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School-based education to improve oral cleanliness and gingival health in adolescents in Tehran, Iran

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Background. Schools can be an important setting for health education programmes, controlling the growing burden of oral diseases and promoting oral health.

Aim. The aim of this study was to evaluate the short-term effect of school-based educational intervention on oral cleanliness and gingival health of 15-year-olds in Tehran, Iran.

Design. The present cluster randomized trial was based on exposing students ($n = 287$; control, $n = 130$) at public schools to oral health knowledge through a leaflet or a videotape. The outcome was evaluated after 12 weeks. A positive outcome was defined as at minimum a 50% reduction in numbers of teeth with dental plaque or gingival bleeding compared to baseline. Evaluation included percentage changes, number needed to treat (NNT), and students' self-assessment.

Results. At baseline, all students had dental plaque, and 93% had gingival bleeding on at least one index tooth. Positive outcome for oral cleanliness was 58% ($P < 0.001$) of the students in the leaflet group, 37% ($P < 0.001$) in the videotape group, and 10% of controls. Corresponding figures for gingival health were 72% ($P < 0.001$), 64% ($P < 0.001$), and 30%. For oral cleanliness, NNT was 2 in the leaflet and 3 in the videotape group; for gingival bleeding, NNT in both groups was 3. More than two-thirds of the students assessed their oral health behaviours as having improved moderately.

Conclusion. An easy-to-organize and inexpensive school-based intervention can in the short term be effective in improving oral cleanliness and gingival health among adolescents; in particular, in countries with a developing oral health system.

Introduction

Oral health education, an important part of oral health promotion[1], has been considered an essential and basic part of dental health services[2]. It aims to promote oral health principally by providing information to improve awareness leading to adoption of a healthier lifestyle, positive attitudes, and good oral health behaviour[3,4].

Oral health education is a powerful and successful tool in promoting oral health in adolescents[5,6]. Adolescence is an important life stage for establishing adulthood behaviours; during adolescence, young people assume responsibility for learning and maintaining health-related attitudes and behaviour[7,8]. People have different learning styles or characteristics for processing information, feeling, and behaving in any learning situation. Based on differences in learning styles, oral health educational programmes can choose various educational methods[9]. Verbal, written, and audiovisual methods are the three main modes for oral health education[4,10,11]. In communities with a low level of oral hygiene and limited manpower resources, written and audiovisual educational methods can improve oral health status[12].

School provides a perfect setting for health education programmes aiming to control the growing burden of oral diseases and to promote oral health. These can be an efficient and effective way to reach children worldwide and, through them, their families and community members[13]. A school is a logical environment to teach preventive dental health practices[14,15], with school-based oral health education showing positive outcomes for oral cleanliness,

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gingival health, and oral health knowledge both in developing[16] and developed countries[5,17]. In Iran, school-based oral health programmes have only been implemented in primary schools[18]. Public education in Iran consists of 5 years of primary, 3 years of secondary, and 4 years of high school. The age for starting primary school is seven and for high school is 15.

Poor oral hygiene and poor periodontal status characterize the oral health condition of Iranian adolescents[19], similar to that in many developing countries[20]. The objective of this study was to evaluate school-based educational intervention designed to improve oral cleanliness and gingival health of 15-year-olds in Tehran, Iran.

Materials and methods

Participants

The cluster randomized intervention was carried out in 2005 among 15-year-olds in public schools in Tehran, Iran, as part of a study project on adolescents' oral health and behaviour[19]. The multistage random sampling procedure included selection of schools from a list provided by the Head Office for Education of Tehran. For the present intervention, a sample size of 399 participants was chosen, using power calculation (133 per study group, $\alpha = 0.05$, power = 90%, 5–10% attrition, prevalence of > 50% for dental plaque and gingival bleeding) to compare changes in dental plaque and gingival bleeding as two outcome variables. The prevalence for these calculations was estimated from a pilot study and a recent report[21].

In the baseline examination, 17 uni-gender public schools participated. Based on the busy schedules of their schools, three school authorities refused participation in this intervention. In each of the 14 schools, among two to five classes of 15-year-olds, one class was selected randomly. Then, 14 classes ($n = 417$; boys, $n = 205$; girls, $n = 212$) were randomly divided into three groups: a leaflet group (two boys and three girls classes, $n = 148$), a videotape group (three boys and two girls classes, $n = 139$), and a control group (two boys and two girls classes, $n = 130$) (Fig. 1). The study was arranged with school authorities, but students were unaware in advance of the examination and intervention dates. Baseline data collection took place in January 2005 and the final examination 12 weeks later ($n = 388$).

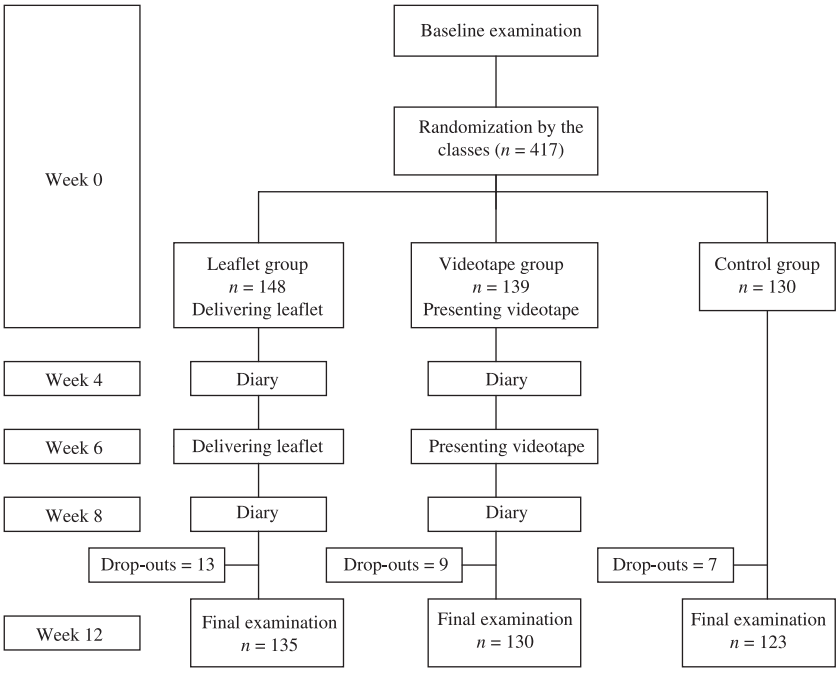

Fig. 1. School-based educational intervention for oral cleanliness and gingival health in 15-year-olds in Tehran, Iran.

Clinical measurements and outcomes

The clinical dental examination was performed on all 417 students during school hours in the health office of the school, with the student in a comfortable chair; a headlamp, a mouth mirror, and a WHO probe were used. Data collection was performed by two trained and calibrated dental examiners. At baseline, one of the authors (R.Y.), and at the follow-up, another experienced dentist blind to the study groups, carried out the clinical examination. Dental plaque (oral cleanliness) and gingival bleeding (gingival health) were recorded for the six index teeth, the same as suggested for recording of the CPI index[22] (16, 11, 26, 36, 31, and 46) at baseline and final examinations. The original plaque index[23] was modified to include these categories: 0 = no plaque, 1 = plaque on the gingival margin only, 2 = plaque elsewhere. The bleeding criterion of the CPI[22] was used for gingival bleeding (0 = no bleeding, 1 = bleeding). For each student, sums of dental plaque scores and gingival bleeding scores were calculated for both baseline and final examination. The theoretical range for sum scores of the dental plaque was 0 to 12, and for gingival bleeding 0 to 6.

Improvement in oral cleanliness and gingival health was first defined as a dichotomy separately for each index tooth. Positive outcomes for oral cleanliness and gingival health per student were defined as showing reduction in, at minimum, 50% of the index teeth that had shown dental plaque or gingival bleeding at baseline.

Educational intervention

Iran has no oral health programmes for this age group in schools or at community level. During the intervention, all students were exposed to same kind of general oral health information available in Iran, in addition to that given in the intervention groups.

The intervention was based on exposing students to oral health knowledge through a leaflet and a videotape designed for this study. The same pictures, dental models, and script were used for producing the leaflet and videotape. Their topics were based on current concepts of recommended oral health prevention[1,16,17] (Table 1). Educational key messages were the same in both materials: the importance of oral health, role of microbial plaque, frequency and methods of proper toothbrushing and flossing, importance of regular dental attendance, a healthy diet, and proper use of fluorides. Both leaflet and videotape emphasized the immediate gains from good oral hygiene. The leaflet and videotape were designed with the assistance of communication experts. Producing the educational materials for this study was inexpensive: for the leaflet 2000 Rials (0.15 €) each and for the videotape 3000 Rials (0.2 €) per student. No

Table 1. Main oral health messages included in leaflet and videotape in a 12-week intervention to improve oral cleanliness and gingival health in Iranian 15-year-olds.

Main subjects	Main messages[1,16,17]
Oral health	The role of healthy teeth and gums in speech, chewing, mouth odour, appearance, fresh breath, aesthetics, general health, and social communication
	Natural teeth can last for a lifetime through careful oral hygiene
Dental plaque	The concept of dental plaque
	Importance of daily removal of dental plaque
Oral hygiene instruction	How to brush and floss the teeth
Dental attendance	Benefits from regular dental visits: early diagnosis of oral and dental diseases, savings in time and money
Diet	Oral health consequences of foods
	Role of sugar consumption in dental caries and systemic diseases like diabetes and obesity
Fluoride	Mechanisms of fluorides in prevention of dental caries
	Regular use of fluorides
	Importance of daily use of fluoridated toothpaste
The recommendations	Regular toothbrushing, daily use of fluoridated toothpaste and dental floss
	Avoidance of and reduction in use of sugary snacks and beverages, especially between main meals
	Regular dental check-ups
	Avoidance of smoking

extra staff were needed for educational interventions because they were carried out in co-operation with school authorities and volunteered teachers.

Leaflet group. The leaflet was pocket size with coloured pictures and illustrations for each topic to maintain the student's attention and interest. It was delivered to the leaflet group twice: at baseline and in the sixth week of the intervention period. After distribution of the leaflets at baseline, about 10 min was allocated for students' reading in class for the first time. This ensured that all students read the leaflet at least once. Motivation for maintaining good oral health behaviour took place twice: at week 4 and week 8 of the intervention period by means of two diaries. These diaries were designed for self-recording of their frequencies of brushing and flossing, and of eating sweet snacks between main meals. Daily actions were recorded during 1 week. The diaries were returned to the teacher after being filled in by students; these served for motivational purposes only.

Videotape group. The videotape was a 17-min film shown in the classroom. It was presented twice, at baseline and in the sixth week of intervention. The motivating diaries, as in the leaflet group, were distributed to the videotape group at weeks 4 and 8.

Control group. The control group underwent the dental examination, but received no educational intervention at all.

Evaluation of intervention

Intervention was evaluated by assessing improvements in oral cleanliness and gingival health in the intervention groups in comparison to the control group. This comparison involved mean and percentage reductions in dental plaque and gingival bleeding. Regarding dental plaque and gingival bleeding, number needed to treat (NNT) was defined separately. For subjective assessment of the intervention, each student filled in a short, self-administered questionnaire after the final examination: for the statement, 'The videotape/leaflet was good material for oral health education' alternative, answers were five: strongly agree, agree, disagree, strongly disagree, I do not know. For further analysis, responses with the last option were excluded ($n = 27$), and the other responses were dichotomized as agree and disagree. The question 'How much improvement in your oral health behaviour occurred after watching the videotape/reading the leaflet?' offered three alternative answers: Little, Moderate, and Very much.

Statistical analysis

Data analysis included those who attended the final dental examination. Evaluation of the statistical significance of the differences in the reduction of plaque and gingival bleeding included a *t*-test and paired *t*-test for the mean, and the chi-squared test for frequencies. A *P* value less than 0.05 denoted statistical significance. NNT was calculated as 1/ARR where ARR = Absolute Risk Reduction.

Ethical considerations

This study was approved by the Ethics Committee and Iran Center for Dental Research of the School of Dentistry, Shaheed Beheshti Medical University. Participation was voluntary, and an informed consent was acquired from each student before the study. No parental consent was required, but the school authorities informed the parents about the upcoming intervention.

Results

At baseline, all students had dental plaque, and 93% had gingival bleeding on at least one index tooth. Mean sum scores for dental plaque were 8.8 (SD 2.6) (boys, 9.2; girls, 8.5) and for gingival bleeding 3.9 (SD 1.8) (boys, 4.2; girls, 3.7), with no differences between the intervention and control groups.

Effects of educational intervention on oral cleanliness

Of all the students, 84% in the leaflet group, 77% in the videotape group, and 41% in the

Table 2. Improvement in oral cleanliness and gingival health after a 12-week intervention among 15-year-olds, by gender (*n* = 388) in Tehran, Iran.

	Leaflet		Videotape		Control	
	Boys *n* = 57	**Girls *n* = 78**	**Boys *n* = 74**	**Girls *n* = 56**	**Boys *n* = 58**	**Girls *n* = 65**
Dental plaque[1]						
Mean baseline (SD)	9.3 (3.0)	8.3 (2.5)	8.6 (2.7)	8.2 (2.5)	9.6 (2.4)	8.7 (2.1)
Mean reduction(SD)	4.2 (3.2)	4.3 (3.0)	4.2 (3.2)	1.5 (2.9)	–0.9 (2.6)	1.4 (2.2)
P value[a]	< 0.001	< 0.001	< 0.001	0.757		
P value[b]	0.911		< 0.001		< 0.001	
Gingival bleeding[2]						
Mean baseline (SD)	4.3 (1.7)	3.8 (1.6)	3.9 (1.9)	4.0 (1.6)	4.2 (1.2)	3.4 (2.0)
Mean reduction(SD)	2.4 (2.1)	2.3 (2.0)	2.2 (2.1)	1.9 (2.0)	–0.1 (2.2)	0.7 (2.2)
P value[a]	< 0.001	< 0.001	< 0.001	0.002		
P value[b]	0.745		0.346		0.048	

Statistical evaluation by *t*-test. *P* values[a] refer to differences between each intervention group and the control group, *P* values[b] refer to differences between genders in reduction shown in each intervention group and the control group.
[1]Sum of plaque scores (0, 1, 2) per six index teeth; maximum = 12.
[2]Sum of bleeding scores (0, 1) per six index teeth; maximum = 6.

Table 3. Oral cleanliness and gingival health during a 12-week intervention in anterior and posterior index teeth, at baseline and final examination among 15-year-olds (*n* = 388) in Tehran, Iran.

	Baseline mean (SD)	**Final examination mean (SD)**	**Percentage change %**	***P* value**
Dental plaque				
Anterior teeth				
Leaflet	2.0 (1.6)	0.6 (1.1)	70	< 0.001
Videotape	1.8 (1.4)	0.8 (1.1)	55	< 0.001
Control	2.2 (1.3)	2.0 (1.5)	9	0.17
Posterior teeth				
Leaflet	6.9 (1.5)	3.9 (2.5)	43	< 0.001
Videotape	6.9 (1.6)	4.7 (2.0)	32	< 0.001
Control	7.0 (1.2)	6.9 (1.5)	1.4	0.38
Gingival bleeding				
Anterior teeth				
Leaflet	0.7 (0.9)	0.4 (0.7)	43	< 0.001
Videotape	0.7 (0.9)	0.2 (0.6)	71	< 0.001
Control	0.9 (0.9)	0.6 (0.8)	33	0.01
Posterior teeth				
Leaflet	3.3 (1.2)	1.2 (1.5)	64	< 0.001
Videotape	3.3 (1.2)	1.7 (1.4)	48	< 0.001
Control	3.0 (1.3)	3.9 (1.2)	30	< 0.001

Statistical evaluation by paired *t*-test. Sum of plaque scores (0, 1, 2) and bleeding scores (0, 1), recorded on six index teeth: two anterior and four posterior teeth.

control group showed improvement in oral cleanliness. In comparison with the control group, reductions in dental plaque were statistically significant, except for girls in the videotape group (Table 2). For all index teeth, the mean sum scores of dental plaque in the leaflet group was 8.8, videotape group 8.4, and control group 9.1 at baseline ($P > 0.05$), and at the end 4.5, 5.5, and 8.9 ($P < 0.05$). Table 3 shows changes in dental plaque scores from baseline to final examination separately for anterior and posterior index teeth. A minimum 50% improvement in oral cleanliness occurred in 58% ($P < 0.001$) of those students in the leaflet group, in 37% ($P < 0.001$) in the videotape group, and in 10% in the control group (Table 4). NNT was two for the leaflet group and three for the videotape group.

Table 4. Improvement[1] in oral cleanliness and gingival health after a 12-week intervention and number needed to treat (NNT) in intervention groups among 15-year-olds (*n* = 388) in Tehran, Iran.

	Leaflet		Videotape		Control	
	n %	NNT	*n* %	NNT	*n* %	*P* value
Dental plaque						
Boys	27 (47)	2	41 (56)	2	4 (7)	< 0.001
Girls	54 (69)	2	10 (18)	10	9 (14)	< 0.001
All	81 (58)	2	51 (37)	3	13 (10)	< 0.001
Gingival bleeding[2]						
Boys	37 (65)	2	49 (67)	2	9 (15)	< 0.001
Girls	61 (78)	3	34 (60)	5	29 (45)	< 0.001
All	98 (72)	3	83 (64)	3	38 (30)	< 0.001

Statistical evaluation by chi-squared test. *P* values refer to differences between each intervention and control group.
[1]At minimum 50% of teeth.
[2]Those with no gingival bleeding at baseline excluded (*n* = 28).

Effects of educational intervention on gingival health

Improvement in gingival health appeared in 79% of the students in both interventional groups, and in 47% in the control group. In comparison with the control group, the reductions in gingival bleeding were significant (Table 2). The mean sum scores of gingival bleeding for the leaflet group were 4.0, videotape group; 3.9; and control group 3.8 at baseline ($P > 0.05$), and at the end 1.6, 1.9, and 3.6 ($P < 0.05$). Table 3 shows changes in gingival bleeding scores from baseline to the end of the intervention separately for anterior and posterior index teeth. A minimum 50% improvement in gingival health appeared in 72% ($P < 0.001$) of those students in the leaflet group, in 64% ($P < 0.001$) of those in the videotape group, and in 30% in the control group (Table 4). NNT was 3 for both leaflet and videotape groups.

Self-assessment of educational intervention

In the intervention groups, 97% of the students assessed the leaflet as a good material for oral health education, with no gender difference. The respective figure for the videotape group was 83% ($P < 0.05$), with a clear gender difference (91% boys vs. 72% girls, $P = 0.004$). Self-assessed improvement in their oral health behaviours was 'little' in 20%, 'moderate' in 54%, and 'very much' in 26% of all students in the leaflet group, with no gender differences. Corresponding improvements in the videotape group were similar (29, 49, and 22%; $P > 0.05$) with higher percentages among boys ($P < 0.05$).

Discussion

This study demonstrates that a school-based, easy-to-organize, inexpensive educational intervention can be effective in improving oral cleanliness and gingival health in 15-year-olds with poor oral hygiene. Moreover, the vast majority of students reported at least moderate self-assessed improvement in their oral health behaviour after the intervention.

According to a communication–behaviour change model[24], oral health educational programmes based on an information persuasion strategy have a positive influence on individuals' knowledge and attitudes. Health messages through educational materials such as leaflets can change individuals' behaviours[9]. In Iran, with its low level of oral hygiene and oral health knowledge, a communication–behaviour approach seems particularly appropriate to improve the oral hygiene of adolescents.

Compared with other educational studies[5,16] and reviews[4,10,25], these improvements in oral cleanliness and gingival health were more obvious. The poor level of oral hygiene of students at baseline[19] and their receiving an educational intervention for the first time may have contributed to this obvious improvement. At baseline, reasons for the poor level of oral hygiene among students may be that no school-based oral health programmes are available for this age group in Iran[18], and no regular dental examinations are provided for adolescents[21]. Furthermore, it can be questioned whether local dental professionals give sufficient priority to preventive care.

In this study, the small NNT for the two intervention groups speaks for the feasibility of this kind of intervention in communities with a similar situation. NNT findings show that school-based educational intervention among adolescents with poor oral hygiene and in communities with a developing oral health system can indeed succeed.

Emphasizing some immediate gains from good oral hygiene[26] (such as fresh breath; clean, white teeth; and attractive appearance) were key aspects for motivating these students to learn and maintain good oral health. In addition, the relationship between good oral health and good general health[27] was demonstrated in this educational material. The relationship between dental caries, obesity, and a sugary diet[28,29] was addressed, as well. These aspects might have had a positive effect on the good results achieved.

In the final examination, improvements in oral cleanliness and gingival health occurred also among girls in the control group, which may indicate a trial effect. Exposing students to a dentist's examination and a questionnaire[30] can have positive effects on their behaviour and oral hygiene. Here, however, the significant improvements in the intervention groups speak for the true effect of the intervention. Significant reduction in plaque and gingival bleeding in both anterior and posterior teeth the intervention groups indicate positive effects for all teeth, but the long-term effects are to be evaluated separately.

People have different learning styles or characteristics for processing information. Based upon differences in learning styles, various educational methods can be effective in oral health educational programmes[9]. Written materials prove less effective than videotapes[11]. Our students in the leaflet group showed more improvement in oral cleanliness and gingival health, however, than did those in the videotape group. Acceptance of a leaflet by adolescents and its stimulation of better oral health behaviour have been reported in a UK study[26]. Similarly, the Iranian students in the leaflet group assessed themselves as having greater improvement in their oral health behaviours than did the students in the videotape group. This may be due to these students being more familiar with traditional learning methods. The leaflet could be read several times and on any occasion, and all students had leaflets for themselves, but the videotape could be viewed on only two occasions.

Boys in the videotape group showed more improvement in their oral cleanliness and gingival health than did girls, a result perhaps related to gender preferences in educational materials found earlier[26] and to socio-cultural factors. In Iran, girls commonly spend time in quiet indoor activities, such as reading, whereas boys may prefer being active with TV or videogames. Moreover, boys usually have less limitation upon outdoor activities in Iranian everyday life. Gender preferences and limitations should be noted when planning school-based oral health interventions. This applies particularly to countries like Iran, in which boys and girls all attend separate schools.

Maintaining any improvement in the oral hygiene of adolescents calls for changes in health policy, health care system, and research. Preventive programmes in schools should be set as a high-priority goal by health policy-makers in Iran. Further research is, however, necessary to establish the long-term benefits of educational interventions.

Conclusion

This study shows that an easy-to-organize and inexpensive school-based intervention can, on a short-term basis, be effective in improving oral cleanliness and gingival health in adolescents. Organizing oral health education in high schools in Iran could lead to improvement in students' oral hygiene to ultimately enhance their oral health. A similar model probably could be applied in other countries with a developing oral health system.

What this paper adds

- For 15-year-olds, the immediate gains from good oral hygiene, such as fresh breath, clean teeth, and attractive appearance, can motivate them to achieve better oral health behaviour.
- In countries with a developing oral health care system, school-based educational intervention can be effective in improving oral cleanliness and gingival health in adolescents with poor oral hygiene.

Why this paper is important to paediatric dentists

- Paediatric dentists should, in their preventive efforts, emphasize the immediate gains from good oral hygiene.

References

1 Daly B, Watt R, Batchelor P, Treasure E. *Essential Dental Public Health*. Oxford: Oxford University Press, 2005: 133–152.
2 Towner EML. The history of dental health education:

a case study of Britain. In: Schou L, Blinkhorn A (eds). *Oral Health Promotion*. Oxford: Oxford Medical Publications, 1993: 1–19.
3 Sheiham A, Watt R. Oral health promotion and policy. In: Murray JJ, Nunn JH, Steele JG (eds). *Prevention of Oral Disease*, 4th edn. Oxford: Oxford University Press, 2003: 241–258.
4 Kay E, Locker D. Is dental health education effective? A systematic review of current evidence. *Community Dent Oral Epidemiol* 1996; **24**: 231–235.
5 Biesbrock AR, Walters PA, Bartizek RD. Initial impact of a national dental education program on the oral health and dental knowledge of children. *J Contemp Dent Pract* 2003; **2**: 1–10.
6 Östberg AL. Adolescents' views of oral health education. A qualitative study. *Acta Odontol Scand* 2005; **63**: 300–307.
7 Honkala S, Honkala E, Rimpelä A, Vikat A. Oral hygiene instructions and dietary sugar advice received by adolescents in 1989 and 1997. *Community Dent Oral Epidemiol* 2002; **30**: 124–132.
8 Åström AN, Samdal O. Time-trends in oral health behaviors among Norwegian adolescents: 1985–97. *Acta Odontol Scand* 2001; **59**: 193–200.
9 Overton Dickinson A. Community oral health education. In: Mason J (ed.). *Concept in Dental Public Health*. Philadelphia, PA: Lippincott Williams and Wilkins, 2005: 139–157.
10 Kay E, Locker D. A systematic review of the effectiveness of health promotion aimed at improving oral health. *Community Dent Health* 1998; **15**: 132–144.
11 Lee A, Rock WP. A comparison between written, verbal, and videotape oral hygiene instruction for patient with fixed appliances. *J Orthod* 2000; **27**: 323–327.
12 Lim LP, Davies WIR, Yuen KW, Ma MH. Comparison of modes of oral hygiene instruction in improving gingival health. *J Clin Periodontol* 1996; **23**: 693–697.
13 World Health Organization. *Oral Health Promotion through Schools. WHO Information Series on School Health. Document 8*. Geneva: WHO, 2003.
14 Flanders RA. Effectiveness of dental health educational programs in schools. *J Am Dent Assoc* 1987; **114**: 239–242.
15 Pine CM. Designing school programmes to be effective vehicles for changing oral hygiene behaviour. *Int Dent J* 2007; **57**: 377–381.
16 Petersen PE, Peng B, Tai B, Bian Z, Fan M. Effect of a school-based oral health education program in Wuhan city, People's Republic of China. *Int Dent J* 2004; **54**: 33–41.
17 Chapman A, Copestake SJ, Duncan K. An oral health education programme based on the National Curriculum. *Int J Paediatr Dent* 2006; **16**: 40–44.
18 Samadzadeh H, Baba Esfahani N, Memari N. *Country Report on Oral Health in I.R of Iran*, 1st edn. Tehran: Ministry of Health, 2000.
19 Yazdani R, Vehkalahti MM, Nouri M, Murtomaa H. Smoking, tooth brushing and oral cleanliness among 15-year-olds in Tehran, Iran. *Oral Health Prev Dent* 2008; **6**: 45–51.
20 Petersen PE. The World Oral Health Report: continuous improvement of oral health in the 21st century – the approach of the WHO Global Oral Health Programme. *Community Dent Oral Epidemiol* 2003; **31**(Suppl. 1): 3–24.
21 Pakshir HR. Oral health in Iran. *Int Dent J* 2004; **54**: 367–372.
22 World Health Organization. *Oral Health Surveys, Basic Methods*, 4th edn. Geneva: WHO, 1997.
23 Silness J, Löe H. Periodontal disease in pregnancy II. Correlation between oral hygiene and periodontal condition. *Acta Odontol Scand* 1964; **22**: 121–135.
24 McGuire WJ. Public communication as a strategy for inducing health promoting behavioural change. *Prev Med* 1984; **13**: 299–319.
25 Hausen H. Oral health promotion reduces plaque and gingival bleeding in the short term. *Evid Based Dent* 2005; **6**: 31.
26 Redmond CA, Hamilton FA, Kay EJ, Worthington HV, Blinkhorn AS. An investigation into the value and relevance of oral health promotion leaflets for young adolescents. *Int Dent J* 2001; **51**: 164–168.
27 Sheiham A, Watt R. The common risk factor approach: a rational basis for promotion oral health. *Community Dent Oral Epidemiol* 2000; **28**: 399–406.
28 Bailleul-Forestier I, Lopes K, Souames M, Azoquy-Levy S, Frelut ML, Boy-Lefevre ML. Caries experience in a severely obese adolescent population. *Int J Paediatr Dent* 2007; **17**: 358–363.
29 Larsson B, Johansson I, Ericson T. Prevalence of caries in adolescents in relation to diet. *Community Dent Oral Epidemiol* 1992; **20**: 133–137.
30 Baranowski T, Allen DD, Masse LC, Wilson M. Does participation in an intervention affect responses on self-care questionnaires? *Health Educ Res* 2006; **21**(Suppl. 1): 98–109.