

# The prevalence of caries in the first permanent molars among students of 7 and 12 years of age in Rafsanjan, Iran, in 2009-2010

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## Abstract

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**Background:** Dental caries is the most prevalent oral disease among children. The first permanent molar has been introduced as an index for predicting caries activity, and determining dental and oral health status and the groups most vulnerable to caries. Thus, the aim of this study was to determine the prevalence of caries in the first permanent molars among students of 7 and 12 years of age in Rafsanjan, Iran, in 2009-2010.

**Materials and Methods:** This cross-sectional study was conducted on 360 students (girls and boys) in Rafsanjan. The participants were selected through multistage random sampling. Clinical examination for the diagnosis of caries was based on the World Health Organization (WHO) criteria. Data were collected through interviews and clinical examinations and analyzed using Mann-Whitney and chi-square tests.

**Results:** The total mean decayed, missing, and filled teeth (DMFT) index of the sample was  $1.66 \pm 1.47$  ( $1.78 \pm 1.51$  in boys and  $1.51 \pm 1.42$  in girls) ( $P = 0.081$ ). Mean DMFT was  $1.79 \pm 1.33$  and  $1.52 \pm 1.56$  in the 12 years and 7 years age groups, respectively ( $P = 0.029$ ). The decayed teeth (DT), missing teeth (MT), and filled teeth (FT) in this index were 52.21%, 40.96%, 6.82%, respectively. The prevalence of caries free (CF) among the students was 34.7% (31.28% in boys and 37.57% in girls). A statistically significant difference was observed among the students in terms of gender and age ( $P < 0.05$ ); CF was 43.24% in the 7 years age group and 24.57% in the 12 years age group.

**Conclusions:** Considering the WHO criteria, the prevalence of caries and CF in the first permanent molars among students of 7 and 12 years of age in Rafsanjan was relatively favorable.

**Keywords:** Dental Caries, Students, DMF, Iran.

## Introduction

Dental caries is one of the most common chronic microbial diseases in the world which can result in the destruction of the calcified tissue of the teeth (1). Caries are the most common in the first permanent molars due to their pits, fissures, and anatomical concavities which can contribute to microbial plaque build-up; they constitute approximately 95% of all dental caries. Caries activity varies significantly; therefore, the progression of each lesion cannot be accurately predicted (1-3). It is necessary to recognize that although the treatment of symptoms is

important, lack of determination and treatment of the underlying cause results in disease persistence. Thus, dental caries prevention is an important responsibility of the profession of dentistry, and therefore, timely diagnosis can prevent more severe problems (4).

The most commonly used epidemiologic scale of caries and index for the determination of oral and dental health status in adults and adolescents

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is the decayed, missing, and filled teeth (DMFT) index. The DMFT index evaluates the number of decayed, missing, or filled permanent teeth (1, 5). The amount determined using this index is not representative of the real prevalence of dental caries in a community (6). Therefore, the percentage of caries free (CF) is used as a complementary criterion in epidemiologic studies. An individual with no decayed, missing, or restored teeth (DMFT index score of 0) is recognized as CF (7, 8). The prevalence of CF in the study by Sadeghi on 12 and 15-year-old students of Rafsanjan, Iran, was 38.2% and 20.6%, respectively (1). Sadeghi also reported a CF prevalence of 30.4% in a study in 2006 on students of 11-12 years of age in Rafsanjan (4). The health status of the first permanent molar is a disease-centered index related to dental caries and a suitable dental health index for children and adults (9). The first permanent molar was introduced as an index for the prediction of caries activity, determination of dental and oral health status, and determination of groups most vulnerable to caries by the World Health Organization (WHO) in 1994 (1, 10). Permanent teeth grow during the ages of 6 to 13. The first permanent molars have been introduced as dental occlusion keys. These teeth are considered as the guidance factor for the maxillary growth pattern; thus, any damage to them can endanger the dental-skeletal system. In addition, they are considered as an important factor in dental arch formation. The space for the growth of canines and permanent premolars is shaped by the mesial surface of the first permanent molars and distal surface of the permanent lateral incisors. Moreover, the growth of the second permanent molar is determined by the distal surface of first permanent molar. Thus, they determine the position of the posterior and anterior teeth (11, 12).

The first permanent molars are the main units of the chewing function; therefore, they have the largest crown and root width. This tooth also

impacts the determination of vertical occlusion and lower face height (11, 12). These teeth have pits and fissures which are not completely joined at the base, and thus, the material in the dental plaque which remain in these areas are transferred to the dentin. Furthermore, the pits in the lingual surface of these teeth in the upper jaw and the pits of the Buccal region of lower molars are prone to the rapid progression of caries (11, 13).

In the permanent dental system, caries generally begin in the pits and fissures of the first molar (14). Hence, sufficient statistical data on the prevalence of caries in the first permanent molars in different areas are useful for planning preventive measures and the correct pattern for the distribution of treatment facilities in the country. Therefore, the present study was conducted with the aim to determine the prevalence of caries in the first permanent molars among students of 7 and 12 years of age in Rafsanjan.

### **Material and Methods**

This cross-sectional study was conducted on 360 students of 7 years of age (first year of elementary school) and 12 years of age (first year of guidance school) in Rafsanjan in 2009-2010. The participants were selected through multistage sampling (stratified cluster sampling and simple random sampling) from approximately 40 elementary and guidance schools. Rafsanjan was divided into 4 regions (strata), and from each region, 1 public and 1 private school (both elementary and guidance schools) were selected. From each school (cluster), about 50% of students of 7 and 12 years of age were randomly selected. The sample volume was determined based on the prevalence of CF in the study by Sadeghi (4) and stratified sampling ( $n = 187$ ). This amount was doubled in order to increase the accuracy of the study ( $n = 360$ ).

$$n = \frac{(Z_1 - \frac{\alpha}{2})^2 p(1-p)}{d^2} = \frac{(1.96)^2 0.35(1-0.35)}{0.072} = 187$$

On arrival at the schools, a short explanation was given to students before the examination to ensure their cooperation. The students completed a demographic characteristics form consisting of questions on age, gender, and parents' occupation and education. Then, the DMFT index was determined. After drying the students' teeth, oral examination was performed by a trained individual under torchlight (the torch was held by a colleague) using a mirror and periodontal probe through observation of decayed, missing, and filled first permanent molars. Oral examination was, respectively, conducted on the upper right, upper left, lower left, and lower right jaw and the results were recorded by a colleague (15). It must be noted that this study was performed by observing the examination criteria, obtaining the approval of the research committee of the School of Dentistry, Ministry of Education, and headmasters or headmistresses of the schools, and obtaining informed consents from the students' parents. Moreover, the participants' information remained confidential.

In clinical examination, a tooth without any sign of restored or non-restored caries was considered as a healthy tooth. The detection of dental caries is difficult in stages in which no cavity is visible. Therefore, chalky white stains, discolored areas or uneven surfaces, pits and fissure in which the probe was caught only briefly, the enamel wall surrounding them was

not soft, and there was no empty space underneath the enamel, and any lesion the researcher was not certain of it being carious was considered as healthy (15).

Teeth with a lesion in the pit and fissure or on the smooth surface which had an empty space underneath the enamel and the surrounding was soft were considered as carious. Moreover, teeth with temporary dressings, previously restored but still carious teeth, and cracked teeth were also considered as carious. Based on the abovementioned criteria, each student's status was evaluated and recorded in the questionnaire in accordance with the WHO forms (1). The collected data were entered into SPSS software (version 16, SPSS Inc., Chicago, IL, USA) and analyzed using statistical tests. Descriptive statistical methods (percentage, frequency, and mean), and the Mann-Whitney and chi-square tests were used to analyze the data. The significance level was considered as  $P < 0.05$  in all tests.

### Results

The assessment of 360 students (170 girls and 190 boys) of 7 and 12 years of age in Rafsanjan showed that their mean age was  $9.41 \pm 2.50$  years,  $9.57 \pm 2.50$  years in girls and  $9.30 \pm 2.49$  years in boys. The relative frequency distribution by gender in the 7-year-old students (185 individuals) was 105 (62.5%) boys and 80 (37.5%) girls, and in the 12-year-old students (175 individuals), was 85 boys and 90 girls.

**Table 1:** Mean and standard deviation of the DMFT index of the first permanent molars in students of 7 and 12 years of age in Rafsanjan distributed by gender

Gender	DMFT (Mean ± SD)	DT N (%)	MT N (%)	FT N (%)	Total N (%)
Girls	1.51 ± 1.42	95 (57.84)	61 (36.9)	9 (5.25)	165 (100)
Boys	1.78 ± 1.51	93 (47.88)	86 (44.09)	16 (8.02)	195 (100)
Total	1.66 ± 1.47	188 (52.21)	147 (40.96)	25 (6.82)	360 (100)
P-value	0.081	0.114	0.232	0.321	

DMFT: Decayed, Missing, or Filled Teeth Index; DT: Decayed teeth; MT: Missing teeth; FT: Filled teeth

As can be observed in the results presented in table 1, DMFT of the first permanent molars was higher in boys ( $1.78 \pm 1.51$ ) than girls ( $1.51 \pm 1.42$ ), but this difference was not significant. The rate of decayed teeth (DT) was higher in girls and the rate of missing teeth (MT) was

higher in boys; however, these differences were not significant. The results of Mann-Whitney test showed that the DMFT index score and percentage of caries were significantly higher in the age group of 12 years compared to the age group of 7 years (Table 2).

**Table 2:** Mean and standard deviation of DMFT index of the first permanent molars in students of 7 and 12 years of age in Rafsanjan distributed by age

Age	DMFT (Mean $\pm$ SD)	DT N (%)	MT N (%)	FT N (%)	Total Nr (%)
7 years	1.52 $\pm$ 1.56	76 (40.95)	97 (52.38)	12 (6.66)	185 (100)
12 years	1.79 $\pm$ 1.33	107 (61.17)	56 (31.88)	12 (6.94)	175 (100)
<b>Total</b>	1.65 $\pm$ 1.44	188 (52.21)	147 (40.96)	25 (6.82)	360 (100)
<b>P-value</b>	0.029	0.000	0.059	0.231	

DMFT: Decayed, Missing, or Filled Teeth Index; DT: Decayed teeth; MT: Missing teeth; FT: Filled teeth

The DMFT of the first molar of the studied students was  $1.66 \pm 1.47$  (Table 3). In the two age groups, DMFT was higher in boys than girls. The prevalence of DT in first permanent molars of the subjects was 52.21%. The prevalence of DT in both age groups was higher in girls compared to boys. The prevalence of MT

among the participants was 40.96%; it was higher in 7 year-old boys compared to other age and gender groups. The prevalence of FT of the subjects was 6.82%; the highest prevalence was observed in 7-year-old boys (9.23%) and 12-year-old girls (7.01%), respectively.

**Table 3:** Mean and standard deviation of DMFT index of the first permanent molars of students distributed by age and gender

Age	Index	DMFT (Mean $\pm$ SD)	DT N (%)	MT N (%)	FT N (%)	Total N (%)	P-value
7 years	Girls	1.22 $\pm$ 1.44	40 (50)	38 (47.50)	2 (2.5)	80 (100)	0.031
	Boys	1.76 $\pm$ 1.66	37 (35.38)	58 (55.38)	10 (9.23)	105 (100)	
12 years	Girls	1.78 $\pm$ 1.35	56 (62.83)	27 (30.15)	7 (7.01)	90 (100)	0.928
	Boys	1.81 $\pm$ 1.32	51 (59.66)	28 (33.45)	6 (6.88)	85 (100)	
<b>Total</b>		1.66 $\pm$ 1.47	188 (52.21)	147 (40.96)	25 (6.82)	360 (100)	

DMFT: Decayed, Missing, or Filled Teeth Index; DT: Decayed teeth; MT: Missing teeth; FT: Filled teeth

The total rate of CF of the students was 34.17%; it was higher in 7-year-old girls (50%) compared to 7-year-old boys and 12-year-old students (Table 4). Mann-Whitney test results showed significant differences between the age groups based on gender and age ( $P < 0.05$ ).

In this study, 20% of subjects did not have their first permanent molars. The highest prevalence of CF was observed in 7-year-old girls and the

lowest in 12-year-old boys (23.3%). The highest prevalence of caries (116 teeth; 38.2%) and tooth extraction (77 teeth; 28.6%) was related to the 36<sup>th</sup> molar. The highest rate of extraction of molars was observed in 7-year-old boys (125 teeth; 46.5%). In addition, the highest number of fillings was related to 46<sup>th</sup> molar (8 teeth; 36%). The highest rate of molar restoration was observed in 7-year-old boys (10 teeth; 40%).

**Table 4:** Relative frequency percentage of the caries free criterion in the first permanent molars of students of 7 and 12 years of age in Rafsanjan distributed by age and gender

CF		Caries free index (%)		
		Girls	Boys	Total
Age	Gender			
	7 years	50	38.1	43.24
	12 years	25.9	23.3	24.57
	Total	37.57	31.28	34.17

Pearson chi-square = 0.28

P < 0.05

### Discussion

Dental caries is one the main causes of the loss of teeth. Teeth can be preserved through adherence to health principles, diet control, preventive measures, and timely treatment if necessary (1, 16-18). The WHO has considered 6, 12, and 15 year age groups as target groups for the study of the prevalence of dental caries. The results of the present study showed that mean DMFT among students of 7 and 12 years of age in Rafsanjan was  $1.66 \pm 1.47$ . Mean DMFT was higher in 12 year-old students and in boys in both groups; however, no statistically significant difference was observed between 7-year-old boys and girls. Considering the goal of the WHO to reach a mean DMFT of 3 or less in 12-year-olds, the status of dental caries was favorable in the present study (10). Furthermore, the finding of the present study was in agreement with the results of the study by Sadeghi (1) The mean obtained in the present study was less than that found by Bayat (19) and the national mean for 12-year-old students (3.02) (10). There are very few documentary researches on first permanent molars; thus, periodic researches to evaluate dental and oral health programs are necessary.

In the present study, the prevalence of caries free in students of 7 and 12 years of age was 34.17%; its prevalence was 31.28% and 37.57% in boys and girls, respectively. The prevalence of CF in the study by Sadeghi in Rafsanjan was 37% in 12-year-old students (35% in girls and 41% in

boys) and 20% in 15-year-old students (22.4% in girls and 17.8% in boys) (4). The results of the present study are not more favorable. Moreover, Sadeghi reported the prevalence of CF in students of 11-12 years of age in Rafsanjan in 2006 as 30% (26% in girls and 34% in boys) (1). The rate of CF in the study by Tomarian in Qom, Iran, was 10.7%, which was higher than that obtained in the present study (20). Considering the goals of the WHO in 2010, the obtained prevalence is low and must be promoted.

On the other hand, the DMFT index score and percentage of carious teeth was higher in the 12 year age group compared to the 7 year age group. This illustrates the necessity of planning to increase the awareness of individuals in the community regarding oral and dental health. More extensive education of parents and children through different methods regarding the importance of teeth and the necessity of maintaining teeth and its principles, encouraging individuals to undergo regular and periodic examinations (every 6 months) by a dentist and treatment if necessary, and preventive measures at different educational levels such as water fluoridation to drinking water and local fluoride therapy are essential. Some studies have reported very low concentrations of fluoride in drinking water in Iran. The best and most cost-effective method of providing individuals with fluoride supplementation is water fluoridation (21, 22). There are contradictory beliefs

regarding the importance of fluoride in human health; however, the majority of studies with negative results have important limitations, and thus, their results cannot be entirely confirmed (23-25). According to the WHO, there is no basis for altering the public health policies concerning the use of fluoride in the prevention of dental caries and the best method for the provision of fluoride is water fluoridation (19).

### Conclusion

Considering the WHO criteria, the prevalence and rate of CF in the first permanent molars among students of 7 and 12 years of age in Rafsanjan was relatively favorable, but attention to education with the objective of prevention and promotion of this index in ages higher than 7 years is necessary.

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