



Determination of the Decayed, Missing, Filled Teeth Index in Iranian Students: A Case Study of Zahedan City

Edris Bazrafshan¹, Hossein Kamani^{1,2}, Ferdos Kord Mostafapour¹, Amir Hossein Mahvi^{3,4*}

¹ Health Promotion Research Center, Zahedan University of Medical Sciences, Zahedan, IR Iran

² School of Public Health, Tehran University of Medical Sciences, Tehran, IR Iran

³ Center for Solid Waste Research, Institute for Environmental Research, Tehran University of Medical Sciences, Tehran, IR Iran

⁴ National Institute of Health Research, Tehran University of Medical Sciences, Tehran, IR Iran

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ABSTRACT

Background: One of the most important health problems in life is dental caries or tooth decay. Untreated caries are painful and may affect diet, school attendance, and sleep. Tooth decay can also have significant negative health and social consequences in later life.

Objectives: The aim of this study was to determine the decayed, missing, filled teeth (DMFT) index in 8-12 year old students in Zahedan City and also to determine fluoride concentrations in drinking water in the studied area.

Patients and Methods: This descriptive and cross-sectional study was performed in 2009 on 800 (400 boys and 400 girls) 8-12 year old students, who were randomly selected in Zahedan City (southeast of Iran) to assess the DMFT index. The DMFT index was determined using standard methods suggested by the World Health Organization (WHO) and drinking water fluoride concentration was measured in 144 samples collected from 12 desalination units using the SPADNS method. Data was analyzed using SPSS 15 software and presented as mean \pm SD.

Results: The mean DMFT value was 2.41 ± 2.12 , which was higher in the boys (2.68 ± 2.15) in comparison with the girls (2.13 ± 1.91). Of the subjects surveyed, 38.5% were healthy, with 42.5% of the girls and 63.75% of the boys. The mean fluoride concentration of the drinking water was 0.57 ± 0.07 mg/L, which is less than the normal range (1.5 mg/L).

Conclusions: According to the results of the present study, the DMFT scores in 8-12 year old students are higher than the global standards suggested by WHO. Results indicate that the availability of other sources of fluoride must also be considered and taken into account in public health dentistry planning programs.

► Implication for health policy/practice/research/medical education:

The content of this article is useful for health managers, especially in tooth and mouth health section. Also, some of these findings are useful for drinking water providers to better operation and supervision of drinking water treatment plants.

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* Corresponding author: Amir Hossein Mahvi, School of Public Health Tehran University of Medical Sciences and Institute of Health Research, Ministry of Health, Tehran, IR Iran. Tel: +98-9123211827, Fax: +98-2166462267, E-mail: ahmahvi@yahoo.com

1. Background

Public health and consequently the health of society has a great influence on the development and capabilities of a community (1). Dental problems are a prevalent disorder in both developed and developing countries and they are among the most significant dental problems, it is widely believed that tooth decay is increasing rapidly, especially in developing countries and this imposes a heavy cost on the community. Nevertheless, during the past decades the common consensus from many reports worldwide was that dental caries had declined significantly and were continuing to decline in populations. The dental community has prided itself on efforts that have reduced dental caries, including the use of; systemic and topical fluorides, toothpastes, sealants, improvements in diet, oral health education and dental care (2, 3). There are, however, recent studies that report alarming increases in caries. According to the United States Surgeon General's report, dental caries is stated to be the most common chronic childhood disease of children aged 5 to 17 years; it is five times more common than asthma and seven times more common than hay fever. The magnitude and severity of dental caries in primary and permanent teeth continues to be a major problem and should receive special attention (4).

According to the Center for environmental and occupational health of the Ministry report of the Ministry of Health, Treatment and Medical Education, the prevalence of dental caries among elementary students is 68%. Dental health indexes are not only indicators of health status, but can also be hallmarks of socioeconomic conditions. One of these indexes is the decayed, missing, filled teeth (DMFT) index. The DMFT index has been widely utilized in epidemiological surveys of oral health. It is recommended by the World Health Organization (WHO) for measuring and comparing the experience of dental caries in populations. The index expresses the mean number of decayed, missing and filled teeth in a group of individuals (5, 6). A WHO estimation of global DMFT for 12 year-old children reported that in the 188 countries included in their database; 200 teeth were decayed, 335 were filled and 280 were missing, on a global basis in that age group alone (7). A number of factors including; oral hygiene habits, nutrition, cultural, social, and economic racial practices of the target populations and low fluoride concentration in drinking water can have an effect on the DMFT index. The role of fluoride in reducing the risk of dental caries, especially among children, is well recognized (8). Fluoride in drinking water is usually the main source of fluoride intake, but excessive consumption of fluoride can cause a wide range of adverse health effects (9-13) Drinking water containing 0.7 to 1.2 mg/l natural or added fluoride is beneficial to children during the time they are developing permanent teeth. An optimum level of fluoride in drinking water is 1.0 mg/l in

temperate climates (14). At the present time water in the distribution system of Zahedan City (southeast of Iran) is not very suitable for drinking use, hence many families acquire their drinking water from desalination units in the city which desalinates the water using the reverse osmosis method. The fluoride concentration in water from desalination units is very low and consequently this water is mixed partially with untreated water, nevertheless, the fluoride concentration in the final water is less than normal range. Also, the mean fluoride content of bottled drinking water samples sold in Iran is 0.3 mg/L with a range of 0.00 to 0.59 mg/L, which is less than the optimal level (15). Therefore, low concentrations of fluoride in consumed drinking water can help to increase the DMFT index among students. The purpose of this study was to determine the DMFT index in 8-12 year old students in Zahedan City and also to make a determination of the fluoride concentration in drinking water in the studied area and to compare it with standard values.

2. Patients and Methods

This descriptive and cross-sectional study was performed between April and December 2009 on 800 (400 boys and 400 girls) 8-12 year old students who were randomly selected in Zahedan City, Sistan and Baluchestan Province in southeastern Iran (*Figure 1*) to assess the DMFT index. The area of the present study is situated between 29°29'33" N latitude and 60°52'01" E longitude at an altitude of 1,352 meters above sea level. It has a semiarid to arid climate with an average yearly temperature 18.2° C and the average annual rainfall is less than 100 mm. A multistage sampling was performed in this study. First, Zahedan City was divided into four districts within which four schools were randomly selected. The boys and girls for the sample of 800 people were selected by visiting 16 preliminary schools, the share of each school was determined according to its students register. Taking into

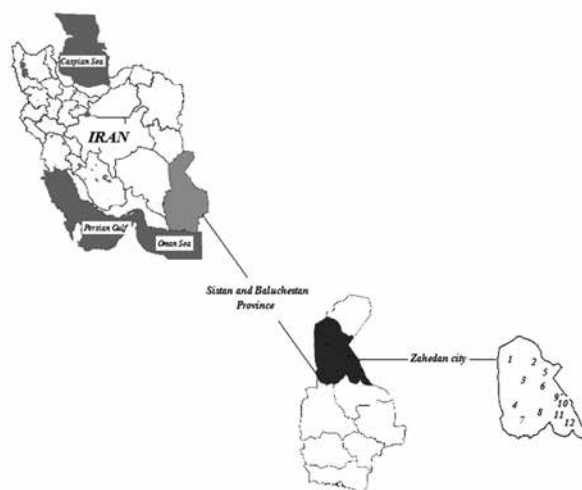


Figure 1. Location of Studied Area and Sampling Points

account the number of students in the different classes, the share of each class in each school was determined and samples were selected randomly. The DMFT index was determined using standard methods suggested by the WHO (16) by two dentists using a sharp dental probe and mouth mirror under good natural light. Drinking water fluoride concentration was measured in 144 samples collected from 12 water desalination units (active stations in the total area of the city) during one year, using the SPADNS method (17), with a DR/5000s Spectrophotometer (HACH Company, USA). The DMFT prevalence rate was determined in the samples, and its real rate (confidence interval) with 95% probability was estimated in the population and the role of sex on DMFT occurrence was assessed. The data was analyzed using a t-test in SPSS 15, and descriptive statistics were presented as percentages and mean \pm SD. P values of 0.05 were considered indicative of a statistically significant difference.

3. Results

In the present study the mean DMFT values were 2.68 ± 2.15 and 2.13 ± 1.91 in the boys and girls respectively and the total was 2.41 ± 2.12 (Table 1). The results show that the DMFT index was higher in the boys than in the girls and this difference was statistically significant ($P < 0.05$). According to the data presented in Figure 1 and Table 1, decayed teeth had the maximum prevalence (65.4%) and filled teeth had the minimum prevalence (3.4%).

The mean values of decayed (D) and missing (M) teeth in the boys was greater than the girls, but the mean values of filled (F) teeth in the girls were more than the boys. Also, according to the results of this study, 38.5% of the students were caries-free with 42.5% in girls and 63.75% among the boys. Table 2 shows that the maximum DMFT prevalence is related to 9 year old students (3.02 ± 2.55) and the minimum DMFT prevalence is related to 12 year old students (1.96 ± 1.8). The results of the questionnaire showed that 32.62% students had consulted and visited a dentist at least once. Also, 29.25% of the students brushed their teeth twice or more a day, 41.88% once a day and 28.87% didn't use a tooth-brush at all. The mean fluoride concentration in 144 samples from 12 water desalination stations (desalination units) was 0.57 ± 0.07 mg/L (Table 3), ranging from 0.45 to 0.68 mg/L. The fluoride concentration was lower than the standard limit (1 mg/l) in all of the drinking water supplies.

4. Discussion

The results of this study showed that mean DMFT values in boys (2.68) was higher than in girls (2.13). In contrast, Mahvi *et al.* had reported the DMFT prevalence to be 1.21 ± 0.16 in boys and 1.75 ± 0.19 in girls, totally 1.48 ± 0.13 in Behshar City, Iran (18) and Mahyae reported the DMFT prevalence to be 2.98 ± 1.95 in 12 year old students in the town of Baboul and also that the DMFT value was higher in girls than in boys (18). In addition, another survey of students in Dayer City, Iran showed a higher DMFT value

Table 1. DMFT^a Prevalence Among 8-12 Year Old Students According to Gender

	Number	D ^a	M ^a	F ^a	D+M+F ^a	DMF ^a Index ^b
Boys	400	726	325	24	1075	2.68 ± 2.15
Girls	400	534	277	41	852	2.13 ± 1.91
Total	800	1260	602	65	1927	2.41 ± 2.12

^a Abbreviations: D, Decayed; M, Missing; FT, Filled Teeth

^b Mean \pm SD

Table 2. DMFT^a Prevalence Among 8-12 Year Old Students of Elementary Schools in Zahedan City by Age

Age, y	Number	D ^a	M ^a	F ^a	D+M+F	DMF ^a Index ^b
8	160	319	117	3	439	2.74 ± 1.9
9	160	310	145	29	484	3.02 ± 2.55
10	160	212	106	17	335	2.09 ± 1.95
11	160	225	121	9	355	2.21 ± 2.03
12	160	194	113	7	314	1.96 ± 1.8
Total	800	1260	602	65	1927	2.41 ± 2.12

^a Abbreviations: D, Decayed; M, Missing; FT, Filled Teeth

^b Mean \pm SD

Table 3. Fluoride Concentration in Various Water Desalination Stations in Zahedan City

Station	1	2	3	4	5	6	7	8	9	10	11	12
F ^a , mg/L	0.52	0.68	0.53	0.45	0.49	0.59	0.65	0.58	0.51	0.53	0.67	0.61

^a Abbreviations: F, Fluoride concentration

in girls than in boys ($P < 0.05$) (19). Nevertheless, Daneshkazemi and Davari have reported a mean DMFT score of 1.8 ± 1.75 (1.95 ± 1.91 and 1.65 ± 1.55 in the boys' and girls' groups, respectively) (20). The mean DMFT score in Saudi Arabia was $7.05 (\pm 4.58)$ with a D component of 6.02, M component of 0.46 and F component of 0.57 (21). As men-

significant difference between DMFT values, the number of dentist consultations and fluoride therapy. Moreover, there was no significant difference between DMFT values and brush number, education, the number of children in student's families or parents' occupation. (Figure 3)

In the present study, the mean fluoride concentration in 144 samples from different sources in the city (desalination units) was 0.57 ± 0.07 mg/L, that is less than the guidelines set by WHO (1.5 mg/L) (14), so the availability of other sources of fluoride also needs to be considered and taken into account in the planning of public health dentistry programs. It can be assumed that low concentrations of fluoride in drinking water can increase the rate of DMFT incidence in children. Mahvi *et al.* have reported a mean fluoride concentration of drinking water in Behshar City, Iran of 0.25 ± 0.06 mg/L which was less than the standard range (18). Ramezani *et al.* reported a mean fluoride concentration of drinking water at 2.43 ± 0.23 mg/L which was higher than the permitted limit (19). Nouri *et al.* reported mean fluoride concentrations of drinking water in the Khuzestan Province, Iran from 0.12 to 2.17 mg F/L (mean 0.6 ± 0.44 mg F/L) and the content of fluoride in the village groundwater in Arsanjan, Iran was found to vary from 1.2 to 0.10 mg/L (24, 25). Another survey in the Qazvin University Dental School mentioned the prevalence of fluorosis in the 12 year old age group to be 13.9% at a 0.653 ppm water fluoride concentration and Ali Mohammadi has reported fluorosis prevalence to be 10.9% in 12-15 year old students of the Alborz Industrial City, Iran (water fluoride concentration 0.53 ppm) (19). In Saudi Arabia it has even been reported that fluoride levels above 1 mg/L were associated with increased dental caries (26). Furthermore, Rahmani *et al.* (27) stated that, although there is a relationship between dental caries and fluoride levels in drinking water, this relationship is not significant and in the case of low levels of fluoride in drinking water, there is no need to add fluoride to drinking water as it may be supplemented by other sources.

Chart Title

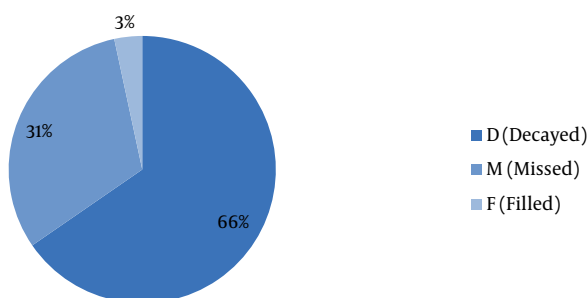


Figure 2. Percentage of Decayed (D), Missing (M) and Filled (F) Teeth Indexes Among the Total Study Population

tioned earlier the mean DMFT score in the study area was 2.41 ± 2.12 with a D component of 65.39%, M component of 31.24% and F component of 3.37% (Figure 2). Furthermore, according to the results of the present study, the DMFT scores in 8-12 years old students are higher than the global standards suggested by WHO references (2.41 ± 2.12 vs. 1.5) (20). According to the results of this study, 38.5% of the students were caries-free with 42.5% in girls and 63.75% among the boys. These findings are near to the caries-free group in Chapple's study (22), Daneshkazemi and Davari's study (28.5%) (20), and Mahvi's study (24%) (18), but this result does not support Montero's study with 68% caries-free (15) and Dasanayake's study with a 72% caries-free group (23). Possible explanations for this discrepancy are due to the differences in oral hygiene habits, nutrition, cultural, social, economic, racial habits of the target populations and low fluoride concentrations in the drinking water. The results of this study also showed that there is a

5. Discussions

According to the results of the present study, the DMFT scores in 8-12 year old students are higher than the global standards suggested by WHO, perhaps this trend of DMFT is due to the concentration of water fluoride. For the purposes of improving oral health, organizing preventive dental services, introducing obligatory oral examination for students and continuous monitoring of fluoride concentrations in drinking water sources can be recommended.

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Chart Title

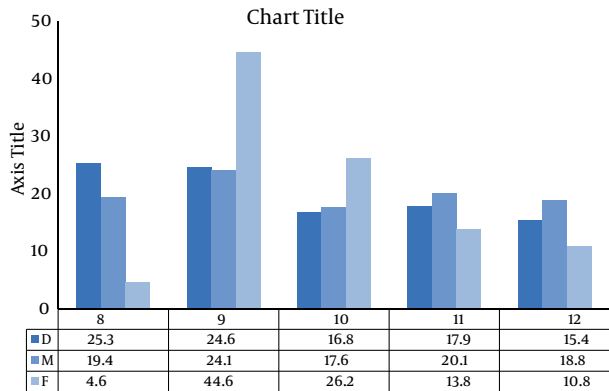


Figure 3. Percentage of Decayed (D), Missing (M) and Filled (F) Teeth Index in Each Age Group in Zahedan City

Authors' Contribution

Conceived and designed the experiments: E. Bazrafshan, A. H. Mahvi; Performed the experiments: E. Bazrafshan, H. Kamani; Analyzed the data: H. Kamani; Contributed reagents/materials/analysis tools: F. Kord Mostafapour; Wrote the manuscript: E. Bazrafshan, A. H. Mahvi.

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