

Oral health behaviours in relation to caries and gingivitis in primary-school children in Tehran, 2008

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سلوكيات صحة الفم ذات العلاقة بنخر الأسنان والتهاب اللثة بين أطفال المدارس الابتدائية في طهران، 2008

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الخلاصة: تهدف هذه الدراسة المستعرضة إلى التعرف على معدلات انتشار نخر الأسنان والنخر الشديد والتهاب اللثة بين أطفال المدارس الابتدائية في طهران من أجل تحليل العلاقة بين عادات صحة الفم ومعدل انتشار الأمراض المنافية لصحة الفم. وقد جُمع الباحثون المعطيات حول عادات صحة الفم من 1271 طفلاً من المدارس الابتدائية في طهران (637 طفلاً و634 طفلة) تتراوح أعمارهم بين 9 و13 عاماً. وأجرى الباحثون الفحوص السريرية للتعرف على منسب الأسنان المصابة بالنخر أو الساقطة أو المحشوة ووجود التهاب اللثة. وقد كان المنسب مساوياً أو أكثر من (1) لدى 83.3% من الأطفال، ويساوي أو أكثر من (4) لدى 55.5% منهم وكان لدى 87.7% منهم موضع واحد أو أكثر من التهاب اللثة. وقد اقتصر زيارات طبيب الأسنان لدى 48.2% من الأطفال على ألم الأسنان، وكان عدم اعتقاد الآباء في أهمية صحة الفم هو السبب الأكثر شيوعاً ($P \leq 0.05$). وقد كان لمصدر التثقيف بصحة الفم الارتباط الأقوى مع النخر الشديد في الأسنان (نسبة الأرجحية 2.35، فاصلة الثقة 95، تتراوح بين 1.80 – 2.60؛ وكان تواتر استخدام الخيوط لتنظيف الأسنان هو أقوى عامل منبئ مرتبط بالتهاب اللثة (نسبة الأرجحية 3.51، فترة الثقة 95، تتراوح بين 1.46 – 8.44).

ABSTRACT The objectives of this cross-sectional study were to determine the prevalence of caries, severe caries and gingivitis in Tehran primary-school children and to analyse the relationship between children's oral hygiene habits and prevalence of these oral health diseases. Data were collected on the oral hygiene habits of 1271 Tehran schoolchildren (637 boys, 634 girls) aged 9–13 years. Clinical examinations were performed to determine the decayed, missed and filled teeth (DMFT) and the presence of gingivitis. Total DMFT ≥ 1 was observed in 83.3% of children; 55.5% had tDMFT ≥ 4 and 87.7% had ≥ 1 site affected by gingivitis. Dental visits of 48.2% of children were limited to toothache occasions and parents' lack of belief in the importance of oral health was the most commonly cited reason ($P \leq 0.05$). The source of oral health education had the strongest independent association with severe dental caries (OR = 2.35; 95% CI: 1.80–2.60); dental flossing frequency was the strongest predicting factor correlated with gingivitis (OR = 3.51; CI: 1.46–8.44).

Comportements en santé bucco-dentaire associés aux caries et aux gingivites chez des enfants du primaire à Téhéran en 2008

RÉSUMÉ Les objectifs de la présente étude transversale étaient de déterminer la prévalence des caries, des caries sévères et des gingivites chez des enfants du primaire à Téhéran et d'analyser la relation entre les habitudes d'hygiène bucco-dentaire des enfants et la prévalence de ces maladies bucco-dentaires. Des données sur les habitudes d'hygiène bucco-dentaire de 1 271 écoliers de Téhéran (637 garçons, 634 filles) âgés de 9 à 13 ans ont été recueillies. Des examens cliniques ont été réalisés afin de repérer les dents cariées, absentes ou obturées (CAO) et la présence de gingivite. L'indice CAO global était supérieur ou égal à 1 chez 83,3 % des enfants, supérieur ou égal à 4 chez 55,5 % des enfants, et 87,7 % d'entre eux avaient au moins un site affecté par une gingivite. Pour 48,2 % des enfants, les visites chez le dentiste se bornaient à la prise en charge des douleurs dentaires. La méconnaissance des parents sur l'importance de la santé bucco-dentaire était la raison la plus fréquemment citée ($P \leq 0,05$). La source de l'éducation bucco-dentaire était le facteur indépendant le plus souvent associé aux caries dentaires sévères (OR = 2,35 ; IC à 95 % : 1,80–2,60) ; la fréquence de l'utilisation du fil dentaire était le facteur prédictif le plus important corrélé à une gingivite (OR = 3,51 ; IC : 1,46–8,44).

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Introduction

Dental caries is one of the commonest chronic diseases with a varying occurrence pattern at a global level [1]. In most developed countries, the occurrence of dental caries is showing a declining rate in children [2]. This improvement can mainly be attributed to water fluoridation, oral health awareness, lower frequency of cariogenic food/drink intake and implementation of preventive programmes [2].

Despite the declining rate of caries occurrence in developed countries [2], surveys still suggest a high prevalence of this disease in Middle-Eastern children [3,4]. Studies carried out in this region have shown the rate of caries experience ranging from 62% to 74.8% for school-children [3,4].

The mean decayed, missing and filled tooth surfaces (DMFT) index in Iranian primary-school children was reported to be 3.54 in 2001 [5]. This was increased to 4.2 [standard deviation (SD) 2.9] in boys and 3.4 (SD 2.6) in girls in a 2007 study [6].

Gingivitis is defined as reversible inflammation of gingival tissues characterized by swelling, bleeding, change in normal colour, and often sensitivity and tenderness [7]. The role of poor oral hygiene and dental plaque in gingivitis occurrence has been well established [7]. In contrast to many developed countries [8], high prevalence of gingivitis has been reported in Iranian children [9]. This has also been seen in Saudi Arabian studies investigating prevalence of gingivitis in children [10,11].

Attempts have been made in a number of countries to explain the association between oral hygiene behaviours and oral health diseases in schoolchildren [11,12]. While such data would be invaluable in school-based oral health programmes, there appears to be no information available about Iranian children's oral hygiene behaviour and its relationship with oral health diseases. Therefore the aims of the present study

were to evaluate the prevalence of the 2 commonest oral diseases (caries and gingivitis) in primary-school children and to analyse the relationship between oral health care habits of primary-school children and prevalence of caries and gingivitis.

Method

Population and sampling

The study was performed on 9–13-year-old children studying in public primary schools in Tehran in 2008. Ethical approval for the study was obtained from the ethics committee of Shahid Beheshti University and the Ministry of Education. Sixteen primary schools in Tehran city were selected using 2-stage cluster random sampling. In the primary sampling stage, we selected 4 districts of Tehran city to be representative of urban Tehran primary schools. We contacted the responsible authorities of the Ministry of Education in each district to obtain their approval. At the time of study all schools in Tehran were segregated. Lists of primary schools for boys and girls were prepared for each district. Two male primary schools and 2 female primary schools in each district were then chosen randomly, making up an overall total of 16 schools.

After obtaining the consent of the school managers for participation in our survey, they were asked to distribute an informed consent form to parents of all the 4th and 5th grade students. The parents were given a week to complete the forms. Of the 1632 potential participants, 79 parents contacted us using the phone number provided on the consent form and asked for further explanation about the nature and purpose of the study. The number of returned forms was 1299. However, 9 of the children refused to participate, and 19 were excluded because they had filled out the questionnaires either improperly or left some items unanswered. Thus, our final study population was 1271 (577 boys and 694 girls).

Oral health assessment:

Dental examinations were carried out in the classrooms under natural light and using disposable, plain, mouth mirrors and World Health Organization (WHO) Community Periodontal Index (CPI) probes. A single dentist, whose caries and gingivitis diagnoses were compared to those of an expert (kappa statistics for intra-examiner variability = 0.89), conducted the clinical examinations. DMFT was calculated according to WHO criteria [13]. Lesions were diagnosed as dental caries when a carious cavity was present on visualization. If there was any doubt, the CPI probe was used to explore the surface. The surface was considered sound unless the probe point entered the cavity. Pits or fissures where the probe was caught were recorded only when there was additional visual evidence. No oral radiograph was taken and incipient caries were not recorded. The Löe and Silness gingival index was used to score gingivitis [14] on 6 surfaces (buccal surfaces of 16, 11, 26, 31, 36 and 41). Gingivitis was then computed as the number of affected sites. The children participating in the study were asked to complete an oral health questionnaire including multiple choice questions about the frequency of using dental floss, brushing and visiting a dentist. This questionnaire was designed based on a previous study [15]. It was translated into Farsi and back translated to check for accuracy. The translated questionnaire was piloted on a sample of 35 schoolchildren and the wording was modified slightly accordingly. We also asked the participants about the form of topical fluoride they used and how they applied it. Questions about other oral health habits were also included. The questionnaire was prepared in Farsi and tested in a pilot study on 35 children who were not part of the main investigation. Where necessary, modifications were made to the questionnaire before the commencement of the main study.

All participants attended a 30-minute education session about "oral health and food choice" which was given after the examinations and the collection of the questionnaires.

Statistical analysis

All data were analysed and processed using SPSS, version 16.0. To test the difference between several means per category in each independent variable, we performed 1-way analysis of variance (ANOVA). P -value ≤ 0.05 was considered significant.

To assess the association between the 3 outcomes (presence of dental caries, presence of severe caries, and gingivitis) and the independent variable (oral health behaviours) the chi-squared test and Fisher's exact test were administered. All 3 outcomes were defined as dichotomous variables and children with more than 4 untreated decayed teeth were classed as having severe caries. Backward stepwise logistic regression was then used to determine variables that had an independent effect on the presence of the 3 outcomes and odds ratios were used to describe the impact of oral health behaviours on dental caries, severe caries and gingivitis.

Results

A total of 1271 primary-school children, 637 boys and 634 girls, aged 9–13 years

were included in the study. Mean age was 11.0 (SD 1.4) years. Prevalence of dental caries and the mean DMFT of the primary and permanent teeth among the children are presented in Table 1. The overall prevalence of dental caries in primary dentition was 65.9% and the mean dmft was 2.30 (SD 2.42). For the permanent teeth, prevalence of dental caries was 70.2% and mean DMFT was 2.51 (SD 2.14). Mean dmft and caries prevalence decreased with age in the primary dentition, while mean DMFT in the permanent dentition increased with age.

Distribution of dental caries [total (t) DMFT ≥ 1], severe dental caries (tDMFT > 4) and gingivitis in relation to sociodemographic factors and oral hygiene behaviours are presented in Table 2. The proportion of children with tDMFT ≥ 1 was 83.8% (1066 of 1271); 55.5% of these (706 of 1271) had severe dental caries. Almost 90% of the children in our sample had ≥ 1 sites affected with gingivitis. Mean tDMFT among the children was 4.81 (SD 4.21). The proportion of untreated caries in reported tDMFT was 85.14%.

There was a statistically significant difference between the sexes in the proportion of children with caries, severe caries and gingivitis; with girls showing all 3 outcomes more than boys ($P \leq 0.05$) (Table 2).

Slightly less than half the children ($n = 612$) reported that their usual dental visits were limited to occasions when they had toothache (Table 2). Caries ($P \leq 0.05$) and severe caries ($P < 0.001$) experience in these children were significantly high. Accordingly, the last dental visit was mainly a result of having toothache (756; 59.5%). These children had significantly more dental caries ($P < 0.001$) and severe dental caries ($P < 0.03$) compared with their peers. The most common reason for not visiting the dentist was the parents' belief that their children's dental problem was not serious. The next most common reason was the children's own belief that their dental problem was not important. The children whose parents belief had prevented them from visiting the dentist experienced significantly more dental caries ($P < 0.001$) and gingivitis ($P < 0.013$).

Five per cent (5%) of the children reported that they never brushed their teeth; these children had significantly more dental caries ($P < 0.001$), severe caries ($P < 0.001$) and gingivitis ($P < 0.001$) than others (Table 2).

Around half the children (47.52%) reported that their school health educators had taught them how to brush (Table 2); in contrast only 10.62% had been taught to brush by their dentist. Children who learned how to brush from both their dentist and their health

Table 1 Prevalence of gingivitis and caries and mean dmft/DMFT in the primary and permanent dentition among Tehran schoolchildren aged 9–13 years, 2008

Age (years)	No.	Primary dentition ^{a,c} (%)	dmft Mean (SD)	Permanent dentition ^{b,c} (%)	DMFT Mean (SD)	Gingivitis ^c (%)
9	246	82.9	3.32 (3.10)	60.1	2.26 (2.10)	85.3
10	268	70.9	2.80 (2.61)	62.9	2.40 (2.60)	81.3
11	240	65.2	2.40 (2.89)	66.1	2.41 (2.21)	91.2
12	270	59.5	1.60 (1.67)	73.0	2.86 (2.50)	88.5
13	247	51.2	1.43 (1.84)	89.6	3.60 (1.26)	92.7
All	1271	65.9	2.30 (2.42)	70.2	2.70 (2.14)	87.7

^aPrevalence of caries (decayed, extracted due to caries, and filled primary teeth).

^bPrevalence of caries (decayed, missing, and filled permanent teeth).

^cStatistically significant between age groups ($P \leq 0.05$).

dmft/DMFT = decayed, missing and filled teeth; SD = standard deviation.

Table 2 Distribution of caries, severe caries and gingivitis among Tehran schoolchildren aged 9–13 years according to age, sex and oral hygiene behaviour, 2008

Factor	Total No.	Caries (tDMFT ≥ 1)			Severe caries (tDMFT > 4)			Gingivitis		
		No.	%	<i>P</i> ^a	No.	%	<i>P</i> ^a	No.	%	<i>P</i> ^a
Total	1271	1066	83.8		706	55.5		1115	87.7	
Sex										
Male	637	508	79.7	< 0.01*	320	50.3	< 0.01*	554	87.0	0.01*
Female	634	558	88.0		386	61.0		561	88.4	
Age (years)										
9	246	227	92.2	0.01*	110	44.7	0.03*	210	85.3	0.01*
10	268	220	82.0		187	69.7		218	81.3	
11	240	201	83.7		133	55.4		219	91.2	
12	270	217	80.4		120	44.4		239	88.5	
13	247	201	81.3		156	63.1		229	92.7	
No. of visits to dentist										
Once/year	239	196	82.0	0.05*	122	51.0	< 0.01*	191	79.9	0.85
Twice/year	185	142	76.7		97	52.4		162	87.5	
When I have toothache	612	536	87.6		372	60.8		562	91.8	
Never	235	192	81.7		115	48.9		200	85.1	
Reason for last visit to dentist										
Toothache	756	650	85.9	< 0.01*	438	57.9	0.03*	691	91.4	0.80
Check-up	293	244	83.3		155	52.9		239	81.5	
Not visited	222	172	77.4		113	50.9		185	83.3	
Reason for not visiting dentist										
Parents did not think problem was serious enough	329	298	90.5	< 0.01*	200	60.7	0.10	311	94.5	0.01*
I did not think problem was serious enough	324	252	77.7		148	45.6		278	85.8	
Afraid of dentists/ the treatment	144	121	84.0		76	52.8		127	88.1	
Parents did not have time	140	104	74.2		81	57.9		130	92.8	
Parents do not know any dentist	135	119	88.1		74	54.8		119	88.1	
Parents do not have money	103	92	89.3		69	66.9		91	88.3	
None	58	44	75.8		32	55.1		28	48.2	
All of the above	38	36	94.7		26	68.4		31	81.5	
Frequency of tooth brushing										
Never	64	62	96.8	< 0.01*	60	93.7	< 0.01*	60	93.7	< 0.01*
2–3 times/ month	78	68	87.1		48	61.5		61	78.2	
Once a week	147	139	94.5		118	80.3		131	89.1	
2–3 times/week	270	235	87.0		169	62.5		248	91.8	
Once/day	325	249	76.6		139	42.7		303	93.2	
2+ times/day	387	313	80.8		172	44.4		312	80.6	

Table 2 Distribution of caries, severe caries and gingivitis among Tehran schoolchildren aged 9–13 years according to age, sex and oral hygiene behaviour, 2008 (*concluded*)

Factor	Total No.	Caries (tDMFT ≥ 1)			Severe caries (tDMFT > 4)			Gingivitis		
		No.	%	<i>P</i> ^a	No.	%	<i>P</i> ^a	No.	%	<i>P</i> ^a
<i>Who taught you how to brush?</i>										
Teacher	138	125	90.5	0.11	84	60.9	0.01*	125	90.5	0.57
Classmate, school manager	14	13	92.9		7	50.0		14	100	
Dentist	158	127	80.3		75	47.5		105	66.4	
School health educator	604	457	75.6		301	49.8		537	88.9	
No-one	307	301	98.0		209	68.0		294	95.7	
Parents	17	15	88.2		14	82.4		16	94.1	
Dentist & school health educator ^b	6	2	33.3		1	16.6		2	33.3	
All but dentist & health educator ^b	27	26	96.2		15	55.5		22	81.4	
<i>Do you use fluoride in any form apart from toothpaste (tablet, mouth rinse)?^c</i>										
No	1123	938	83.5	0.11	642	57.1	0.52	999	88.9	0.17
Yes and right	96	82	85.4		35	36.4		70	72.9	
Yes and wrong	51	46	90.1		29	56.8		46	90.1	
Tablet	1	0	0.0		0	0.0		0	0.0	
<i>Dental flossing frequency</i>										
Never	633	524	82.8	0.06	356	56.2	0.03*	597	94.3	0.02*
2–3 times/month	96	78	81.2		49	51.0		93	96.8	
Once a week	97	80	82.5		41	42.3		91	93.8	
2–3 times/week	37	27	73.0		19	51.4		22	59.4	
Once a day	210	181	86.2		112	53.3		155	73.8	
2+ times/day	85	71	83.5		52	61.2		52	61.1	
Do not know what floss is	113	105	92.9		77	68.1		105	92.9	
<i>Do you use the mouth rinse that school provided?^d</i>										
Yes	189	131	69.3	< 0.01*	44	23.3	< 0.01*	105	55.5	0.06
No	193	151	78.2		74	38.3		163	84.4	
They did not give us this year	286	238	83.2		133	46.5		253	88.4	
It is finished and I did not substitute it	603	546	90.5		455	75.4		594	98.5	
It is finished and I substitute it	0	0	0.0		0	0.0		0	0.0	

*Statistically significant at $P \leq 0.05$.

^aFisher's exact test was administered for the cells with less than 5 participants.

^bThis choice was added due to the children choosing more than one choice in replying to this question.

^cThis question was open ended in order to evaluate the application method of fluoride. The answers were read by a dentist and coded as: No = did not use fluoride in any form other than toothpaste; Yes and right = used fluoride and applied it appropriately; and Yes and wrong = used fluoride but the application method was inappropriate.

^dThe Iranian Ministry of health provides primary schools with mouth rinse each year.

tDMFT = total decayed, missing and filled teeth

educators were less likely to be affected by severe dental caries ($P < 0.001$).

More than two-thirds of our participants (88.3%) did not use fluoride in any form other than toothpaste (Table 2). Half the children (49.9%) did not use dental floss at all and slightly less than half (47.4%) reported they did not substitute the mouth rinse that school had provided them after finishing it.

To identify the factors contributing to the high prevalence of dental caries, severe dental caries and gingivitis, multivariate analysis was performed (Table 3). Six factors emerged as having an independently significant influence on occurrence of dental caries. For both severity of dental caries and gingivitis 4 factors emerged. Children who brushed their teeth once a week had almost 4 times the likelihood of experiencing dental caries and gingivitis compared to those who brushed their teeth ≥ 2 times a day. The strongest association between severe dental caries and contributing factors was with the source of dental health education. Children who were not taught how to brush at all were more than twice as likely to experience severe dental caries as those who had been taught by their dentist. Likewise, children who did not have any idea what dental floss was were more than 3 times more prone to experiencing gingivitis than the other children (Table 3).

Discussion

The fact that more than two-thirds of the children in our study suffered from dental caries and gingivitis, and that slightly more than half had severe dental caries merits consideration. As almost 80% of our study population had at least 1 untreated decayed tooth, D was the major component of the tDMF score, indicating a high proportion of children in need of dental treatment.

We documented a higher mean DMFT compared to what was reported in a 2006 Iranian study on 12-year-olds

[16]. Part of this discrepancy could be ascribed to the different age groups studied, and the children in the 2006 study resided in Tehran and Isfahan, not Tehran only. However our findings are comparable with another 2006 study investigating dental health care in Tehran [17]. These results substantiate the concerns of the Iranian National Ministry of Health about the increasing rate of caries prevalence among Iranian adolescents [18].

The Tehran school-children in our survey had a gingivitis prevalence of 87.7%. This falls between the 73% and 100% which were reported in 2 other major cities in the Islamic Republic of Iran [5,9]. Gingivitis prevalence of our study population was however lower than that seen in Saudi Arabia reported by Al-Banyan [10] and higher than what Guile, al-Shammery and el-Backly reported [11]. Overall, and despite the slight differences in gingivitis prevalence in Middle-Eastern countries, there is still a higher prevalence than in developed countries [8]. This condition necessitates the implementation of immediate therapeutic and preventive policies.

Multivariate analysis suggested that prevalence and severity of caries are affected by a number of oral health factors. Among these, lack of oral health education and infrequent tooth brushing were shown to have the strongest independent associations with severity and prevalence of dental caries, respectively. Also our results further suggested that using dental floss two or more times a day exerted an independent effect on prevention of gingivitis. Tooth brushing mode and frequency have been previously shown to alternatively influence caries severity and prevalence [12,19] while our study suggests lack of oral health education to be the most effective factor in increasing the caries severity. This is simply explainable by knowing that children's mode of brushing is directly under the influence of oral health education [20]. A majority of study population reported they

had learned brushing from their school health educator. In contrast, only 6 children reported that they were taught how to brush both from their dentist and their school health educators. Not surprisingly, among these children caries, severe dental caries and gingivitis prevalence were lowest among all.

Tehran's water supply is not fluoridated, and according to the American Academy of Pediatrics children residing in the communities with non-fluoridated drinking water are recommended to be given routine fluoride supplements [21]. Only 1 child reported using fluoride tablets as an auxiliary source, and slightly more than 5% of the children benefited from using mouthwashes with an appropriate method of application. This is an indicator that oral health education and intervention is necessary to establish correct oral health behaviour in this age group. The need for education is emphasized further when considering that almost 10% of the children did not have any idea about dental floss.

An association between caries severity and age, frequency of dental visits and frequency of brushing, although significant in bivariate analysis, failed to emerge in the multivariate model. Since these variables were proved to be strongly associated with caries prevalence, their effect could have been mediated through the effects of other variables such as sex, nutritional habits and oral health behaviours of the participants. Also, for frequency of dental visits, the effect could be influenced by the fact that the majority of our study population reported their dental visits to be limited to relief care instead of routine care or check-ups. The lack of relationship between sex and gingivitis in multivariate analysis, despite a significant relationship in the bivariate model, could also be the result of other interfering variables such as the difference in commitment to oral health behaviours in the 2 sexes. Other variables such as nutritional habits, frequency of brushing and application of fluoride and mouth

Table 3 Predictors of caries, severe caries and gingivitis from multivariate logistic regression models^a

Factor	Caries (tDMFT ≥ 1) OR (95% CI)	Severe caries (tDMFT > 4) OR (95% CI)	Gingivitis OR (95% CI)
<i>Sex: male/female</i>	1.85 (1.36–2.51)	1.76 (1.31–2.37)	
<i>Age: < 11/≥ 11 (years)</i>	0.672 (0.49–0.91)		0.48 (0.32–0.73)
<i>No. of visits to dentist</i>			
Twice a year/Toothache occasions	1.59 (1.01–2.52)		
Twice a year/Never	1.55 (1.03–2.34)		
<i>Reason for not visiting dentist</i>			
None/Afraid of dentist or treatment	1.34 (1.14–1.86)		0.45 (0.20–0.89)
None/I didn't think my dental trouble was serious enough	1.43 (1.20–1.92)		
<i>Frequency of tooth brushing</i>			
More than twice a day/once a week	2.72 (1.20–6.17)		2.87 (1.06–8.25)
More than twice a day/2–3 times a week			0.02 (0.01–0.15)
<i>Who taught you how to brush</i>			
Dentist/No-one		2.35 (1.80–2.65)	
<i>Frequency of flossing</i>			
More than twice a day/Never		1.82 (1.02–2.51)	
More than twice a day/Don't know what dental floss is			3.51 (1.46–8.44)
<i>Do you use the mouth-rinse that school has provided?</i>			
Yes/No		1.70 (1.03–2.81)	
Yes/They did not give it out this year	1.44 (1.24–3.29)	1.93 (1.21–3.06)	
Yes/It is finished and I did not substitute it	1.73 (1.10–2.72)		

^aResults are shown for variables with statistically significant association with ≥ 1 outcomes in the backward stepwise logistic regression model.
tDMFT = total decayed, missing and filled teeth; CI = confidence interval; OR = odds ratio.

rinse could also serve as overwhelming factors.

During this investigation we faced this limitation that children may over-report their dental hygiene knowledge, attitudes and habits. In order to overcome this problem, we assured the children that their responses were confidential and would not influence their marks. The children had also received a demonstration on how to answer our multiple choice questions even though the 4th and 5th grade students are quite familiar with this type of questions.

This study showed a high prevalence of dental caries and gingivitis. This situation, along with the inadequate dental health services available for children demonstrates the necessity for urgent intervention both in terms of therapeutic and preventive policy makings.

Asking school health educators to have a more active role in dental health education and also educating parents about their children's oral health could be a first step towards oral health promotion. As suggested by Saied-Moallemi et al., better oral self-care among Iranian mothers is reflected in better oral health status and behaviour of their children [22], therefore mothers could potentially play a significant role in children's oral health, which should be taken into account in developing oral health programmes.

International health-promoting school programmes have suggested schools as a unique environment for development of regular oral health practices [23]. The experience of other Middle Eastern countries, e.g. Kuwait [24], should also be taken into account in order to benefit from the school setting

as a platform to promote oral health care.

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