

Changes in dental caries indices over a period of last 5 years in Shiraz, Iran¹Faezeh Ghaderi, ²Raha Habibagahi*, ³Zahra Abdoli Nadik, ⁴Elmira Niazi, ⁵Mahboobe Ahamdbeigi¹Department of Pediatric Dentistry, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran²Orthodontic research center, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran³Department of Pediatric Dentistry, Rafsanjan School of Dentistry, Rafsanjan, Iran⁴Postgraduate Student of pediatric dentistry, Department of Pediatric Dentistry, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran⁵Department of Endodontics, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran**Corresponding Author:** Raha Habibagahi, PhD of biomaterials. Orthodontic Research Center, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran.**Type of Publication:** Original Research Paper**Conflicts of Interest:** Nil**Abstract**

Background: Despite some previous promising reports, there has been an increase in prevalence of dental caries. The developing world may be hurt more from the burden of this dental disease. This retrospective study was conducted to evaluate the dental caries prevalence in children during last 5 years in Shiraz.

Methods: DMFS (Decayed, Missed and Filled Surfaces) and dmfs (decayed, missed and filled surfaces) indices of 938 healthy 4-12 years old children who had sought medical help at Shiraz Dental School in a 5 year Period from 2010 to 2014 were obtained through their dental records.

Results: The prevalence of children with sound permanent teeth (DMFS=0) increased from 66.4 % to 74.9 % from 2010 to 2014 ($p=0.001$). The highest prevalence for DMFS=0 was reported in 2012 with 84.3 %. The DMFS and dmfs scores had decreasing trends in all age groups except for the 7-9 years old children who experienced an increase since 2013. The girls had statistically significant higher DMFS index than the boys

in overall [1.16 ± 1.92 (SD) vs. 0.55 ± 1.33 , $p < 0.001$]. No statistically significant difference was seen in dmfs based on gender [13.99 ± 7.18 (SD) vs. 13.29 ± 6.77 for girls and boys. ($p=0.06$)].

Conclusions: In Shiraz (a big city of Iran) the oral health status had showed some improvement from 2010 to 2014. However, some indices showed points of regression in 2013. Oral indices are more concerning in girls and children of 7-9 years old. The latter may be due to governmental insurance coverage program discontinuance which was considered for permanent first molar restorations in children 6-12 years old.

Keywords: Oral Health, Dental Caries, DMF Index.

Introduction**Background**

Despite some previous promising reports, there has been an increase in prevalence of dental caries. Worldwide data indicate that dental caries in population of countries with inequality in socioeconomic status inflicts a more serious damage (1). In societies that are subjected to change their diet or have to migrate, a higher degree of caries

prevalence is observed (2). Societies with poor socioeconomic status, individuals with low education levels and low income also show a higher degree of tooth decay (3, 4).

Oral health affects both the individuals and the societies in different aspects. Poor Oral health has a negative effect on people's confidence and social performance as malocclusion lessens the beauty of smile (5, 6). In addition, financial costs also impose a burden on an individual(7).According to World Health Organization (WHO) oral diseases are the 4th most costly diseases to treat in most of the developed countries(8). Treatment costs consist of direct treatment expenses (for diagnosis, cure and medications), and also indirect costs due to loss of productivity in school or work (9).

Dental caries in children require more attention since caries are more common in this group. Additionally, preventive care and educational programs is easier to implement (10). What's more, it is convenient to supervise an intensive program in schools (11).

Parameters like high sugar intake, changes in diet and immigration have had undesirable effects on oral health in general and Decayed Missed Filled Tooth (DMFT) in particular. What has happened is that the sugar intake of children of the families who have migrated increases, which results in an increased dental caries (12).

Based on the report from Federation Dentaire International and WHO, another important issue that affects oral health is fluoride deficiency. Fluoride is a common ion in countries with reduction in caries that can be effective either through added fluoride to drinking water or by using fluoride toothpastes (13). The optimal concentration of fluoride to prevent dental caries in drinking water is 0.7ppm in tropical zones to 1.2 ppm in cold regions (14). However, in most regions in Iran, the drinking water lacks this fluoride concentration. In spring

of 2010 fluoride concentration in Shiraz's drinking water, a southern city in Iran, was reported to be at 0.349 ± 0.153 mgL⁻¹ which was lower than the optimum (15). However, in another study it was mentioned to be 0.69 mgL⁻¹ (16).

In the last decade there has been a decrease in dental carries in developed countries and has reached a plateau, while in developing countries a variable trend has been observed (12, 17, 18). In Iran, a developing country there has been mixed reports (19-21). According to WHO global oral health data bank, a decrease in DMFT has been observed in the past three decades and the index has dropped from 4.9 in 1974 to 2 in 1995, which was a significant improvement (19). In a survey in 1999 conducted by the Oral Health Department of the Ministry of Health and Medical Education of Iran the mean dmft of 1.8 for 3-years-old children was reported. Also the mean DMFT index regarding 12-years-old children was 1.5(20). DMFT and dmft index in 8 to 11-years-old children in Shiraz was reported at 1.22 ± 1.5 and 2.8 ± 2.5 (21).

There are controversial results in the area of dental caries prevalence in Iranian children, especially in Shiraz a city in southern Iran. Moreover, there have been limited researches that have investigated the changing trend over time. Hence, this retrospective study was conducted to evaluate the dental caries prevalence in children from 2010 to 2014 in Shiraz.

Methods

Population and Sampling

This retrospective analytic study was conducted on dental records of children 4-12 years old. The participants had sought medical help for their different dental conditions at Shiraz University of Medical Sciences in a five year period from 2010 to 2014. Total of 1,015 dental records were evaluated. The exclusion criteria were as follow:

1. Dental records that were not signed by the supervisors were excluded.

2. Children who had systemic diseases were not evaluated.

Finally 938 dental records were chosen. This study was approved by the ethics committee of Shiraz University of Medical Sciences.

Data Acquisition and dental examination

All the patients were examined under direct light, using mirror and dental explorer and their diagnoses were recorded. If there were any indication of caries, bitewing radiography was taken and the additional information was added to the patient's dental records. All the records were accredited by an attending professor at pediatric dentistry department of Shiraz Dental School.

DMFS and dmfs of children were calculated based on their records. WHO guidelines were used to calculate the DMFS score (22). The DMFS compared to DMFT provides a more accurate description of patient's oral health. In this index, D is for the number of teeth with decay that requires restoration, M represents the number of missing teeth which have been extracted, F shows the number of teeth with filling, and S is for tooth surfaces. By adding the four numbers of D, M, F, and S, the DMFs amount is measured.

The children were divided by their age into three categories:

1. Below six years, primary dentition (<6 years)
2. Six to nine years, early mixed dentition ($\leq 6 < 9$)
3. Nine to thirteen years, late mixed dentition (≥ 9)

Data analysis

All the statistical and analytical calculations in this review were performed by Statistical Package for the Social Sciences (SPSS) version 16.0 (IBM, Chicago, IL, USA).

The means and standard deviation were calculated for both DMFS and dmfs indices in each year from 2010 to 2015. The percentage of children with DMFS=0 in each year was recorded. In these children, all the permanent

teeth, except for the third molars, were present and recorded.

Mean DMFS was calculated in each age group. Also the age-specific and sex-specific amounts for the DMFS means were calculated. To obtain time trends, all of the mentioned means were calculated and analyzed in each year.

The correlations between different parameters were measured by using Pearson Chi-Square and Independent t-test. Significance level was 0.05 in all statistical analyses.

Results

Total of 938 dental records were evaluated. From that 456 (49%) of the patients were boys and 482 (51%) were girls. Table 1 shows the yearly Means for DMFS and dmfs indices of all the 938 subjects and the Sex-specific means. According to our findings, the oral health status had an improvement from year 2010 to 2014. However, some indices show points of regress in 2013.

As it is shown in figure 1, overall DMFS and dmfs indices significantly decreased from 2010 to 2014. ($P=0.005$)

The prevalence of children with healthy permanent teeth (DMFS=0) increased from 66.4 % to 74.9 % from 2010 to 2014 ($P=0.001$). Sex-specific analysis showed that overall, mean DMFS was higher in girls than in boys [1.16 ± 1.92 (SD) vs. 0.55 ± 1.33 , $P<0.001$], but there was no significant difference in dmfs [13.99 ± 7.18 (SD) vs. 13.29 ± 6.77 for girls and boys. ($P=0.06$)].

Figure 3 shows the time trend analysis in different age groups. Mean DMFS had a significant decrease in 10-12 years old children during 2010 to 2014 ($P=0.001$). In the 7-9 year old children group no significant change was observed in dmfs. Children aging 10-12 years-old, experienced a mild decrease ($P=0.03$).

Sex-Specific time trend analysis showed that the mean DMFS and mean dmfs scores had a roughly similar pattern to the overall pattern in both boys and girls (Fig 4).

Discussion

It is important to analyze the changes in DMFT and dmfs over time to evaluate improvements in oral health of patients in different countries. Since studies conducted in Iran have used different diagnostic indices, sampling methods and age groups, these studies cannot be compared with that of ours. According to studies, dental caries in Shiraz has a higher prevalence in comparison with other cities in Iran (23-25). A study was conducted in 2003 in Dayer, a city in southern Iran on 506 adolescents 10-16 years old, their results showed an average DMFT of 1.8(24). In 2006, children between 5 to 6 years old who sought dental care at a clinic in Kerman had an average dmft of 7.1 (25). In 2010 a similar study in Kashan on a group of 2-6 year olds found a mean dmft of 1.57(23). In our study 363 participants 4-6 were studied and 6.6 % had no caries and the mean dmfs was calculated at 15.1. The WHO guidelines in 2010 sets the goal for children 5-6 years old to be more than 90% caries free (26). The high prevalence of dental caries in our study could be due to our sampling method which was not population based. However, the prevalence in our study compared to other studies with similar sampling method was higher (25). Even though a decreasing in dental caries prevalence has been observed within the past 5 years, but a disappointing trend was observed in 2012. In Iran permanent first molars in children 6-12 years old was covered by insurance companies from 2010 to 2012 and due to this coverage children in this period visited dentists or dental clinics more often. In this study as well as other studies a meaningful difference was observed between females and males. Girls showed a higher DMFS and dmfs compared to boys (27, 28). This can be explained by the fact that tooth eruption in girls occurs earlier and consequently a longer exposure to factors inducing caries (29). Apart from the alarming

results in the female group, the study also indicates that decay indices are higher in children 7-9 years old and require more attention by health policymakers; hence they should advise comprehensive treatment and preventive measures for these two groups.

These results are alarming for Shiraz as a major city in Iran and a city with good dental facilities. Different parameters could have caused this high level of prevalence. The primary factor is the concentration of fluoride in the drinking water. Mesdaghnia et al., had measured the amount of fluoride in groundwater resources and found that Fars province has a low average concentration of fluoride (0.5 mg/L) (30). On the other hand, some studies had indicated that in some southern regions of Iran the concentration is higher than optimum that can lead to dental fluorosis (15, 31).

The other parameter, as in other dental diseases, is poor preventive care. Preventive care in children should be improved by educational programs for children and their parents. Educational brochures should be prepared to increase the parent's knowledge and further educational plans are suggested in primary and pre-primary school levels through educational programs (32).

For future studies we recommend to evaluate the prevalence of caries in adolescents 12-15 years old as the international research committee of WHO has emphasized on this age group.

Based on the result of our study, a tangible improvement was observed during the past few years, but a reversing trend was also observed, which could lead to crisis if left neglected. Since dental caries in children not only affect the children, but it also has a negative effect on the family and society, where preventive care plan should be devised by the public and private sector.

Conclusion

In Shiraz the oral health status had showed some improvement from 2010 to 2014. However, some indices showed points of regression in 2013. Oral indices are more concerning in girls and children 7-9 years old.

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Legends Figure

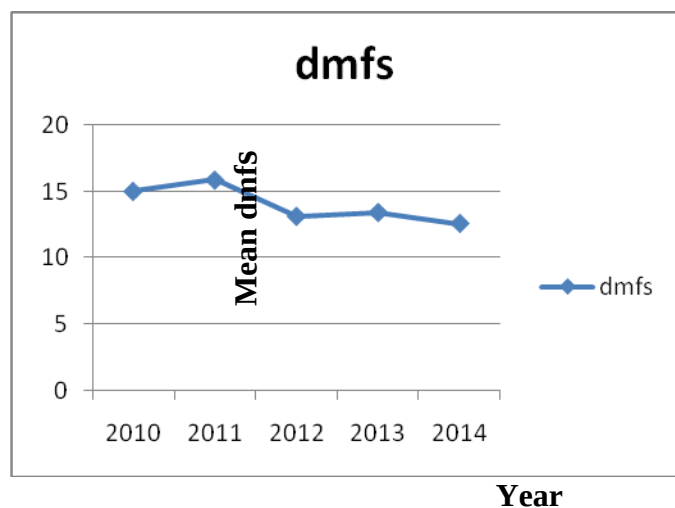
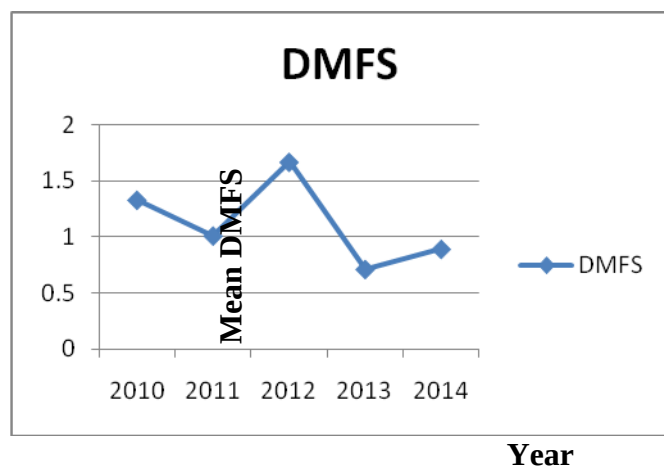


Figure1. Overall Mean DMFS and dmfs Time Trend from 2010 to 2014

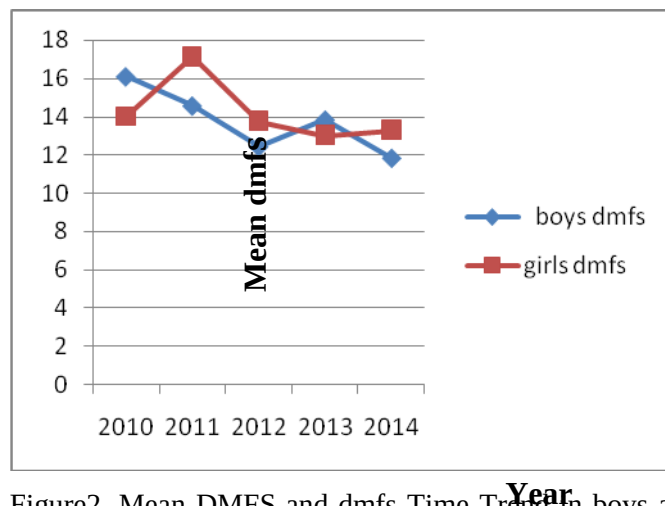
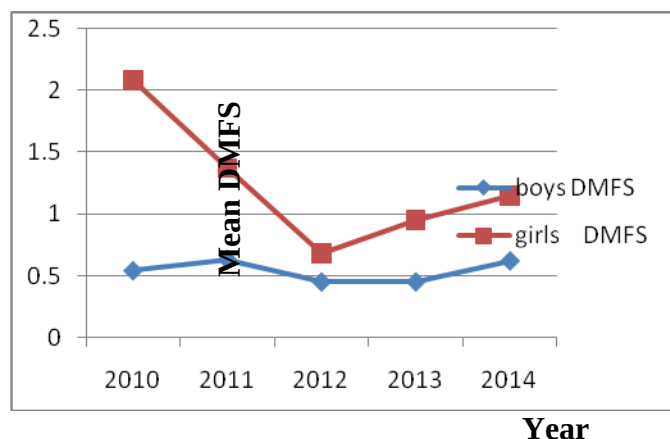


Figure2. Mean DMFS and dmfs Time Trend in boys and girls from 2010 to 2014

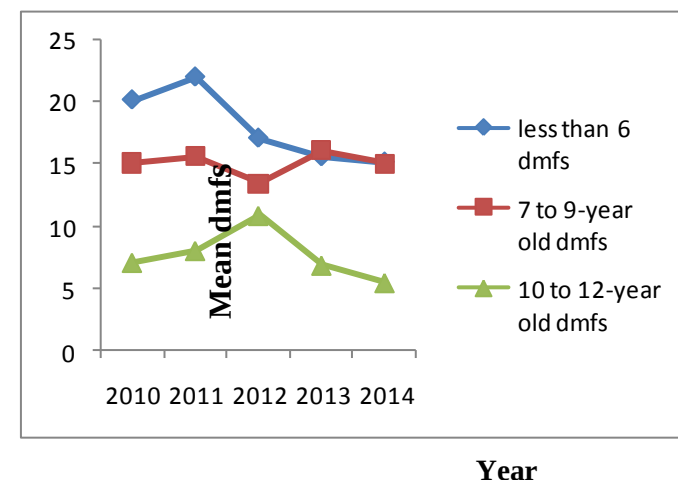
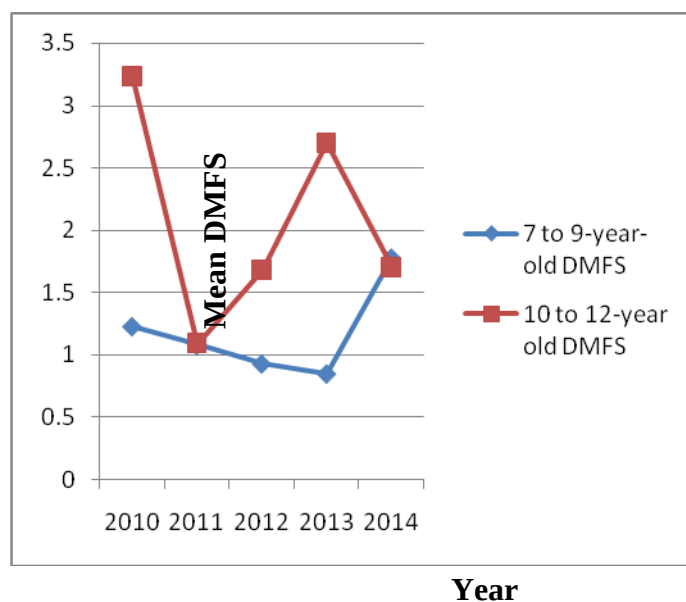


Figure3. Time trend analysis of Mean DMFS and dmfs in different age groups from 2010 to 2014.

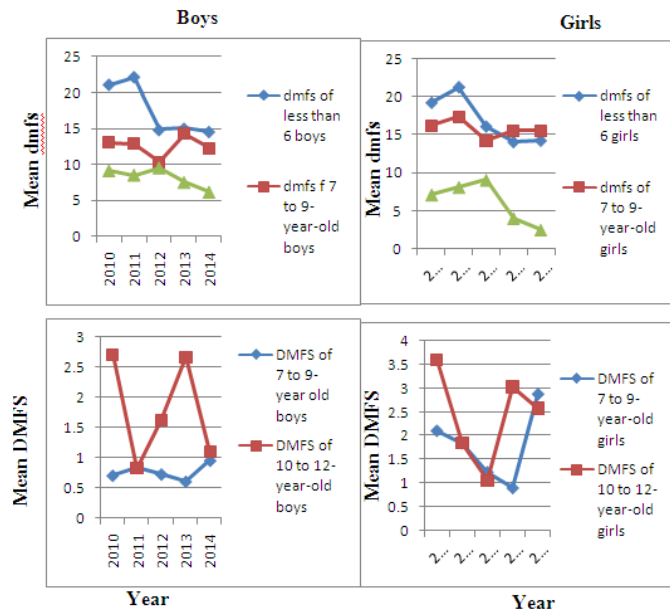


Figure4. Sex-Specific time trend analysis of Mean DMFS and dmfs in different age groups from 2010 to 2013.

Overall	Mean DMFS	Mean dmfs	DMFS=0	Boys	Mean DMFS	Mean dmfs	Girls	Mean DMFS	Mean dmfs
2010	1.33	15.02	66.4		0.54	16.10		2.08	14.00
2011	1.01	15.88	72.2		0.63	14.57		1.37	17.13
2012	0.57	13.12	84.3		0.45	12.43		0.68	13.77
2013	0.71	13.41	79.6		0.45	13.84		0.95	13.01
2014	0.89	12.58	74.9		0.62	11.84		1.15	13.29