Caries Prevalence and Treatment Needs of 12-Year-Old Children in the Islamic Republic of Iran

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Key Words

Dental caries • Caries prevalence • Epidemiology • Twelve-year-old children • Socio-economic status • Iran

Abstract

Objective: To assess the prevalence of dental caries and treatment needs of 12-year-old children living in Teheran and a rural area surrounding Esfahan. **Subjects and Methods:** A total of 1,102 pupils were examined clinically for caries according to WHO criteria. One calibrated dentist examined all children. **Results:** Of the children studied, 63.8% had sound permanent dentition, 9.9% had filled teeth and 26.3% needed treatment. The mean DMFT value found was 0.77 (DFS: 1.19). The D component was 58.7%, the M component 3.4% and the F component 37.9%. The levels of caries experience varied according to the child's residence. The teeth of children living in the rural area (mean DMFT: 0.38) were significantly less affected than those of children living in Teheran (mean DMFT: 1.1). In the capital city of Teheran, considerable differences related to social status were observed. The lowest DMFT values (0.74) were found in southern Teheran where the poorest people live. The highest caries experience was found in the middle-class social stratum. **Conclusion:** The results indicate that caries prevalence among 12-year-old children in the Islamic Republic of Iran is as low as in the developed countries of central Europe.

Introduction

The caries status of a number of Middle Eastern countries has been the subject of previous, generally small, investigations [1–5]. In the Islamic Republic of Iran only a few surveys concerning dental health had previously been made, and these only published a part of their data [6–9]. The aim of this study was to assess the prevalence of dental caries and the treatment needs of 12-year-old children living in Teheran, the capital of Iran, and in a rural area surrounding Esfahan. The relationship between caries experience and socio-demographic status was given special attention.

Subjects and Methods

Sample

The study was conducted from February to March 1999. It was approved by the Ministry of Health and the Ministry of Culture gave official permission to conduct the examinations. Subjects were identified from class lists supplied by the Ministry of Education.

Representative samples of 12-year-old children from Teheran and villages near Esfahan were examined. Both in Teheran as well as in the region around Esfahan, the samples were chosen randomly from the school lists provided by the official offices.

In the process, we assigned the Teheran pupils to various levels of social status depending on the location of their school. Group 1 comprised schools in the northern and the middle part of Teheran and represent the highest socioeconomic status. Pupils allocated to group 2 visited schools in the north-eastern part of the town and

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Table 1. Caries experience in Iranian 12-year-olds

Region	Total	Mean DMFT	95% CI	Mean DFS	95% CI	Caries free %	Children with decayed surfaces, %	Children with filled surfaces %
Teheran	754	1.10 (1.50)	0.99; 1.20	1.59 (2.59)	1.41; 1.78	52.3	34.6	13.1
Villages near Esfahan	348	0.38 (0.82)	0.29; 0.46	0.70 (1.73)	0.52; 0.89	77.3	16.7	6.0
		p < 0.001		p < 0.001				

Figure in parentheses are standard deviations; CI = confidence interval.

Table 2. Mean DMFT and DFS values in Teheran depending on socioeconomic status (SES)

	Total	Mean DMFT	95% CI	Mean DFS	95% CI
High SES	322	1.14 (1.49)	0.97; 1.30	1.60 (2.30)	1.34; 1.85
Medium SES	138	1.76 (1.92)	1.43; 2.08	2.53 (3.39)	1.96; 3.10
Low SES	294	0.74 (1.14)	0.61; 0.87	1.11 (2.30)	0.85; 1.37

Figures in parentheses are standard deviations; CI = confidence interval.

represent the middle class and group 3 consisted of children in the schools in the southern area of Teheran. They represent the lowest social class.

In Teheran, two boys' and two girls' schools were chosen by lot from each of level 1 and level 3, and one boys' school and one girls' school from level 2. Thus a total of five boys' and five girls' schools representing the various socioeconomic classes and distributed from north to south were selected. From each of these schools, 70–80 pupils were chosen by lot for examination.

From the list of schools in the villages surrounding Esfahan, seven schools were randomly chosen in which we examined all 12-year-old children. No differences between the socioeconomic status were made in this region.

The sample consisted of 1,102 pupils: 754 children from Teheran and 348 from villages in the rural area near Esfahan.

Clinical Examination

All children were examined by one calibrated dentist (M.M.) using the WHO system for caries diagnosis. The examination chairs were placed in the rooms in such a way as to ensure an adequate source of natural light while at the same time avoiding direct sunlight. Teeth were examined without drying, using a No. 4 plane mouth mirror and a dental explorer. Caries diagnosis was based solely on clinical examination, and only caries at or beyond the dentinal level was recorded. DMFT and DFS values were recorded. The intra-examiner reproducibility was calculated on the basis of duplicate examinations of a group of children and yielded a kappa value of 0.978.

Data Management

The findings were coded on special survey sheets, later transferred to a computer and processed using a special analysis pro-

gram. The statistical evaluation was performed by means of the software package SPSS, version 11.5. Non-parametric tests (Mann-Whitney U test) were performed to compare the mean caries scores of various subgroups. The level of significance was set at $p < 0.05$.

Estimation of Fluoride Content in Drinking Water

According to the Iranian Ministry of Agriculture and Water, drinking water is not fluoridated. An analysis of water samples from Teheran and Esfahan revealed 0.21 ppm (mg F/l) and 0.47 ppm (mg F/l), respectively.

Results

Of the children studied, 63.8% were clinically caries free (DMFT = 0), 9.9% had filled teeth and 26.3% needed treatment. The mean DMFT value found was 0.77 (DFS: 1.19). The D component was 58.7%, the M component 3.4% and the F component 37.9%. The level of caries experience varied according to the child's place of residence. Children living in the rural area (mean DMFT: 0.38, mean DFS: 0.7) had significantly fewer affected teeth/surfaces than children living in Teheran (mean DMFT: 1.10, mean DFS: 1.59) (table 1). In Teheran, considerable differences related to social status were observed (table 2). In the high-class social strata the mean DMFT value found (1.14) was significantly ($p = 0.001$) lower than the DMFT value in the middle socio-economic strata (1.76),

Fig. 1. Frequency distribution (%) of DMFT values in Teheran according to socioeconomic status (SES).

Table 3. Breakdown of D, M and F components in Teheran in relation to diseased teeth

	D	M	F
High SES	158 (43.0)	5 (1.4)	205 (55.6)
Medium SES	143 (58.9)	9 (3.7)	91 (37.4)
Low SES	187 (85.8)	5 (2.3)	26 (11.9)

Figure in parentheses are percentages.

which showed the highest caries experience in Teheran. The lowest DMFT value (0.74) was found in southern Teheran where the poorest people live and was significantly lower than the values found in the high SES ($p = 0.003$) and in the medium SES ($p < 0.001$). The frequency distribution (%) of DMFT values in Teheran among the three different socio-economic strata is shown in figure 1.

The distribution of the D, M and F components in the various social strata in Teheran is given in table 3. Teeth extracted due to caries were extremely rare in all three social strata. The D and F components, however, differed considerably between the various social strata. The largest proportion of untreated carious teeth was found among children of low socioeconomic status (85.8%), who also had the lowest number of filled teeth (11.9%). Children of high socioeconomic status had the largest proportion of filled teeth (55.6%).

Discussion

The mean DMFT observed in this study, 0.77, shows that caries prevalence in 12-year-old Iranians currently falls within the 'very low' category (DMFT < 1.2) as defined by the World Health Organization [10], and is within the global goal of three or less decayed, missing or filled teeth at age 12 by the year 2000.

Although caries experience is low, considerable differences between the social strata were observed.

As far as socioeconomic status was concerned, there are great differences between the north and the south of the city of Teheran. This is why we were compelled to assign the Teheran pupils to three different social strata according to their place of residence. The sociological instruments used in Western countries to determine socioeconomic status could not be applied to Iran.

Several studies have been conducted on the connection between oral hygiene and social status in industrialized countries. These studies all showed increased caries experience among the lower social classes [11–13].

In some developing and emerging nations, however, this situation is reversed. The caries experience in those countries is commonly higher in children of high socioeconomic status [14–17].

The results of the present study confirm this trend. This can perhaps be explained as follows: the upper classes can regularly afford sweets and beverages sweetened with sugar. This is at least partially offset by regular oral hygiene, in particular, the use of fluoridated toothpaste. There is only a limited range of oral hygiene products on sale in Iran. As a rule, Iranian children therefore use adult toothpaste, which has a higher fluoride content.

By contrast, the middle class can usually afford foodstuffs containing sugar, although awareness of oral hygiene is substantially lower in this class. It may be that not all children in this sample used fluoridated toothpaste, so that no topical fluoridation was performed. The lower class, however, is only rarely able to afford to buy or consume foodstuffs containing sugar. Since people in this socioeconomic stratum cannot afford beverages sweetened with sugar (soft drinks), they primarily drink tap water and black tea.

The fact that all social strata and age groups in Iran drink black tea along with their tap water could help explain the low caries prevalence in the population. A series of tests by Zhang and Kashket [18], for instance, proved that black tea inhibits up to 90% of the amylases in the oral cavity. The tannin contained in tea inhibits both salivary amylase as well as streptococcal amylase. The con-

sequence is that starch breakdown is inhibited, thus giving rise to fewer low molecular weight carbohydrates that could provide the bacteria with a substrate [18].

Fluoridated table salt is not common in Iran, and is only rarely obtainable in special import stores. We found its market share to be less than 1%. Hence there was no systemic fluoridation in this way.

The breakdown of specific DMF components in table 3 shows that the D and F components are differently distributed in the different social strata. Although people of low socioeconomic status exhibit the lowest DMFT scores, this is also the group with the highest number of carious DMF teeth and only 11.9% are provided with a filling. This trend is substantiated by a national study conducted in Iran in 1998–1999 [19] which also showed that children from poor and low-income families have a larger number of ruined teeth. This could possibly be because these children do not have ready access to oral health services, or because their parents are unable to pay for dental treatment.

Various studies have shown that caries experience rises as people live closer to a city [20–23]. Our results confirm this trend. This may well be explained by the fact that they have easier access to sugar [24–26]. Moreover, cities generally also tend to be the only places where a large selection of Western products (such as chocolate or soft drinks) can be found (and at high prices). In regions where diets are traditional and sugar consumption is low, dental caries tend to be less prevalent [27]. The teeth of populations which obtain their nourishment from a diet of natural foods requiring more strenuous chewing exhibit less damage [28].

The lower rate of decay experience in rural communities may also be due to the higher fluoride level in drinking water. A study conducted in Saudi Arabia found that ‘among the primary schoolchildren there was a statistically significant difference in mean dmft scores at various fluoride levels of drinking water’ [29].

To what extent is the consumption of fluoride in food of significance to the low prevalence of caries? To obtain accurate information, comprehensive data on children’s dietary habits must be collected. A study done in 1999 calculated the concentrations of fluoride in various food groups in an Iranian province [30]. The same group of authors then studied the sources of dietary fluoride intake in 4-year-old children residing in areas where the fluoride content of the drinking water differed [31]. They discovered that, depending on the levels of fluoride in the water, the mean dietary fluoride intake was between 413 and 3,472 µg/day. Drinks provided 72–87% of dietary fluo-

ride. Tea was an important source of dietary fluoride. The study revealed that 80% of Iranian children drink tea routinely. Therefore, tea can contribute substantially to total fluoride intake. As already mentioned above, drinking black tea could well be the reason for this lower rate of caries experience.

Another important reason for the generally low DMFT scores in Iran could also be related to the areas on which the government has been focusing its efforts. The government has increasingly been promoting medical and dental care for the population and is in particular attempting to improve children’s health by having doctors and dentists make regular visits to schools.

In the course of these developments, dental care has improved decisively. While there were 15,000 residents per dentist in 1990, this figure was only 5,500 in 2000 [32]. However, many Iranians have no health insurance. As a rule, visits to doctors and dentists must be paid for in cash. As a result, people with low incomes are only rarely able to take advantage of professional dental care.

Conclusions

The state of 12-year-old school children’s caries experience in Iran can be assessed as surprisingly good compared with most developing countries.

Despite the good results, it is necessary to implement programs to maintain the low caries level, or even decrease it. Further national surveys are needed to assess the caries prevalence and treatment needs and to monitor potential oral health programs.

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