

# Effects of Educational Interventions on Oral Hygiene: A Systematic Review and Meta-Analysis

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## Research article

**Keywords:** Oral Hygiene, Oral Health, Health Promotion, Intervention, Systematic Review, Meta-Analysis

**Posted Date:** March 30th, 2020

**DOI:** <https://doi.org/10.21203/rs.2.15898/v2>

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# Abstract

**Background:** The objective of this study is to evaluate the effects of school based oral health interventions programs on students' oral hygiene, in developing countries through systematic review and meta-analysis.

**Methods:** Our investigation was conducted in electronic databases including MEDLINE Ovid), Embase Ovid, Scopus), Web of Science from 2000 to march 2018. The data were extracted based on a standard data collection form specific to observational studies, and entered into RevMan 2014. Inclusion criteria included individually randomized controlled trials (RCTs) or cluster-RCTs including quasi- experimental studies that were related to oral health interventions. Software RevMan 2014 was used for meta-analysis. A meta-analysis was carried out using random-effects models.

**Results:** Twelve studies of students in this review finally entered the study including five individual RCTs, four cluster-RCTs, and three quasi-experimental studies. The intervention study period ranged from 1 month to 9 month. Interventions described in the studies briefly included oral health education with activities such as lectures, albums, slides, pamphlets, posters, and role playing. Meta-analyses showed a significant difference in knowledge (SMD 3.31, 95% CI 2.52 to 4.11; I<sup>2</sup> = 98; P < 0.001), attitude (SMD 1.99, 95% CI 0. 43 to 3.54; I<sup>2</sup> = 99; P < 0.001), behavior (SMD 4.74, 95% CI 3.70 to 5.77; I<sup>2</sup> = 99; P < 0.001), plaque index (SMD -1.01, 95% CI -1.50 to -0. 51; I<sup>2</sup> = 97; P < 0.001) and Gingival index (SMD 0. 33, 95% CI -0. 36 to 1. 02; I<sup>2</sup> = 98; P = 0.34) for students receiving educational interventions compared to those receiving usual care .

**Discussion:** The systematic review concludes that educational interventions are effective for improving oral health knowledge, attitudes, behaviors, etc., which could potentially lead to improved oral health, reduced oral diseases, and reduced costs from treating oral diseases.

## Introduction

Oral health is a basic component of public health and well-being [1-3]. Poor OH such as dental caries, periodontal disorders and missing tooth are important public health issues around the world given the fact that poor oral hygiene has wide-spreading impacts on overall health and quality of life. Some common diseases include tooth decay (cavities), gum (periodontal) disease, and oral cancer are caused from the direct effect of untreated OH problems [4]. There is a link between poor OH and social-behavioral and environmental factors possibly leading to poor nutrition, absence from work and school, pain and suffering, and increased healthcare costs [5, 6] . According to the Global Burden of Disease Study (2016), at least 3.58 billion people are afflicted with oral diseases at a global scale. In fact, caries of the permanent teeth has been the most common of all the target conditions. The global estimation is that 2.4 billion people are faced with caries of permanent teeth and 486 million children are afflicted with caries of primary teeth[7].

Tooth decay is common in about 50 % of the world's population [8]. The World Health Organization reported in 2015 that most of the adults and schoolchildren experience dental caries and 5%-15% of most populations are affected by severe periodontitis [9].

OH can be improved if certain challenges are overcome. Especially in developing countries these challenges are harsher. Thus, it is essential to improve public health programs globally and to take effective preventive measures against diseases and at the same time to promote OH [10].

OHE programs continue to be promoted and practiced in schools, which implies that the critical evaluation and summarization of that evidence is key to give clinicians, stakeholders and decision-makers the required information about the cost-effectiveness of OH programs which are educational in type [11].

Considering the low cost of these interventions compared to the treatment of oral diseases, it is crucial for public health managers, especially in developing countries, to conduct evidence-based effective preventive measures against diseases while promoting OH [10, 12, 13].

The past decades have witnessed a growing interest in the effectiveness of oral/dental health interventions. Thus, achieving a sound understanding of these studies and examining their effectiveness require systematic reviews. Though there has been systematic reviews with this concern, each has addressed one aspect of the topic of interest [6, 14, 15]. Yet, the present study aims to explore the effectiveness of oral/dental health-related interventions in a particular student population considering all variables with short-term consequences such as awareness, attitude, behaviors such as brushing teeth, flossing and so on as well as long-term consequences such as tooth plaque and gums bleeding. The aim of this study is to evaluate the effects of school based OH interventions programs on students' oral hygiene, in developing countries.

## Methods

### Search methods to select the studies

This systematic review was based on the search strategy developed for MEDLINE Ovid and Embase (Pico), Scopus and Web of Science. The search strategy used a combination of controlled keywords and free-text terms include: ("Student" OR "School Student" OR "Primary school" OR "Secondary school") AND ("Training" OR "Education" OR "Intervention" OR "Program" OR "Health education" OR "Health promotion" OR "Text message" OR "peer education" OR "distance learning" OR "distance education" OR "EHealth") AND ("Dental Health" OR "Oral health" OR "Brushing" OR "Flossing" OR "Dental plaque" OR "DMFT" OR "Oral hygiene" OR "Dental Hygiene" OR "tooth" OR "teeth" OR "Gingival") AND ("Knowledge" OR "attitude" OR "Behavior" OR "Performance" OR "belief" OR "skill" OR "practice").

### Electronic searches

The following electronic databases were searched (2000 to march 2018) (Supplement 1):

- MEDLINE Ovid (see Appendix 1).
- Embase Ovid) (see Appendix 2).
- Scopus (see Appendix 3).
- Web of Science (see Appendix 4).

In addition, search engines such as Google and Google Scholar were also used to identify all potentially eligible publications. We also scanned reference lists of relevant papers to identify additional papers (snowballing). When searching the electronic databases, authors placed English and Persian language of publication.

### **Inclusion criteria**

Individually randomized controlled trials (RCTs) or cluster-RCTs including quasi-experimental studies were used to enhance oral hygiene (dental plaque), associated knowledge, and attitude, performance of students using one or more school-based OHE and/or oral health promotion interventions programs (the case group in comparison with consistent oral hygiene education (the control group). The studies mentioned above must also have been in line with the **Pico** conditions:

**Population:** Studies that have evaluated the primary, middle, and high schools in their communities; Indeed, Male and female students at primary and secondary schools were selected for this study. Most of them were 6-18 years old.

**Intervention:** School-based educational interventions to improve scores on OH variables including knowledge, attitude, behavior, gingivitis, dental plaque and DMFT.

**Comparison:** Studies with groups that got any sort of OHE intervention vs controls (the group had not received any training).

**Outcome:** Studies that assess scores on OH variables including knowledge, attitude, and behaviors such as brushing and flossing that determined by any tools applied in the included studies (e.g. questionnaire or interview), gingivitis, dental plaque and DMFT. It is noteworthy that gingival index measured by gingival scores, Dental plaque measured by plaque scores and DMFT scores (The score of decayed, Missing and filled teeth).

### **Screening, Data extraction**

The search strategy was conducted by two of the review authors (ASM, SD). The first phase was a search in the titles and abstracts and done independently reviewed by two authors. The second phase was marked by a thorough checking through the articles in full-text by both authors independently. The review authors were not blinded to authors of included studies. If disagreement occurred, the two review authors would try to solve it through discussion; otherwise, they would seek consultation with a third review author and finally those articles that were mutually agreed-upon were selected for inclusion. The collected

data included author's name, publication year, country, sample size, frequency for each group, participants, age range, effects, delivery type, language, study design, details of the intervention, outcome measures, and follow-up. Data extraction was done independently by two review authors (AS, SD) by applying a standard survey data collection, which was put into Review Manager 5 Software (RevMan 2014). The extracted data were entered in Excel software 2010 in accordance with the above-mentioned categories. Data was extracted based on the fidelity of the intervention implementation. If, information on the afore-mentioned issues was insufficient, authors gathered additional information through contacting authors of the primary studies. The Cochrane Collaboration tool was applied to evaluate the risk of bias. The risk of bias was assessed in seven specific domains: random sequence generation; allocation concealment; blinding of participants and personal; blinding of outcome assessment; incomplete outcome data; selective reporting and other bias. This was done through the assignment to "low risk of bias," "high risk of bias" or "unclear risk of bias" rulings [16].

## **Statistical analysis**

We used RevMan 2014 for meta-analysis. Before combined analysis, we assessed data heterogeneity among studies. Heterogeneity was evaluated statistically by the authors; it was also quantified among studies included in each analysis using the  $I^2$  statistic. To assess the change of variables, mean difference (MD) was applied and its matching 95% confidence interval (CI) was used if the same tool was used. Moreover, if the used tools were not similar, the standardized mean difference was used (SMD). Measures for continuous data were evaluated as follows: mean change in Plaque Index (pre- and post-intervention phases) and standard deviations; mean change in gingivitis (pre- and post-intervention) and standard deviations.

## **Results**

### **Results of the search**

Based on search strategies carried out by two (ASM, SD) screened 309 abstracts for inclusion, and assessed 37 publications in full text. Finally, 12 Studies had the eligibility criteria. Studies in English and Persian were included in the study.

### **Excluded studies**

We excluded 25 studies: fifteen had no educational component; six included university students; and four assessed no predefined outcomes (Figure 1).

### **Duration of follow-up**

Follow-up for two studies was one month [17, 18], and for six studies ranged from one month to three months [19-24]; for two studies was from three months to six months [25, 26], and a study was followed up after nine months [27]. In one study, follow-up time was not reported.

Altering knowledge, attitude and behavioral skills can be influenced by short-term educational interventions while changes in goal-oriented behaviors are supported by policies and environments[28]. Thus, within a short time span, mange changes can be made to oral/dental health-related knowledge, knowledge of different oral, oral cavity and material use, attitude, use of tooth brush and floss, visiting a dentist, behavior (alcohol consumption, cigarettes, fluoride toothpaste, delayed brushing of teeth, brushing of teeth

with parents). Moreover, long-term effects such as tooth plaque, bleeding gum would take longer time. Post-intervention follow-up has been also considered as a key factor in categorizing the related body of research. It is also noteworthy that in several studies, short-term and long-term variables were taken into account. In such studies, the variable that related to the main consequence was considered. Authors categorized studies covering less than three months as short term and more than three months as long term (Supplement 2).

Some interventions were complex interventions, which involved more than one active component. All educational interventions covered theoretical or practical education sessions, or both, on OH for students. The characteristics of the studies based on the variables studied are described in Table 1.

**Table-1: Characteristics of studies Based on the to the variables studied**

Author	Year	country	Participant	Sample size	Sample size in each group					language
					Ig1	Ig2	Ig3	Ig4	Cg	
Alarkhora et al.	2018	Iran	Primary school	90	45	-	-	-	45	Persian
Andrashekar et al.	2014	India	Middle school	141	36	35	36	-	34	English
Napathi et al.	2015	India	Middle school	200	40	40	40	40	40	English
Al-eem et al.	2012	Pakistan	Primary school	200	40	40	40	40	40	English
Arzoo and Arora	2013	Indian	Middle school	568	141	143	-	-	284	English
Assani et al.	2016	Iran	Middle school	80	40	-	-	-	40	Persian
Abduganiyev et al.	2018	Uzbekistan	High School	86	42	-	-	-	44	English
Alana et al.	2017	Indian	Middle school	200	50	50	50	-	50	English
Alamshahi et al.	2013	Iran	Middle school	300	100	100	-	-	100	Persian
Agipuram et al.	2016	India	Middle school	450	150	150	-	-	150	English
Alzaidi et al.	2009	Iran	High School	388	135	130	-	-	150	English
Ang et al.	2009	Taiwanese	High School	135	67	-	-	-	68	English

Author	effects	Time point	Oral health-related Outcomes					
			Gingival index	knowledge	attitude	behavior	Dental plaque	DMFT
Alarkhora et al.	Short-term	4w	-	ü	ü	ü	-	-
Andrashekar et al.	Short-term	3m	ü	-	-	-	ü	ü
Napathi et al.	Short-term	8w	-	ü	-	-	ü	-

leem et al.	Long-term	6m	-	ü	-	ü	ü	-
Arz and Adhya	Long-term	9m	ü	ü	-	ü	ü	-
Assani et al.	Short-term	1m	-	ü	ü	ü	-	-
Badanov et	Short-term	2m	-	ü	ü	ü	-	-
Barana et al.	Short-term	1.5m	-	ü	-	-	-	ü
Hamadkhah al.	Short-term	3m	-	ü	ü	ü	-	-
Kagipuram et	Long-term	6m	ü	ü	-	ü	ü	-
Kazdani et al.	Short-term	3m	ü	-	-	-	ü	-
Ng et al.	-	N /R	-	ü	ü	ü	-	-

### Included studies

We included five individual RCTs [20-22, 26, 27], four cluster-RCTs [19, 24, 25, 29], and three Quasi-experimental [17, 18, 23] with 2838 students as participants.

The existing body of research explored the variety of educational content and methods. The interventions were described in oral/dental health pamphlets and instructions. The educational methods involved lecture, album, slides, films, pamphlets, booklets, dental educational models, PowerPoint presentations, role-play, use of tooth brush under the supervised tooth brushing system and group discussions. Moreover, teachers, peers and dentists were involved in the transfer of educational information (Table 2).

**Table 2: The main findings of studies reviewed**

Author	Study Design	Model of delivery	group	Outcomes assessed <sup>1</sup>
Andarkhora et al.	Quasi-experimental*	Film, lecture	Ig1: lecture	K, A, B
			Ig2: Multi Media	
			Control group	
Chandrashekar et al.	Cluster- RCT <sub>S</sub>	Brochure, demonstration the model	Ig1: DHE by a qualified Dentist + using the audio-visual aids	PI, DMFT, GI
			Ig2: DHE by the trained school teachers	
			Ig3: DHE by the trained school teachers + oral hygiene aids (tooth brush and tooth paste)	
			Control group	
Ganapathi et al	RCT <sub>S</sub>	Audio record, pamphlets	Ig1: Audio record	K, PI
			Ig2: Pamphlets	
			Ig3: Tooth models	
			Ig4: Multisensory	
			Control group	
Haleem et al.	Cluster- RCT <sub>S</sub>	Booklet supplemented, session	Ig1: Dentist-led	K, B, PI
			Ig2: Teacher-led	
			Ig3: Peer-led	
			Ig4: Self-learning	

			Control group	
D'Cruz and Aradhya	RCT <sub>S</sub>	Pamphlets, demonstration the model	Ig1: A lecture using a PowerPoint presentation	K, B, PI, GI
			Ig2: lecture, a demonstration of the tooth brushing method	
			Control group	
Hassani et al.	Quasi-experimental	Booklet, CD, session	Ig	K, A, P
			Control group	
Khudanov et al.	RCT <sub>S</sub>	Lesson, lecture, messages, demonstrational models	Ig	K, A, P
			Control group	
Sadana et al.	RCT <sub>S</sub>	Audio record, pamphlets	Ig1: verbal communication	K, DMFT
			Ig2: verbal communication and self-educational pamphlets	
			Ig3: audiovisual aids and verbal communication	
			Control group	
Mohamadkhah et al.	Quasi-experimental	Film, lecture	Ig1: film Group	K, A, P
			Ig2: lecture Group	
			Control group	
Vangipuram et al.	RCT <sub>S</sub>	Power point presentation, chalk and talk presentation, using charts, posters, booklets and tooth brushing demonstration models	Ig1: peer Group	K, B, PI, GI
			Ig2: dentist Group	
			Control group	
Yazdani et al.	Cluster- RCT <sub>S</sub>	Leaflet, Videotape	Ig1: Leaflet Group	PI, GI
			Ig2: Videotape Group	

			Control group	
Yang et al.	Cluster- RCT <sub>s</sub>	lectures, role-playing, small group discussion and group contests	Intervention group Control group	K, A, B

Outcomes assessed<sup>1</sup>: K (knowledge), A (Attitude), B (behavior), PI (Plaque index), GI (Gingival Index), DMFT (decayed, missed, filled permanent tooth). \*Quasi-experimental research involves the manipulation of an independent variable without the random assignment of participants to conditions or orders of conditions.

### Overall risk of bias

The presentation of the assessments of the risk of bias was done based on Figure 2, using Review Manager 2014 software. None of the studies reported low risk of bias. A high risk of bias in assessment of risk of bias was observed in eight studies [17, 18, 20, 23-27]. The other four studies were at unclear risk of bias [19, 21, 22, 27, 29].

### Measured outcomes

Statistical heterogeneity of studies was assessed through the calculation of tau<sup>2</sup> and I<sup>2</sup>. As the heterogeneity of studies was higher than 25%, a random effects model was applied.

#### Oral health-related knowledge

Based on the results, ten studies reported oral health-related knowledge of students [17, 18, 20-23, 25, 27, 29]; all studies Oral health-related knowledge assessed by self-administered questionnaires. Data of twelve studies on students' knowledge were combined in the current study. Moreover, ten studies at high and unclear risk of bias including 2309 members of students were combined in a meta-analysis. Oral health knowledge scores improved significantly more among students receiving the oral health educational intervention compared with students that no receive educational activities (SMD 3.31, 95% CI 2.52 to 4.11; I<sup>2</sup> = 98; P < 0.001) (Figure 3).

#### Oral health-related attitude

Oral health-related attitude of students was evaluated by six studies [17, 18, 21, 23]. Self-administered questionnaires were applied with Likert scale. Self-administered questionnaires were applied with Likert scale. Six studies including 1141 members of students were combined in a meta-analysis by the authors. Oral health attitude scores improved significantly more among students receiving the oral health educational intervention compared with students that no receive educational activities (SMD 1.99, 95% CI 0.43 to 3.54; I<sup>2</sup> = 99; P < 0.001) (Figure 4).

#### Oral health-related behavior

Oral health-related behavior of students was evaluated by eight studies [17, 18, 21, 23, 25, 27]. Eight studies including 1909 members of students were combined in a meta-analysis by the authors. OH behavior scores improved significantly more among students receiving the oral health educational intervention compared with students that no receive educational activities (SMD 4.74, 95% CI 3.70 to 5.77; I<sup>2</sup> = 99; P < 0.001) (Figure 5).

#### Dental plaque index

We meta-analyzed six studies [19-22, 24-27] and involving 1947 students. Dental plaque scores improved significantly more among students receiving the oral health educational intervention compared with students that no receive educational activities (SMD -1.01, 95% CI -1.50 to -0.51; I<sup>2</sup> = 97; P < 0.001) (Figure 6).

#### Gingival index

Authors meta-analyzed four studies [19, 24, 26, 27] and involving 1541 students. Gingival scores improved significantly more among students receiving the oral health educational intervention compared with students that no receive educational activities (SMD 0.33, 95% CI -0.36 to 1.02;  $I^2 = 98$ ;  $P = 0.34$ ) (Figure 7).

## Discussion

Oral health knowledge scores improved significantly more among students receiving the oral health educational intervention compared with students that no receive educational activities. Therefore the effectiveness of OHE-related program has been able to increase of knowledge. According to the results by Kay and Locker, it was possible to enhance knowledge by dental health education [30]. Nevertheless, Pieper et al. argued that tooth decay could be decreased by preventive services even with no change in knowledge and health behavior [31]. On the other hand, one of the ways to increase knowledge and attitudes can be engaging other groups in educational interventions. Naker reported that the education when more effective on the students that involvement of other groups, such as parents, as teachers [32].

Systematic review shows that OHE in a range of sample sizes efficiently enhanced oral health-related behavior. Studies were more effective when OHE aimed school student and when important others were included. A significant progression in oral health-related behavior was observed by Alsada et al., Kowash et al., Vachirarojpisan et al. and Rong et al. Besides, all the above-mentioned studies covered important others like care givers and mothers of children in the intervention of the target groups that affected the practice of the target group efficiently [33-36].

Since the students spend most of their time at school, schools can provide an important and effective context for improving oral and dental health. Aljanakh et al. reported the role of the school in promoting the oral health behavior of students [37].

The results of meta-analysis show that oral health attitude scores improved significantly more among students receiving the oral health educational intervention compared with students no receive educational activities. The results of the meta-analysis indicated that the educational program in the intervention group were able to improve the students' positive attitude towards health behaviors. Effective education and raising knowledge can be one of the reasons for positive attitudes among students. On the other hand, improving attitude can lead to health behavior. Studies have shown that there is a positive relationship between positive attitude and frequent tooth brushing of students [38-40]. Moreover, the positive attitude of educational staff can lead to a positive attitude in students. A study showed that teachers who have a positive attitude towards oral hygiene of students can be a positive role model, and vice versa, teachers with a negative attitude would have an unfavorable effect on students' health behaviors [41]. According to the studies recommendations, the oral health knowledge, attitude, and behavior were improved by OHE based on theories and it is possible to use them to develop theoretical structure of the interventions [42-45]. Therefore the role of health education and health promotion in promoting OH can be crucial. In fact, educational interventions will be more effective when they are based

on theories. Due to the insufficient of theory-based studies in this study, it was not possible to compare the efficacy of theory-based and routine interventions (without the use of theory).

The results of gingivitis outcome in meta-analysis showed that there was difference between the experimental and control groups indicating that OH intervention had effect on gingivitis reduction. The results showed that majority of the studies had a short-term follow-up period. Therefore, there is a need to assess long-term studies, which can evaluate the effects of the education practices on those outcomes, especially because the goal of the education actions in the settings such as school is to prevent oral disorder and expand healthy behaviors and practices.

Dental plaque scores improved significantly more among students receiving the oral health educational intervention compared with students that no receive educational activities. These review showed the impact of OHE on plaque levels on short term. The systematic review of Prabhu and John showed that oral health educational interventions and consequently improvements in individuals' knowledge, attitude, and oral health-related practice were effective in improving OH indexes status such as reduction in dental plaque, gingival bleeding, and significant decline in dental caries [46]. Teachers are also trained in many countries and are used as a powerful tool for reducing dental plaque and improving oral hygiene among students (Petersen & Kwan, 2004). Therefore, health education and health promotion should be an essential element in educating teachers and other educational staff. Because the role of teachers in this field is very significant and valuable, they can affect thousands of students and families [37].

Most of the studies reported data on short-term effects (three or six months). Seemingly, follow-up period was sensible for outcome like plaque and gingivitis. Nonetheless, it should be emphasized that it was no adequate for other outcomes like knowledge and attitude. It is possible that constant impressions on knowledge and attitudes for school are required to pave the way for behavioral changes in OH care. Thus, outcomes should be measured in future studies in the longer term.

It is noteworthy that outside school in such contexts as hospitals, primary care centers and private dental clinics, there is also the possibility of making oral/dental health related interventions. However, schools might be the best place to promote oral/dental health as about a billion children worldwide spend most of their daily time at school [47]. Furthermore, such factors as reduced lost time, facilitated educational courses at school, access to a great number of 5-18 year-old population at schools as an educational setting where people get educated, possibly effective interventions due to the presence of teacher and reduced costs of education and similar concerns would orient educational interventions toward such contexts as schools.

The present authors suggest that further investigations are done to make up for the present limitations. The first limitation was that this study was narrowed down to developing countries. Further research can take an overall view to include other countries in the world too concerning oral/dental health to compare the effect of education in developing and developed countries. Another limitation was the exclusion of the related literature in languages other than Persian and English. A relevant meta-analysis to compare

theoretical and interventions and those beyond theories was deemed impossible to conduct due to the inadequacy of the theory-based literature. Several works of research contained inadequate information for the meta-analysis and the present researchers received no reply from the corresponding author to solve this issue.

## **Conclusions**

The systematic review concludes that educational interventions are effective for improving oral health knowledge, attitudes, behaviors, etc., which could potentially lead to improved OH, reduced oral diseases, and reduced costs from treating oral diseases.

## **Abbreviations**

OH: Oral health; OHE: oral health education; DMFT: The decay-missing-filled (DMF) index or decayed, missing, and filled teeth

## **Declarations**

### **Ethics approval and consent to participate**

The study has been approved by the Ethics Committee of the School of Public Health & Neuroscience Research Centre in Shahid Beheshti University of Medical Sciences; Approval ID: IR.SBMU.PHNS.REC.1397.051 : Approval Date:2019-01-15).

### **Availability of data and materials**

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

### **Consent for publication**

Not applicable.

### **Competing interests**

The authors have no conflicts of interest.

### **Funding**

This study is sponsored by Shahid Beheshti University of Medical Sciences in Tehran. The funding agencies had no role in the design of study, data collection and analysis, or presentation of the results.

### **Authors' contributions**

MGH, SD, and ASM designed the study. ASM, AA, MM and SD wrote the first draft. All authors contributed to writing, revising, and approved the final manuscript.

## Acknowledgments

The authors would like to thank the research deputy of Shahid Beheshti University of Medical Sciences for their financial support.

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## Figures

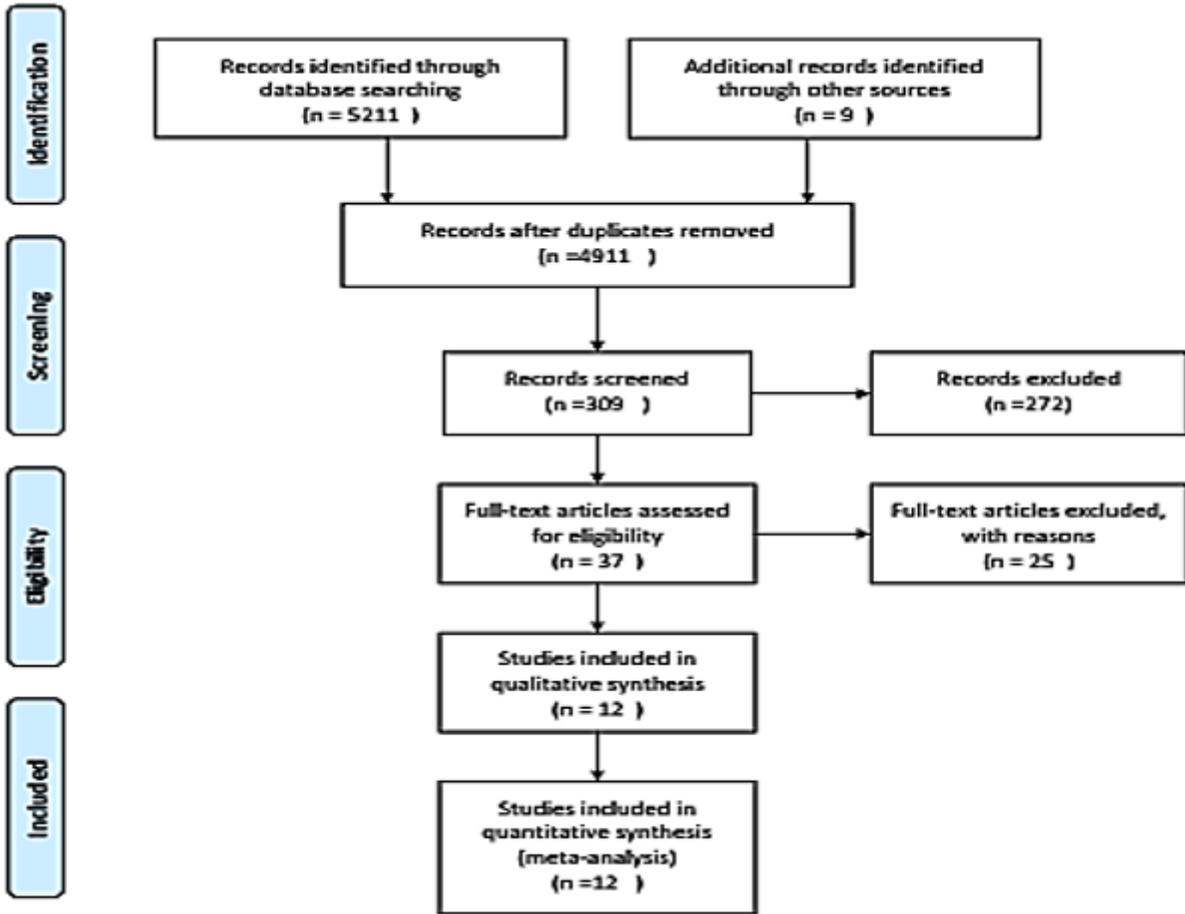
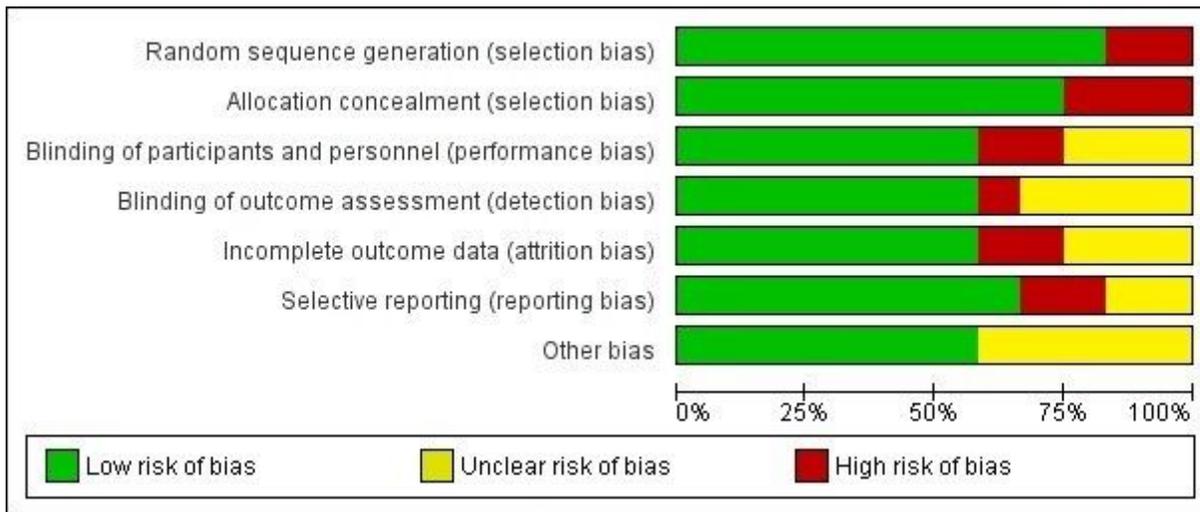
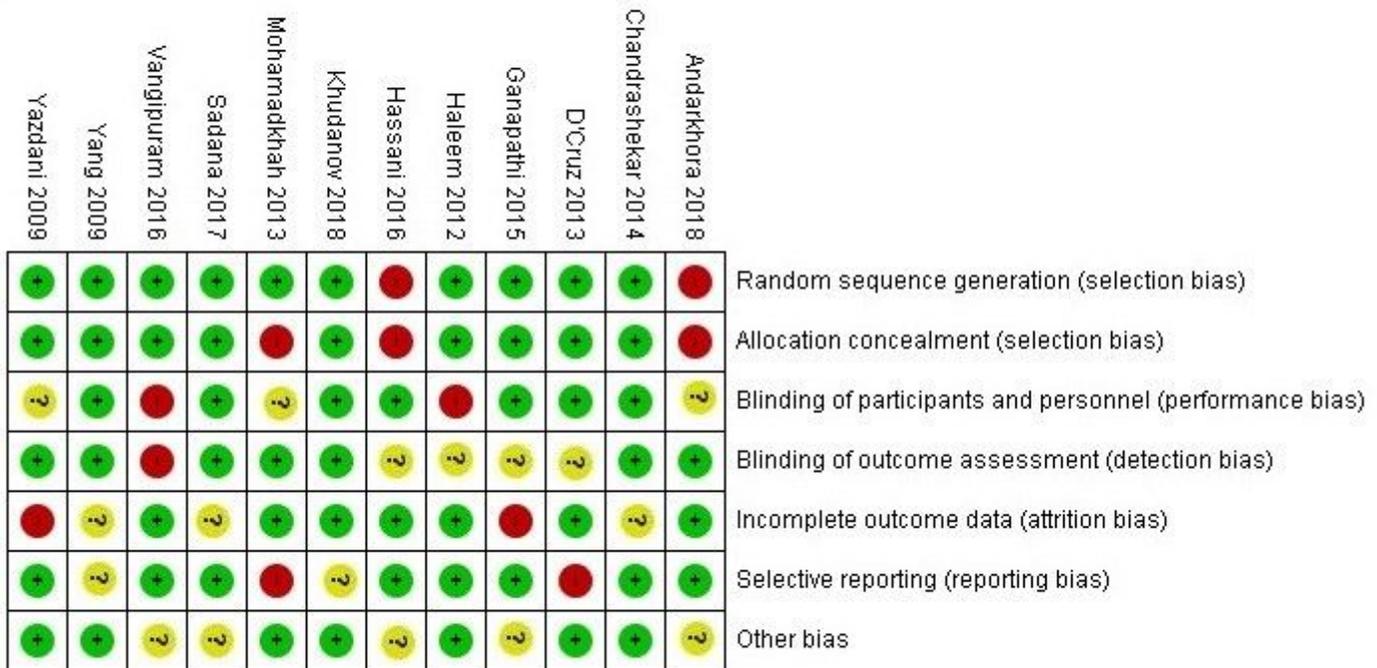


Figure 1

Study flow diagram



**A**



**B**

**Figure 2**

Risk of bias summary

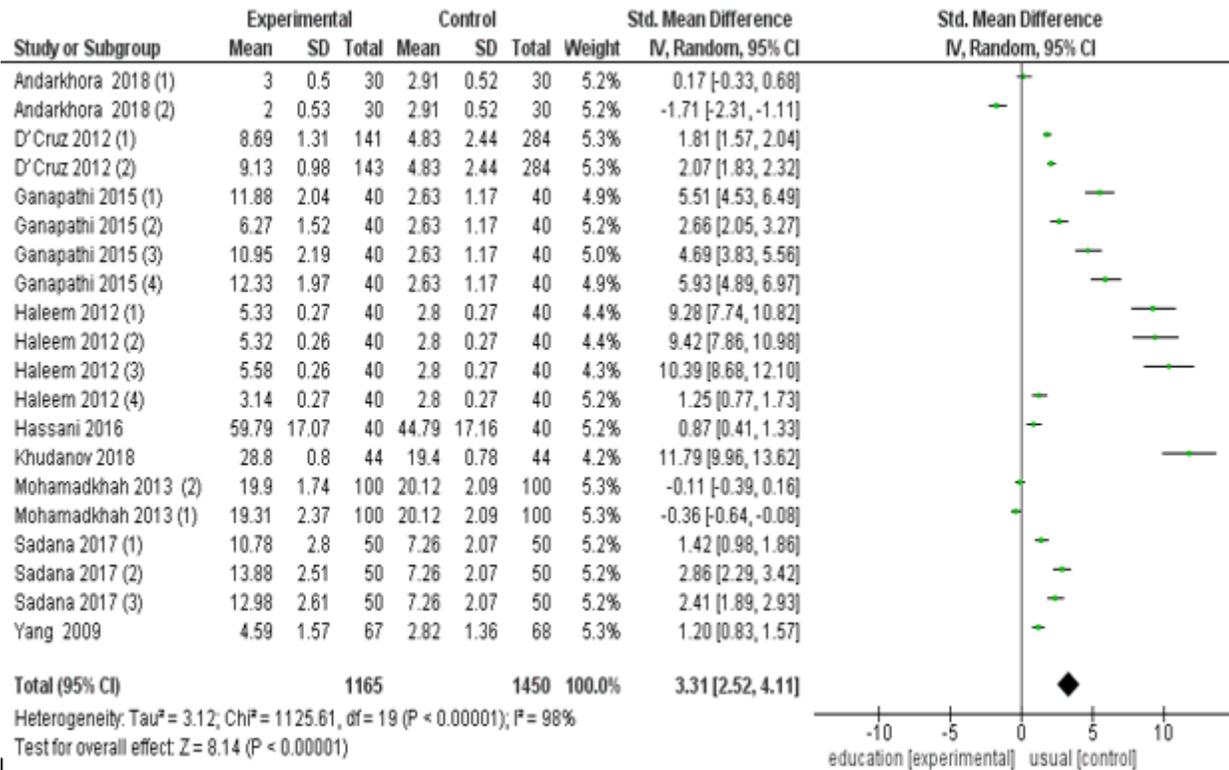


Figure 3

Comparison Educational intervention versus usual care, Outcome Oral health-related knowledge.

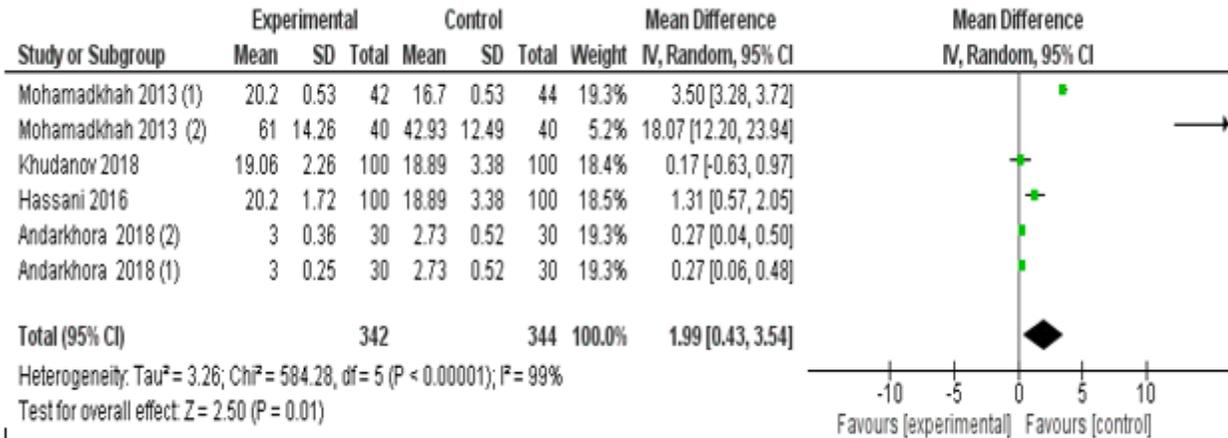


Figure 4

Comparison Educational intervention versus usual care, Outcome Oral health-related attitude.

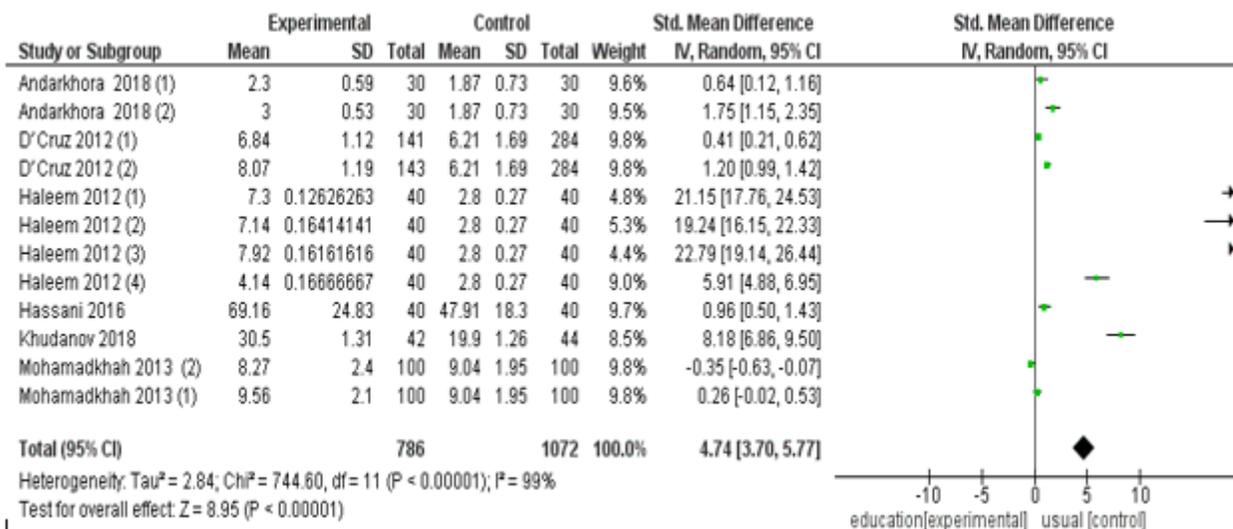


Figure 5

Comparison Educational intervention versus usual care, Outcome Oral health-related behavior.

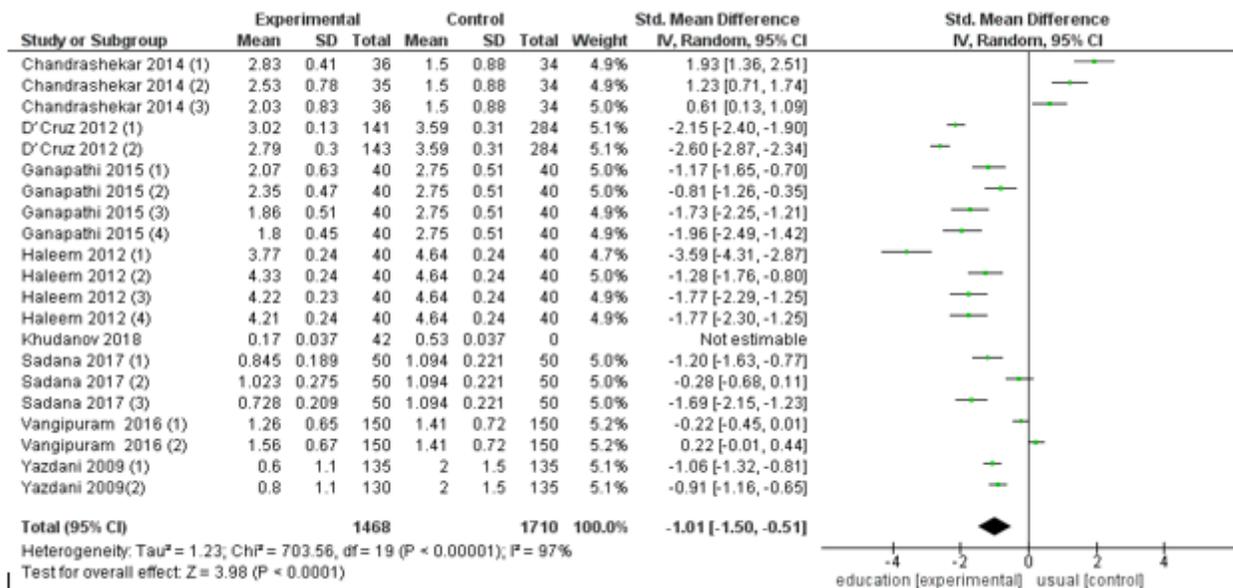


Figure 6

Comparison Educational intervention versus usual care, Outcome plaque index.

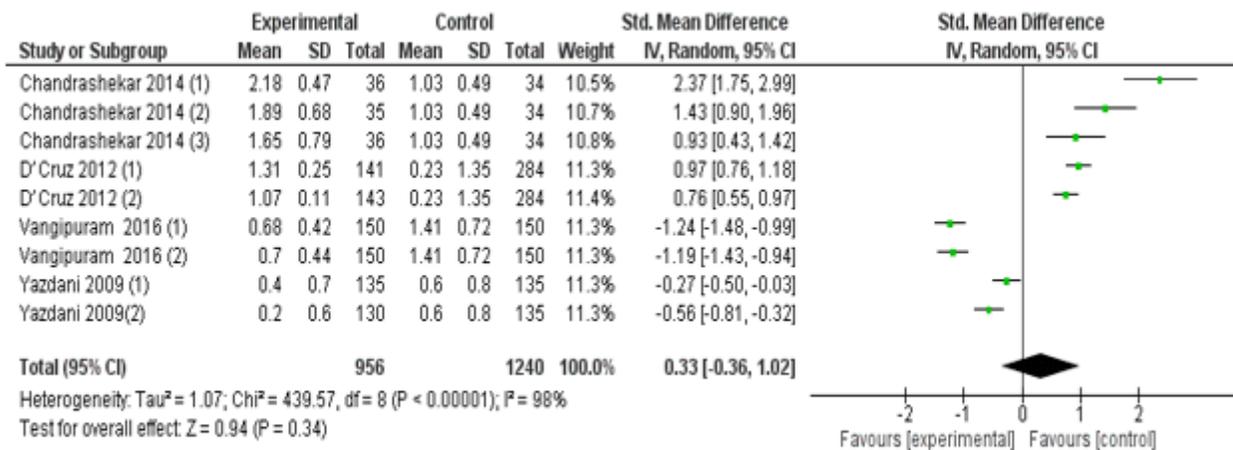


Figure 7

Comparison Educational intervention versus usual care, Outcome Gingival index.

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