

Oral Health Education for Improving Oral Health Status of School Children - A Systematic Review

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Background: Oral health education is most widely used in prevention of dental diseases. However, there is uncertainty about the value of these interventions. The primary objective of this review was to evaluate the effectiveness of oral health education among school children.

Methods: The following databases were selected for identification of studies. The Cochrane central register of controlled trials, PubMed, LILACS / BBO, MEDLINE, SCIENCE DIRECT. Studies of at least 3 months duration with clinical evaluation like plaque index, gingival index and DMFT/DMFS index, studies with pre- to post - test design were included for this review. Standardized mean difference is calculated for difference between intervention and control group in plaque score, gingival index scores and DMFT Index values. The meta-analysis was conducted using a random – effects model.

Results: Six studies were included in this review, 4 studies provided data for comparison of plaque and gingival index scores and 2 studies provided data for comparison of DMFT index scores. Results showed interventions were effective in reducing the dental plaque, improved gingival status and decreased DMFT scores of the children.

Conclusion: Oral health education is effective in improving oral health status of school children; data shows that oral hygiene is improved by decrease in plaque and gingival bleeding and also there was a significant decrease in dental caries.

Keywords: Oral health education, school children, dental caries and dental plaque.

I. Introduction

Poor oral health can have a detrimental effect on children's performance in school and their success in later life. Children who suffer from poor oral health are 12 times more likely to have more restricted-activity days including missing school than those who do not ^[1]. More than 50 million hours annually are lost from school due to oral diseases ^[2]. It has been hypothesized that oral health can be improved through health education ^[3], schools provide an ideal setting for promoting oral health it offers an efficient and effective way to reach over 1 billion children worldwide and, through them, families and community members.

The school years cover a period that runs from childhood to adolescence. These are influential stages in people's lives when lifelong sustainable oral health related behaviors, as well as beliefs and attitudes, are being developed. Children are particularly receptive during this period and the earlier the habits are established, the longer lasting the impact. Moreover, the messages can be reinforced regularly throughout the school years. Children may also be equipped with personal skills that enable them to make healthy decisions, to adopt a healthy lifestyle. It was suggested that the sooner oral health related behavior were initiated in life, higher probability for successful long – term maintenance ^[4, 5]. Oral health education is not only directed at reducing disease and injury to the teeth and their supporting structures rather it influences on general health and promotes a feeling of well – being. The aim of this review was to examine the evidence relating the effectiveness of oral health education program for school children. In order that the review could be scientifically defensible and free from bias, a systematic approach was taken. The primary objective of this systematic review is to assess the evidence on the effectiveness of oral health education delivered in the form of group lectures or on individual basis, using audio visual aids, leaflets at schools in improving the oral health status of school children.

The specific objectives are

1. To determine whether there is any difference between gingival index and plaque index after intervention.
2. To determine whether there is any difference between DMFT/DMFS after intervention.

II. Methodology

The following databases are searched for identification of studies The Cochrane central register of controlled trials, PubMed, LILACS / BBO, MEDLINE, SCIENCE DIRECT. Electronic search key words used are 'Oral health education', 'oral health promotion', 'dental health education' and 'community based trials' the participants were 'School children' and 'adolescents' clinical measures like 'dental plaque', 'calculus', 'dental

caries', 'gingival bleeding', 'oral hygiene', 'gingival index', 'oral health index' and 'DMFT index'. Figure 1. Shows the search strategy used in the present review for identification of the relevant studies.

Inclusion criteria:

- School children aged between 9 to 15 years.
- Students, classes or schools that were randomized to receive different programmes or to be control.
- Studies with minimum duration of 3 months and clinical evaluation like plaque index, gingival index and DMFT/DMFS index, studies with pre- to post - test design (randomised controlled trials) and studies with a negative (no intervention) control group

Exclusion criteria:

- Studies aiming to modify diet behaviour as diet assessed through self - reports was not considered as a reliable and valid measure of lifestyle change, particularly in this age group
- Studies targeting at disabled school children with special needs were excluded as these children were considered to be substantially different from healthy school children,
- Studies which included preventive programmes like pit and fissure sealants and topical fluorides for school children and studies with only intervention group were also excluded.

Types of interventions

Oral health education was given using slide projector, plaster models, charts, photo albums, posters, leaflets, pamphlets and lectures the interventions included giving information on structure and functions of teeth, types of dentition, diet and its effect on oral tissues, prevention, clinical manifestations and treatment of dental caries, periodontal diseases and malocclusion, influence of oral health on general health, importance of brushing twice daily and proper tooth brushing technique.

The review author independently carried out the selection of papers on the basis of the title, keywords and abstract, and the decisions about eligibility. The full text of every article considered for inclusion was obtained. Data was extracted independently by the author using a data extraction form. Characteristics relating to participants that were extracted included: number of children in control group and experimental group, Characteristics regarding interventions included various methods used for improving the oral health status of school children, Characteristics regarding outcomes includes plaque index score, gingival index scores and DMFT scores of the school children at baseline and at follow up examination expressed in mean and standard deviation were recorded.

Characteristics of included studies

Helen V. Worthington 2001 ^[6]

Conducted a study in North-West of England among primary school children of age 10 years, the study duration is of about 7 months, schools were the unit of randomization and 17 schools were included in experimental group and 15 schools were included in control group. Intervention includes Oral health education program titled 'my mouth matters' consisted of four hour lessons based on tooth function and appearance, diet and its influences on tooth brushing and also involved participation of parents or caregivers. No health education was given for the control group. A Questionnaire was administered to assess the knowledge and behaviour, Plaque scores were measured at baseline and follow- up examination.

Luo Wei 2007 ^[7]

Conducted a study in China among 12 year old children, the study duration was 3 months, Children were divided into Parental aid group n = 102, Teacher aid group n = 102 and control group n = 103. Oral health education program was conducted to teachers and parents of children in the experimental group; no oral health education program was conducted to children in control group. Debris index, calculus index and gingival index were assessed. Teacher based oral health education group had better improvements in oral health.

P Axleson 1994 ^[8]

Conducted a study in Brazil among 12 to 13 year old children, the study duration was 3 years, Children were randomly divided into Test Group I – n = 79, Test group II – n = 72, and Control group – n = 71. Test group I received comprehensive oral hygiene training program, parents and teachers of the children of this group were also included in the program. Test group II received traditional oral hygiene instructions on an individual basis, control group no intervention was provided. DMFS scores were assessed at baseline and at follow – up examination.

Reza Yazdani 2009^[9]

Conducted a study in Iran among 15 year old children, the study duration was 12 weeks, Children were randomly divided into n = 148 leaflet group, n = 139 videotape group, and n = 130 control group, Oral health education was delivered at baseline and at 6 weeks for the leaflet and videotape groups. Motivation of oral health behaviour took place at week 4 and week 8 of intervention period by two diaries, designed for self – recording their frequencies of brushing and flossing. No intervention was given for the control group. Plaque score and Gingival bleeding status were assessed at baseline and at 12 weeks follow up.

Saied Moellimi 2009^[10]

Conducted a study in Iran among 9 year old children, the study duration was 3 months, Children were randomly divided into Class work group n = 115, parental aid group n = 114, Combined group n = 111 and Control group n = 117. Class work group, intervention consists of seven various illustrative puzzles printed on A4 sheets used as learning tools including oral health messages guiding children to brush twice – daily, a health counsellor provided information on oral health message and guided children in solving puzzle. Parental aid group were given a two page A4 size oral health leaflet and a brushing daily register, leaflet contained information on aetiology and prevention of common oral diseases and their association with general diseases and quality of life. Combined group was given both types of intervention. No intervention was provided for control group. Plaque index and gingival bleeding index were assessed at baseline and at follow up examination.

Van Plaenstein Helderma 1997^[11]

Conducted a study in Tanzania among 9 year old children, the study duration was 36 months, Children were randomly divided into n = 309, experimental group and n = 122, control group. School teachers oral health knowledge were first assessed by an interview and a seminar was organised for teachers regarding oral health care and importance of good oral hygiene for children, later teachers implemented supervised tooth brushing sessions for children. No intervention was given to the control group. Plaque index, Gingival bleeding index, calculus and DMFT were assessed at baseline and at follow up examination.

III. Results

Description of the studies

The review included six studies^[6, 7, 8, 9, 10 and 11]. All the studies were conducted in schools and involved providing interventions to promote oral health status among school children.

Four studies included outcomes measurement using plaque index^[6, 9, 10 and 11]. Four studies included outcomes measurement using gingival index^[7, 9, 10 and 11] and two studies included assessment of dental caries^[8 and 11].

In all the studies, oral health educational intervention was provided in combination with oral health examination. Intervention were provided for the children in experimental group using audio – visual aids, leaflets, lectures conveying message about structure and functions of teeth, importance of oral health to general health, prevention and treatment of dental caries and periodontal diseases and also about importance of brushing twice daily and about proper brushing technique. In all the studies schools or classes or children were the units of randomization. For all the included studies, participants were followed for at least a minimum of 3 months and maximum of up to 3 years.

Report of randomization was clear in five studies^[6, 7, 9, 10 and 11], of which schools were the unit of randomisation in four studies^[6, 7, 10 and 11] and school classes were randomised in one study^[9], In the study by P.Axelsson 1994^[8], allocation concealment was not clear and children were the unit of randomisation. Risk of bias was found to be low in five studies^[6, 7, 9, 10 and 11], Unclear information about the risk of bias in allocation concealment in the study by P.Axelsson 1994^[8].

Interventions in all studies were a team effort involving dentist, school personnel, parents and school children, interventions were primarily directed towards school children.

Statistical software Comprehensive Meta-Analysis was used, given the high heterogeneity present in the studies reported a sensitivity analysis was performed using a random – effects model.

Effects of intervention

All the analyses were conducted following adjustment for cluster sampling method. When the six clinical trials of oral health educational interventions compared to usual care or no contact controls are pooled, a statistically significant difference was observed for all the four studies used in plaque index^[6, 9, 10 and 11] there was a significant reduction in plaque scores after intervention (Table 1 and Figure 2) and for the studies used for assessment of the gingival status three studies showed significant improvement in the gingival health status of children^[7, 10 and 11] and in one study^[9] there was no significant improvement in the gingival health status of the children (Table 2 and Figure 3). There is significant decrease in dental caries after intervention in both the studies^[8 and 11] (Table 3 and Figure 4). Heterogeneity was evident between all the studies.

IV. Discussion

This review reveals that limited published literature exists assessing the impact of oral health educational intervention among school children. However available evidence is consistent with the hypothesis that oral health educational intervention among school children was effective in promoting their oral health. The data was subjected to meta-analysis forest plot drawn showed that oral health education was effective in improving the oral health status of school children. All the four studies showed significant improvement in plaque status of the children in the intervention group before and after intervention [6, 9, 10 and 11] similar to review by Vilma Brukiene and Jolanta 2009 [12]. The overall effect of the intervention may be small, and the review showed improvement in oral health status of children in a short term basis as most of the included studies were of short duration 3 to 7 months [6, 7, 9 and 10]. Only two of the included studies were of longer duration 3 to 4 years [8 and 11], both the studies reported significant decrease in dental caries. Long term studies are required for further assessment of improvement in oral health of school children. Most of the studies reported gain in oral health knowledge though they were not reported in analysis. A major problem encountered with the papers reviewed is that almost none described the costs of the experimental programme. Thus while small improvements in outcome measures could be demonstrated no statement about cost: benefit ratios, or the suitability of the programmes can be made.

A seemingly unequivocal finding from the literature reviewed was that the levels of an individual's knowledge can be improved and that this is relatively easy to do. The results presented in this paper are broadly in agreement with the findings of other recent review by Elizabeth kay and David Locker 1998 [13].

V. Conclusion

Given the small number of trials comparing oral health educational intervention with the control group without any intervention, the effectiveness of dental health education is obvious in improving oral health status of school children. More research is needed to clarify the relative effectiveness of various methods of oral health education.

References

- [1]. US General Accounting Offices. Oral health: Dental Disease Is a Chronic Problem Among Low- Income Populations. Report to Congressional Requesters. Washington, 2000.
- [2]. Gift HC, Reisine ST, Larach DC. The social impact of dental problems and visits. Am J Public Health 1992; 82:1663-8.
- [3]. Louise F. Brown. Research in Dental Health Education and Health Promotion: A review of the literature. Journal of Health Education and Behaviour 1994; 21:83-102.
- [4]. Honkala E. Promotion with children and adolescents. Oral health promotion. Oxford: Oxford University press 1993: 168 – 187.
- [5]. Ingle hart MR, Tedesco LA. The role of family in preventing oral diseases. Disease prevention and oral health promotion 1995:271-306.
- [6]. Worthington HV, Hill KB, Mooney J, Hamilton FA, Blinkhorn AS. A cluster randomized controlled trial of a dental health education program for 10 – year old children. J Public Health Dent 2001; 61: 22-7.
- [7]. Luo W, Hu DY, Fan X. Comparison between the effectiveness of two – oral health programs for middle school students. West China Journal of Stomatology 2007; 25:266-8.
- [8]. P. Axelsson, Y.A.P. Buischi, M.F.Z. Barbosa, R. Karlsson, M.C.B. Prado. The effect of a new Oral Hygiene Training Program on Approximal Caries in 12-15- year old Brazilian Children: Results after three years. Adv Dent Res 1994; 8:278-84.
- [9]. Yazdani R, Vehkalahti MM, Nouri M, Murtomaa H. School – based education to improve oral cleanliness and gingival health in adolescents in Tehran, Iran. Int J Paediatr Dent 2009; 19: 274-81.
- [10]. Saied-Moallemi Z, Virtanen JI, Vehkalahti MM, Tehranchi A, Murtomaa H. School – based intervention to promote pre-adolescents' gingival health: a community trial. Community Dent Oral Epidemiol 2009; 37:518-26.
- [11]. van Palenstein Helderman WH, Munck L, Mushendwa S, van't Hof MA, Mrema FG. Effect evaluation of an oral health education programme in primary schools in Tanzania. Community Dent Oral Epidemiol 1997; 25: 296-300.
- [12]. Brukiene V, Aleksejuniene J. An overview of oral health promotion in adolescents. Int J Paediatr Dent 2009; 19: 163-71.
- [13]. Kay E, Locker D. A systematic review of the effectiveness of health promotion aimed at improving oral health. Community Dent Health 1998; 18:132-144.

Table 1. Influential analysis of plaque index (Random effects model)

Study	Standardised mean difference	Confidence Interval	% Weight (Random)
Helen 2001	0.767	0.535 – 0.998	25.77
Saied 2007	0.364	0.100 – 0.627	23.21
Van 1997	0.702	0.488 – 0.917	27.15
Yazdani 2009	0.848	0.593 – 1.103	23.87

Number of trials combined - 4

Pooled estimates:

Standardised mean difference - 0.675
 95% Confidence interval - 0.482 – 0.869
 Test for overall effect, Z - 6.843
 p - value - 0.0000

Table 2. Influential analysis of gingival index (Random effects model)

Study	Standardised mean difference	Confidence Interval	% Weight (Random)
Luo Wei 2007	1.114	0.820 – 1.408	24.62
Saied 2007	0.837	0.564 – 1.110	24.86
Van 1997	1.183	0.959 – 1.406	25.35
Yazdani 2009	0.000	-0.244 – 0.244	25.16

Number of trials combined - 4

Pooled estimates:

Standardised mean difference - 0.782
 95% Confidence interval - 0.224 – 1.340
 Test for overall effect, Z - 2.749
 p - value - 0.0006

Table 3. Influential analysis of dental caries index (Random effects model)

Study	Standardised mean difference	Confidence Interval	% Weight (Random)
P. Axelsson 1994	4.150	3.582 – 4.719	49.75
Van 1997	0.378	0.167 – 0.589	50.25

Number of trials combined - 2

Pooled estimates:

Standardised mean difference - 2.254
 95% Confidence interval - 0.224 – 1.340
 Test for overall effect, Z - 1.195
 p - value - 0.232

Figure 1. Search Strategy

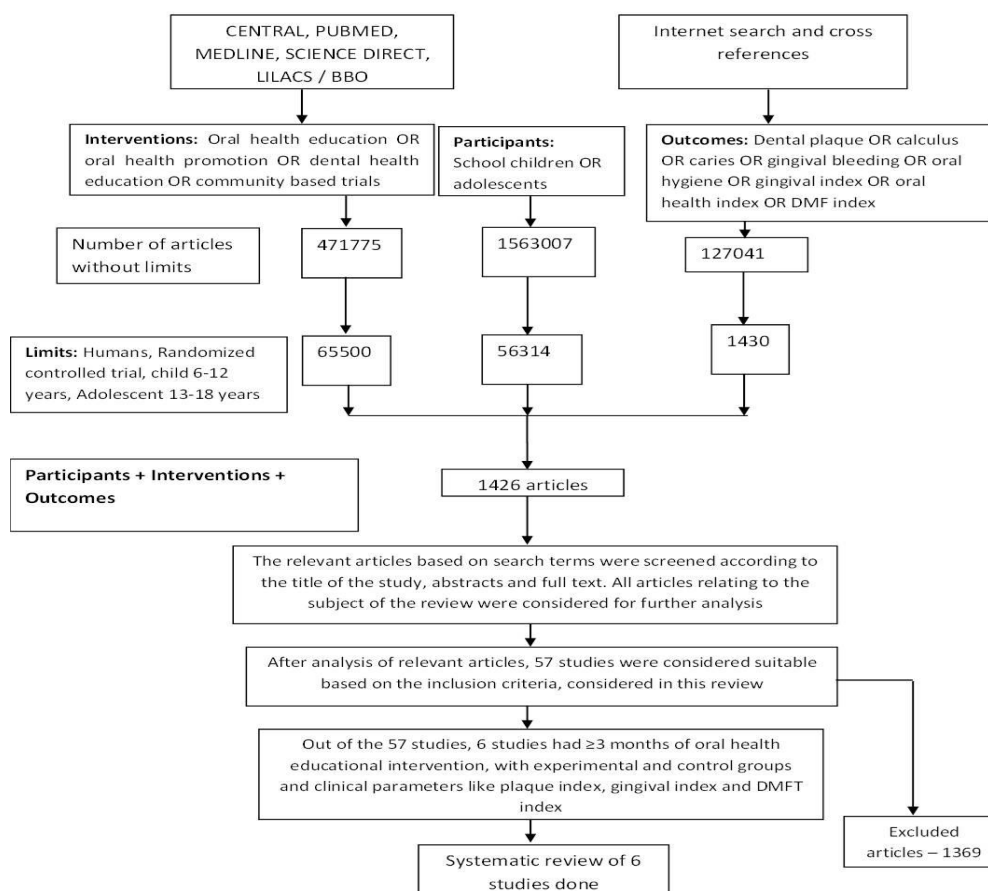
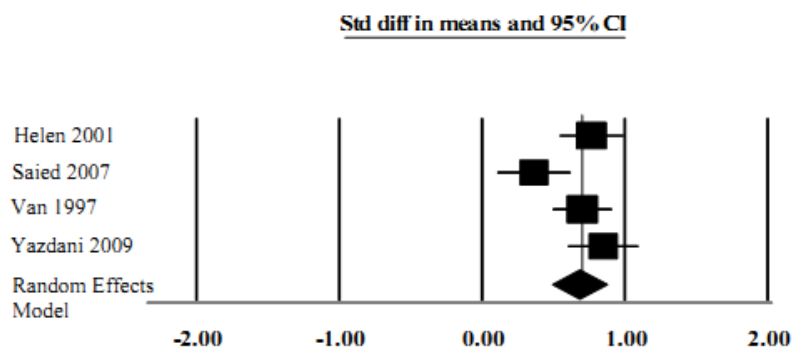
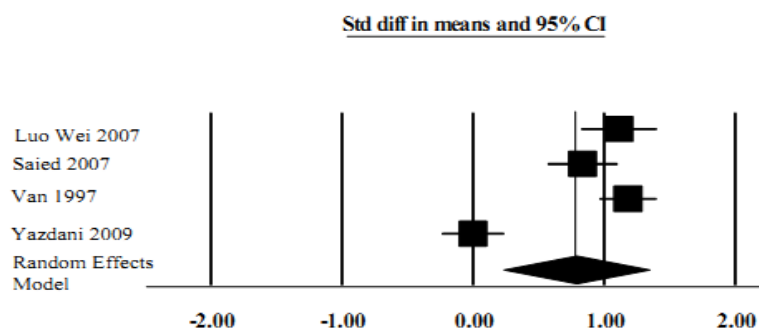


Fig 2: Plaque index comparison Forest Plot



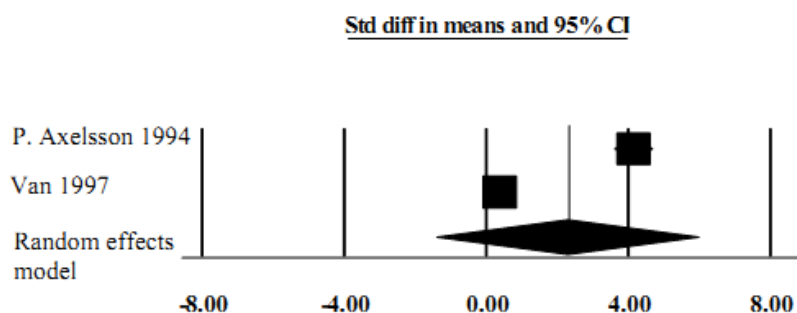
The vertical line extending from the random effects model represents the Standardised mean difference – 0.675.

Fig 3: Gingival Index comparison Forest Plot



The vertical line extending from the random effects model represents the Standardised mean difference – 0.782.

Fig 4: Dental caries index comparison Forest Plot



The vertical line extending from the random effects model represents the standardised mean difference – 2.254