Original Article

Access this article online

Quick Response Code:

Website: www.jehp.net

DOI: 10.4103/jehp.jehp_672_22

Evaluation of peer role models as oral health education providers among school children in Mysuru, Karnataka, India

Pratibha Sharma, Byalakere R. Chandrashekar, Vivek Bhaskar[1], Bharath S, Mirunalini Sundar

Abstract:

BACKGROUND: India lacks organized school oral health programs, resulting in limited access to oral health care among children. The peer role models, or teachers, may help in bridging the gap to enhance knowledge on self-care preventive practices. The aim of the study was to evaluate and compare the effectiveness of dental health education (DHE) offered by qualified dental professional, trained teachers, and peer role models in promoting oral hygiene status and behavior among school-going children in Mysuru, Karnataka.

MATERIALS AND METHODS: This was an interventional study conducted over a period of 3 months in an academic year in three selected schools in Mysuru City, India. A total of 120 students were divided into three groups – group 1 were given DHE (dental health education) by a dental professional, group 2 were given DHE by a trained teacher, and group 3 were given DHE by peer role models. Oral health knowledge was assessed using a close-ended questionnaire, plaque levels were assessed using Turesky Gilmore Glickman modification of Quigley Hein plaque index, and gingival status was assessed using Loe and Sillness gingival index. After 3 months, the same index and questionnaire were used post intervention.

RESULTS: The mean scores for knowledge on dental caries at baseline in groups 1, 2, and 3 were 3.75 ± 1.25, 3.65 ± 1.07, and 3.40 ± 1.17, respectively, with no significant difference between the groups, which changed to 4.43 ± 1.27, 3.37 ± 1.14, and 4.93 ± 0.99, respectively, following intervention. Similar results were observed with regard to knowledge on gingival and periodontal diseases. The mean plaque scores at baseline for groups 1, 2, and 3 were 4.17 ± 0.30, 3.24 ± 0.70, and 4.10 ± 0.31, respectively, which changed to 3.85 ± 0.32, 3.90 ± 0.39, and 3.69 ± 0.34, respectively, in three groups following intervention. Post intervention, plaque scores and gingival scores significantly improved in groups 1 and 3 but worsened in group 2. Overall, knowledge scores improved in groups 1 and 3 for some questions, but improvement was not noted in some questions.

CONCLUSION: Under the limitations of the study, it was found that peer role models were as effective as dental professionals in providing DHE in schools.

Keywords:

Dental caries, dental health education (DHE), peer teaching, periodontal disease, school dental health education

Department of Public Health Dentistry, JSS Dental College and Hospital, JSS Academy of Higher Education and Research, Mysuru, Karnataka, India, [1]Specialist Orthodontist, Muscat, Oman

Address for correspondence:
Dr. Byalakere R. Chandrashekar, Vice Principal and Head of Department, Department of Public Health Dentistry, JSS Dental College and Hospital, JSS Academy of Higher Education and Research, Mysuru, Karnataka, India.
E-mail: drchandrubr@yahoo.com

Received: 13-05-2022
Accepted: 21-01-2023
Published: 31-03-2023

Introduction

Health is a fundamental right for every human and an important resource for everyday life. Decision makers reflect their social responsibility for health in their choice of practices and policies meant for protecting and promoting health.[1]

How to cite this article: Sharma P, Chandrashekar BR, Bhaskar V, Bharath S, Sundar M. Evaluation of peer role models as oral health education providers among school children in Mysuru, Karnataka, India. J Edu Health Promot 2023;12:106.

Universal health coverage was set as an umbrella goal for health for all in the post-2015 development agenda.[2] In universal health coverage, people avail the required health services without unaffordable out-of-pocket payments.[3] It involves equal coverage – from health promotion to prevention, treatment, rehabilitation and palliation, and financial risk protection; the main point is accessibility to everyone.[3,4] To achieve the universal health coverage outcomes, it is important to improve the geographical coverage of health services and make it universally accessible.

80% of school-going children worldwide are affected by dental caries and gingival diseases.[5] The development of children, their growth and appearance, and nutritional intake along with quality of life are affected with the adverse effects caused by oral diseases.

The children through school-based dental health programs are offered a chance to experience optimal oral health. School continues to be an integral structure for the dissemination of disease prevention information. As the classroom maximizes the number of children reached at the same time, school-based education is valid and reliably efficient. School advocates the adoption and practice of behaviors, which are deemed desirable by the society. Treatment is not always the answer to solving children's oral health problems; instead, prevention is the key.[6]

In India, there are no organized school dental health programs and vast sections of the population do not get access to a dentist. Therefore, peer role models or teachers may help in bridging the gap. Expenditure incurred in treating dental diseases can be overwhelming in developing countries like India.[7] The public health burden of the disease can be reduced by taking preventive steps, the most important of which being oral hygiene education.

Studies have demonstrated the efficacy of utilizing the network of teachers and peer role models for positively influencing oral hygiene status and oral health behavior among children. Studies by Chandreshekar BR *et al*.,[8,9] Vidya Sekhar *et al*.,[10] Gambhir RS *et al*.,[11] and Chachra S *et al*.[12] have demonstrated the effectiveness of school-based dental health programs in positively impacting the oral hygiene status and behavior among children.

Studies comparing the effects of oral hygiene education given by dentists in comparison with that given by peer role models and teachers are scanty. Studies undertaken to evaluate the effectiveness of school-based oral health education offered by public dentists in comparison with that offered by trained teachers and peer role models in Mysuru city were non-existent. Hence, this present study was undertaken to test the hypothesis that there is a difference in the effectiveness of dental health education (DHE) offered by qualified dental professionals, trained teachers, and peer role models in promoting oral hygiene status and behavior among school-going children in Mysuru, Karnataka. The novelty of the study is that the peer role models were trained for educating their classmates on simple self-care practices that could help in preventing the most common oral diseases, and we evaluated their effectiveness as change agents in promotion of dental health knowledge and oral hygiene status.

Materials and Methods

Study design and setting

This was an educational interventional study conducted over 3 months from September to December 2021 in three schools in Mysuru City.

Study participants and sampling

The study participants and sampling were computed using Master software for comparing means using matched pair cluster design. The sample size was computed to be 35 per group at an estimated mean difference of 0.2 at 80% power and 5% alpha error. The sample size was rounded off to 40 per group anticipating 10% drop out. Three schools were selected in Mysuru district using convenience sampling. Although DHE was offered to all available school children in these schools, evaluation and assessment of change in oral health knowledge and oral hygiene status and behavior were performed among 40 randomly selected children aged 12–14 years.

Students aged 12–14 years with signed consent from guardians and children with permanent dentition and having a minimum of 20 permanent teeth were included for evaluation. School students with systemic diseases, gross oral defects, any deleterious and/or parafunctional oral habits, and severe malocclusion and/or oral appliances were excluded.

Data collection tools and technique

Development and validation of the questionnaire: Based on the subject expert inputs, a structured close-ended questionnaire was drafted with two real-life case scenarios including dental caries and gingival/periodontal diseases. The initial questionnaire was prepared by synthesizing the inputs from experts and literature review and was subjected to content validation by six subject experts.

The final draft of the questionnaire in English and Kannada containing seven items in dental caries section,

four items in gingival/periodontal disease section, and nine items in oral hygiene practices section was then distributed to three high school children, three undergraduate dental students, and three postgraduate students in Public Health Dentistry for eliciting known group validity evidence.

The questionnaire was then subjected to cognitive interview using retrospective verbal probing technique. It was distributed to ten prospective study participants. They were advised to read each item of the questionnaire and explain their interpretation to the investigator. The final questionnaire containing 20 items was then assessed for internal consistency using split half method on 20 school children.

Training and calibration of the investigator: The principal investigator was trained by Author 1 in the use of the plaque and gingival indices used in the baseline examination over 15 days. Reliability was assessed using test–retest method.

Pre-intervention evaluation: A structured close-ended validated questionnaire was used for collecting information on knowledge, attitude, and oral hygiene behavior among these children.

- The baseline examination was performed by the investigator to assess plaque scores with the Turesky Gilmore Glickman modification of Quigley Hein Plaque Index and gingival status using Loe and Sillness Gingival Index.[13,14] Clinical oral examination was performed on a plastic chair under natural day light using a mouth mirror and an explorer.
- **Intervention:**
  Group 1: In the first school, DHE highlighting the most common causative factors for oral diseases, their progression and treatments to be obtained in different stages of the diseases, and simple self-care practices that can be adopted to prevent these diseases, along with demonstration of brushing technique, was given by the principal investigator. Health education aids such as brushing models, pamphlets, and charts were used.
  Group 2: In the second school, four teachers were selected and trained for the intervention procedure by the principal investigator. Similar training content was used in this group as well. The change in knowledge among these teachers following training was ascertained by using a validated questionnaire.
  Group 3: Five active students nominated by teachers were offered training in their school by the principal investigator using health education aids described earlier. The change in knowledge among these peer role models following training was ascertained by using a validated questionnaire.

The flow diagram of the study is cited as Figure 1.

DHE in group 1 was offered by qualified public health dentists only once. In groups 2 and 3, the headmaster of the school was requested to allot 1 hour every week so that the selected teachers and peer models could provide the DHE to the other children for 3 months. In group 2, trained teachers offered DHE on a weekly basis (1 hour per week) to the selected children. In group 3, trained peer role models offered DHE on a weekly basis (1 hour per week) to the selected children. The noticeable difference here is the frequency of DHE offered. In groups 2 and 3, DHE was offered every week by the trained teachers and peer role models, respectively. In groups 2 and 3, the teachers and peer role models/teachers were provided with required health education materials. The headmasters, concerned teachers, and student representatives were contacted at fortnightly intervals to ensure compliance.

Post-intervention evaluation: This was performed by the principal investigator using the same questionnaire and indices used in the pre-intervention evaluation.

Statistical analysis: Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) software version 24. Correct and incorrect responses were given scores of 1 and 0, respectively. Comparison of baseline and post-intervention knowledge scores pertaining to the two case studies between the three groups as well as comparison of mean plaque and gingival scores at baseline and post-intervention between the three groups was performed using analysis of variance and Tukey's *post hoc* test. The change in mean scores of knowledge pertaining to dental caries, knowledge pertaining to gingival and periodontal diseases, and plaque and gingivitis between baseline and post-intervention in each group was analyzed using paired samples *t*-test. The statistical significance was fixed at 0.05.

Ethical consideration

The study protocol was approved by the Institution Ethics Committee (IEC) vide JSSDCH IEC No: 67/2019. Permission was obtained from the concerned heads of the three schools. A written informed consent in English and Kannada was obtained from the guardians of the participants after informing them about the research protocol.

Results

A total of 120 students with 40 participants in each group were recruited for the study [Table 1].

The mean knowledge scores pertaining to dental caries at baseline in groups 1, 2, and 3 were 3.75 ± 1.25,

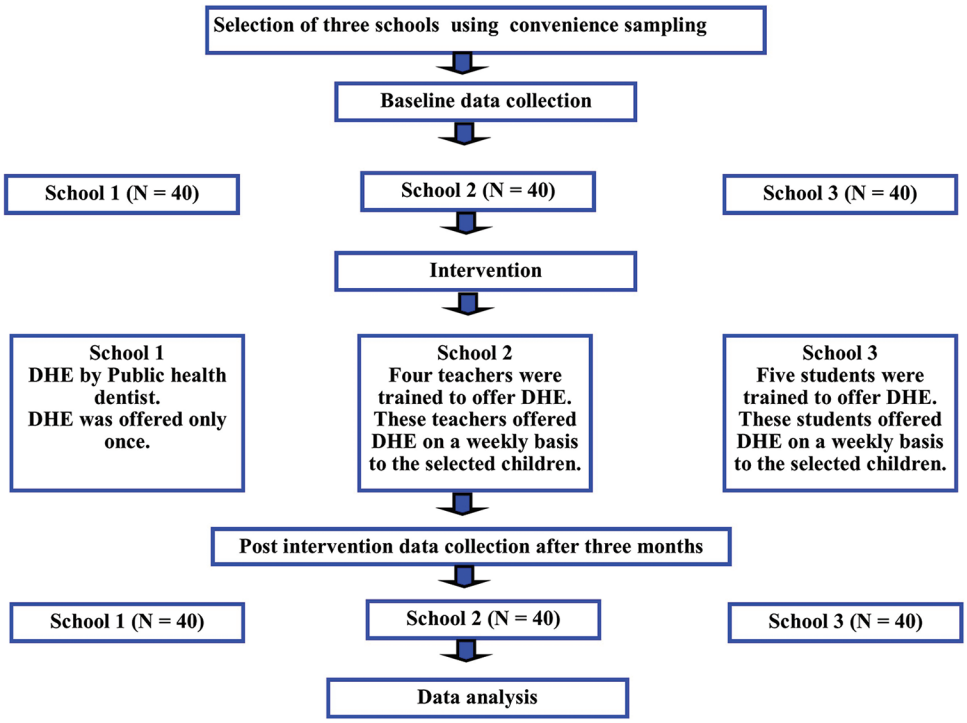

Figure 1: CONSORT flow diagram

3.65 ± 1.07, and 3.40 ± 1.17, respectively, with no significant difference between the groups. The mean scores for knowledge on dental caries post intervention in the three groups were 4.43 ± 1.27, 3.37 ± 1.14, and 4.93 ± 0.99, respectively. This was significantly higher in group 3 compared to other two groups. There was a significant improvement in knowledge scores for dental caries at post-intervention compared to baseline in groups 1 and 3 with no significant difference in group 2 [Table 2].

The mean scores for knowledge score pertaining to gingival and periodontal diseases at baseline in groups 1, 2, and 3 were 2.00 ± 0.93, 2.02 ± 0.86, and 2.47 ± 1.01, respectively. The score was significantly higher in group 3 compared to others. The mean post-intervention scores for knowledge pertaining to gingival and periodontal diseases in the three groups were 2.37 ± 1.16, 1.92 ± 0.94, and 2.55 ± 1.05, respectively. The mean score was significantly higher in group 3 compared to other two groups. There was no significant improvement in knowledge scores for gingival and periodontal diseases in all three groups [Table 2].

The mean plaque score at baseline was significantly higher in group 1 (4.17 ± 0.30) compared to others (group 2 = 3.24 ± 0.70 and group 3 = 4.10 ± 0.31). The mean plaque scores decreased significantly in groups 1 (3.85 ± 0.32) and 3 (3.69 ± 0.34), while the score significantly increased in group 2 (3.90 ± 0.39) at post-intervention compared to baseline [Table 3].

Table 1: Gender distribution and mean age of study participants in different intervention groups

Group	Males *n* (%)	Females *n* (%)	Total *n* (%)	Mean age Mean±SD
Group 1	17 (26.2)	23 (41.8)	40 (33.3)	13.13±0.89
Group 2	24 (36.9)	16 (29.1)	40 (33.3)	13.25±0.81
Group 3	24 (36.9)	16 (29.1)	40 (33.3)	12.80±0.82
Total	65 (100)	55 (100)	120 (100)	13.06±0.85

The mean gingival score at baseline was significantly higher in group 1 (1.50 ± 0.32) compared to others (group 2 = 0.97 ± 0.50 and group 3 = 1.43 ± 0.41). The mean gingival scores decreased significantly in groups 1 (1.16 ± 0.40) and 3 (0.95 ± 0.37), while the score significantly increased in group 2 (1.43 ± 0.42) at post-intervention compared to baseline [Table 4].

Discussion

Poor oral health can have a detrimental effect on the quality of life of a school student.[15] It is estimated that approximately 51 million hours of school are lost per year as a result of dental-related illnesses.[16] As per the World Health Organization's School Health Initiative, schools can be used as a source for health promotion because students can easily be molded during the formative years.[17] Sometimes in India, school is the only place where facilities for health promotion are available. Well-trained teachers foster an environment where positive oral health care practices and prevention of dental disease are a normal part of everyday life.[18] If

Table 2: Comparison of mean change in knowledge score pertaining to dental caries and gingival and periodontal diseases between baseline and post-intervention among children in each intervention group

Group	Knowledge score on dental caries at baseline Mean±SD	Knowledge score on dental caries following intervention Mean±SD	Statistical inference	Knowledge score on gingival and periodontal diseases at baseline Mean±SD	Knowledge score on gingival and periodontal diseases following intervention Mean±SD	Statistical inference
Group 1	3.75±1.25	4.43±1.27	*t*: -2.352, df: 39, *P*: 0.025	2.00±0.93	2.37±1.16	*t*: -1.642, df: 39, *P*: 0.109
Group 2	3.65±1.07	3.37±1.14	*t*: -0.0248, df: 39, *P*: 0.806	2.02±0.86	1.92±0.94	*t*: 0.448, df: 39, *P*: 0.656
Group 3	3.40±1.17	4.93±0.99	*t*: -5.878, df: 39, *P*:<0.001	2.47±1.01	2.55±0.95	*t*: -0.338, df: 39, *P*: 0.737

Table 3: Comparison of mean change in plaque scores between baseline and post-intervention among children in each intervention group

Group	Plaque score at baseline Mean±SD	Plaque score following intervention Mean±SD	Statistical inference
Group 1	4.17±0.30	3.85±0.32	*t*: 4.841, df: 39, *P*:<0.001
Group 2	3.24±0.70	3.90±0.39	*t*: -5.468, df: 39, *P*:<0.001
Group 3	4.10±0.31	3.69±0.34	*t*: 14.561, df: 39, *P*:<0.001
Total	3.84±0.64	3.81±0.36	
Statistical Inference	*F* -:46.843, df: 2, *P* -:0.000	*F* - 3.68, dF - 2, *P* - 0.028	
Post Hoc analysis	Group 1 vs Group 2: 0.000		
Tukey HSD	Group 1 vs Group 3: 0.794		
	Group 2 vs Group 3: 0.000		

Table 4: Comparison of mean change in gingival scores between baseline and post-intervention among children in each intervention group

Group	Gingival score at baseline Mean±SD	Gingival score following intervention Mean±SD	Statistical inference
Group 1	1.50±0.32	1.16±0.40	*t*: 4.011, df: 39, *P*<0.001
Group 2	0.97±0.50	1.43±0.42	*t*: -4.237, df: 39, *P*<0.001
Group 3	1.43±0.41	0.95±0.37	*t*: 15.755, df: 39, *P*<0.001
Total	1.30±0.48	1.18±0.44	
Statistical Inference	*F*: 18.67, df: 2, *P*: 0.000	*F* - 14.05, df- 2, *P* - 0.000	
Post Hoc analysis	Group 1 vs Group 2: 0.000	Group 1 vs Group 2: 0.011	
Tukey HSD	Group 1 vs Group 3: 0.735	Group 1 vs Group 3: 0.052	
	Group 2 vs Group 3: 0.000	Group 2 vs Group 3: 0.000	

school children and teachers are provided quality oral health education, then this would lead to a snowball effect where they would share their knowledge with others in the family and community. This ensures that those who do not have access to schools or formal health care will also be made aware of positive oral health care practices.[8]

In this study, we selected participants between 12 and 14 years of age as this is the age that most students would leave basic schooling. If we had decided on an older age group, then we might not have obtained the necessary number of students, while at the same time, if we had chosen a younger age group, they might not have been able to completely understand and infer the oral health education we provide. Also, at the age group of 12 onward, the influence of peers in behavior shaping increases.[8,19,20]

Post intervention, we found that group 3 (peer role models) had the highest knowledge scores regarding dental caries. This was followed by group 1 (dental professionals) and group 2 (trained teachers). We found a similar pattern regarding knowledge scores pertaining to gingival and periodontal disease where the students taught by their peer role models obtained higher scores, followed by those taught by the dentist and then by those who were taught by trained teachers. This further emphasizes the role of peer role models in behavior shaping related to oral hygiene.[20] A study by Karuveettil V *et al*.[21] to evaluate the effectiveness of curriculum-based educational intervention on oral health behavior using trained school teachers found that there was a significant increase in the knowledge on oral health among school children. The peer role models had only eight students in their group, which might have resulted in an active group discussion and knowledge exchange among the participants. Students might have felt more comfortable seeking further clarifications from their friends rather than from either the teachers or dental practitioners.

The results were similar to some other studies comparing the efficacy of a peer role model-based oral health education delivery. In a study performed by Vangipuram *et al*.,[16] they found that peer role models were as effective as dentists in effecting positive change in oral health knowledge and behavior. However, in this study, they found no change after 3 months but a saw significant change in oral health knowledge scores after 6 months. In our study, we noted a significant change in oral health-related knowledge scores after the entire study duration of 3 months. The exact reason behind achieving these scores at an earlier interval compared to other studies is unclear. However, the frequent interaction at weekly intervals might reinforce the knowledge among the participating children. This probably could be a reason for enhanced oral health knowledge post intervention in our study.

At baseline, we found the mean plaque scores to be 3.84 ± 0.84, which indicates poor oral hygiene in all our participants at baseline. This is a common finding seen in most public schools in India.[8,9] The mean gingival index scores seen in our sample before intervention were 1.30 ± 0.48, indicating moderate gingivitis. This correlates well with most other studies which inferred that moderate to severe gingivitis was a common finding across school-going children.[22,23] The above findings show us that providing oral health education to school children and finding the best route in implementing the same are important. The reduction in mean plaque score was the highest in group 3 (from 4.10 ± 0.31 to 3.69 ± 0.64), followed by group 1 (from 4.17 ± 0.30 to 3.85 ± 0.70), while group 2 (3.24 ± 0.70 to 3.90 ± 0.70) showed an increase in mean plaque scores. This shows that in our study, peer role model and dentist-provided oral health education led to equal reduction in plaque scores (peer role models slightly but significantly better than dentists). Those trained by teachers showed an increase in the plaque scores. This pattern could not be found in any reviewed literature. Revision of the oral health education content with the teachers at more frequent intervals could be something that can be investigated if teachers are being roped in into school oral health education programs. Moreover, the frequent disruption of school hours because of pandemic and teachers being stressed out on many aspects of maintaining coronavirus disease appropriate behaviors among the children would not have focused completely in undertaking DHE to an extent where children are internally motivated to adopt behavioral changes which could have reduced the plaque scores.

The reduction in gingival scores was the highest in group 3 (from 1.43 ± 0.41 to 0.95 ± 0.37), followed by group 1 (from 1.50 ± 0.32 to 1.16 ± 0.40), while it increased in group 2 (from 0.97 ± 0.50 to 1.43 ± 0.42). Similar to the changes seen in the mean plaque scores, the reason for obtaining an increase in gingival index scores after oral health education provided by teachers could not be found.

The increase in plaque and gingival scores which most often is not expected to happen post intervention is a definite concern which could be again attributed to neglect of oral hygiene by the participating children in a particular school, especially at a time when the children were not attending schools regularly in the scare of pandemic. The increase in plaque and gingival scores indicates that the increase in knowledge pertaining to oral diseases is not getting translated as an improvement in their practice of oral hygiene to reduce the plaque and gingival scores. We are witnessing a gap between improvement in knowledge on oral diseases and plaque and gingival scores especially in group 2. This highlights the fact that the behavior change requires a high degree of internal motivation and behavior change requires a little more time (for the knowledge to get translated into action). The time required for behavior change following health education varies from individual to individual. However, the decrease in plaque and gingival scores in other two groups indicates some translation of improved knowledge into oral hygiene practice. These children in group 2 probably need more focused and more frequent interaction to bring about a change in their behavior than the other two schools.

The possibility of less duration of study where students in one school might have taken more time to translate their improved knowledge into action for improvement in plaque and gingival status cannot be ruled out. The improvement in plaque control and gingivitis in groups 1 and 3 is consistent with other published literature by Stein *et al*.[24] and Saied-Moallemi *et al*.,[25] who showed that plaque scores and gingival index scores improve after an educational intervention. Angelopoulou MV and Kavvadia K[26] have proposed experiential learning utilizing trained teachers to be an effective interventional model for oral health education in school settings. The trained teachers and peer role models in our study were expected to apply the knowledge that they gained through training along with their own personal experiences for DHE in their respective groups. The application of this by teachers in our study was curtailed by the pandemic, while trained students could have applied this during DHE. Overall, our findings were consistent with the conclusions of a metanalysis by Abedi N, who found educational interventions to be effective in promotion of oral health.[27]

The study had some limitations. It was conducted during the pandemic where school hours were haphazard and inconsistent, which led to two main issues. Exposure

of the students to teachers would have been less, while exposure to their peers could have remained the same more or less. We were compelled to use a convenience sampling technique to select the schools rather than adopting the initially planned stratified cluster sampling, thereby impacting the external validity of the study. The follow-up also was reduced from the planned 6 months to 3 months.

Conclusion

Under the limitations of the study, it can be concluded that the peer role models were as effective as dental professionals in providing DHE in schools. This study paves the way for a study involving a larger sample size and increased study duration and frequency of reinforcement of knowledge in future before large-scale recommendations are made.

We recommend a larger study involving multiple schools in the district. This will provide data to validate the results of the present study highlighting the effectiveness of school-based oral health promotion through trained teachers and peer role models. This could become a strategic recommendation for oral health promotion among school children in public health programs in India.

Acknowledgments

We acknowledge the kind support offered by the headmasters of the three schools, teachers, peer role models and students who took part in the study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. World Health Organization. The Jakarta Declaration on Leading Health Promotion into the 21st Century. Geneva: WHO; 1997.
2. Vega J. Universal health coverage: The post-2015 development agenda. Lancet 2013;381:179-80.
3. The world health report 2010 – Health systems financing: The path to universal coverage. Geneva: World Health Organization; 2010.
4. Kutzin J. Health financing for universal coverage and health system performance: Concepts and implications for policy. Bull World Health Organ 2013;91:602-11.
5. Peterson PE. The World Oral Health Report 2003: 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):3-23.
6. Hanganu C, Danila L, Barlean L, Murariu A, Mihailovici A, Saveanu L. School-based dental health considerations for program development University of Medicine and Pharmacy. OHDMBSC 2004;III: 4-10.
7. Yee R, Sheiham A. The burden of restorative dental treatment for children in Third World countries. Int Dent J 2002;52:1-9.
8. Chandrashekar BR, Suma S, Kiran K, Manjunath BC. The use of school teachers to promote oral hygiene in some secondary school students at Hyderabad, Andhra Pradesh, India: A short term prospective pilot study. J Family Community Med 2012;19:184-9.
9. Chandrashekar BR, Suma S, Sukhabogi JR, Manjunath BC, Kallury A. Oral health promotion among rural school children through teachers: An interventional study. Indian J Public Health 2014;58:235-40.
10. Sekhar V, Sivsankar P, Easwaran MA, Subitha L, Bharath N, Rajeswary K, *et al*. Knowledge, attitude and practice of school teachers towards oral health in Pondicherry. J Clin Diagn Res 2014;8:ZC12-5.
11. Gambhir RS, Sohi RK, Nanda T, Sawhney GS, Setia S. Impact of school based oral health education programmes in India: A systematic review. J Clin Diagn Res 2013;7:3107-10.
12. Chachra S, Dhawan P, Kaur T, Sharma AK. The most effective and essential way of improving the oral health status education. J Indian Soc Pedod Prev Dent 2011;29:216-21.
13. Turesky S, Gilmore ND, Glickman I. Reduced plaque formation by the chloromethyl analogue of Victamine C. J Periodontol 1970;41:41-3.
14. Loe H. The gingival index, the plaque index and the retention index systems. J Periodontol 1967;38:610–6.
15. Edomwonyi AI, Adeniyi AA, Adedigba MA, Oyapero A. Use of teachers as agents of oral health education: Intervention study among public secondary school pupils in Lagos. J Family Med Prim Care 2020;9:2806-13.
16. Vangipuram S, Jha A, Raju R, Bashyam M. Effectiveness of peer group and conventional method (Dentist) of Oral Health education programme among 12-15 year old school children-A randomized controlled trial. J Clin Diagn Res 2016;10:125-9.
17. Saxena V, Jain M, Tiwari V, Torwane N, Sharva V, De J, *et al*. Oral health promotion by peer group model approachamong orphanages in Bhopal City, Central India. J Orofac Res 2015;5:77-9.
18. Myint ZCK, Zaitsu T, Oshiro A, Soe KK, Kawaguchi Y. Effectiveness of a School oral health education program in Yangon, Myanmar. Inter Ped Dent Open Acc J 2020;4:291-9.
19. Alsumait A, ElSalhy M, Behzadi S, Raine KD, Gokiert R, Cor K, *et al*. Impact evaluation of a school-based oral health program: Kuwait National Program. BMC Oral Health 2019;19:202.
20. Shenoy RP, Sequeira PS. Effectiveness of a school dental education program in improving oral health knowledge and oral hygiene practices and status of 12- to 13- year old school children. Indian J Dent Res 2010;21:253-9.
21. Karuveettil V, Kumar SV, Janakiram C, Joseph J. Effectiveness of a curriculum-based educational intervention on oral health behavior and dental caries experience among Indian schoolchildren. J Educ Health Promot 2020;9:90.
22. Al Saffan AD, Baseer MA, Alshammary AA, Assery M, Kamel A, RahmanG. Impact of oral health education on oral health knowledge of Private School Children in Riyadh city, Saudi Arabia. J Int Soc Prev Community Dent 2017;7(Suppl 3):186-93.
23. Tao LM, Zao YM, Gu LB, Shen J, Liu CJ. Diversified health education mode applied in oral health care of preschool children. Shanghai Kou Qiang Yi Xue 2017;26:94-7.
24. Stein C, Santos NML, Hilgert JB, Hugo FN. Effectiveness of oral health education on oral hygiene and dental caries in schoolchildren: Systematic review and meta-analysis. Community Dent Oral Epidemiol 2018;46:30–7.
25. Saied-Moallemi Z, Virtanen JI, Vehkalahti MM, Tehranchi A, Murtomaa H. School-based intervention to promote preadolescents' gingival health: A community trial. Community

Dent Oral Epidemiol 2009;37:518–26.
26. Angelopoulou MV. Kavvadia K. Experiential learning in oral health education. J Educ Health Promot 2018;7:70.
27. Abedi N. Meta-analysis of the effectiveness of educational interventions on dental and oral health promotion in Iran. J Educ Health Promot 2019;8:29.