researchers in different parts of Iran [23] and other countries [24]. For example, Rezaeian et al [23] in their study among school children in a western region of Iran indicated remarkable differences between rural and urban areas in the number of decayed, filled and missed teeth, but not in the overall prevalence of caries. Gorbatoeva et al showed a significant urban-rural disparity in dental caries, so that poor dental health was common among rural children [24]. Contrary to our results, national level studies suggest no significant differences in DMFT values between urban and rural

children [12]. A study conducted by Kiadaliri et al [25] to assess the distribution of dentists across the provinces in Iran, showed that there are 28 dentists per 100,000 population. They reported that availability of dentists in Iran is higher than global average, but the distribution of dentists across the country vary due to substantial pure and social disparities. In other words, dentists are located in the provinces with better social rank. As a result, most dental practices are probably located in urban areas and rural residents therefore have no more access to dental health services.

Our result was consistent in both crude and adjusted stages of analyses, which indicated that age was an important factor related to dental caries. Children aged 11-12 years old were more likely to have dental caries than children aged 6-8 years old. Our result is in concordant with other study which older age is associated with dental caries [26]. The difference of dental caries prevalence among age groups may be due to the different types of behaviours. Price et al [27] reported that school children are exposed to opportunities inside or outside school settings to purchase sugary beverages. Moreover, sugary foods consumption along with poor dental health may explain the higher rate of dental caries among the older school children [28].

Although our study has several limitations it makes a significant contribution to knowledge in an area of little published data. An important limitation of this study was the use of self-reports for some data. This may prone the results to information bias due to underreporting of unhealthy behaviors [29]. Another limitation is the cross-sectional nature of study, which limits the ability to identify causality inference. In addition, no information was available about socioeconomic factors of the children parents, which should be considered in future studies. Despite these limitations, the high response rate (91%) was the strength of this study.

## CONCLUSION

Dental caries in children aged 6-12 years old was prevalent in the studied district and found public health problem. Sugar consumption, time of tooth brushing, and older ages were important factors associated with dental caries. The comprehensive and effective strategies will be needed to reduce the sugar consumption among children. It may also be concluded that time of tooth brushing to achieving the proper oral hygiene should be emphasized.

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